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**TPC Benchmark™ H**  
**Full Disclosure Report**

***NEC Express5800/1320Xe (32 SMP)***

**with Microsoft SQL Server 2005  
Enterprise Edition 64-bit  
and  
Microsoft® Windows® Server 2003, Datacenter Edition  
for 64-bit Itanium-based Systems Service Pack1**

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**Second Edition**

**Submitted for Review  
July 19, 2005**

**Revision date  
November 10, 2005**

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# NEC Express5800/1320Xe (32 SMP)

TPC-H Rev.2.1.0

Report Date:Jul 19, 2005

Revision Date:Nov 10, 2005

Total System Cost

Composite Query per Hour Metric

Price/Performance

**\$1,573,303 (USD)**

**22,967.3 QphH@1000GB**

**\$68.51 / QphH@1000GB**

Database size

Database Manager

Operating System

Other Software

Availability Date

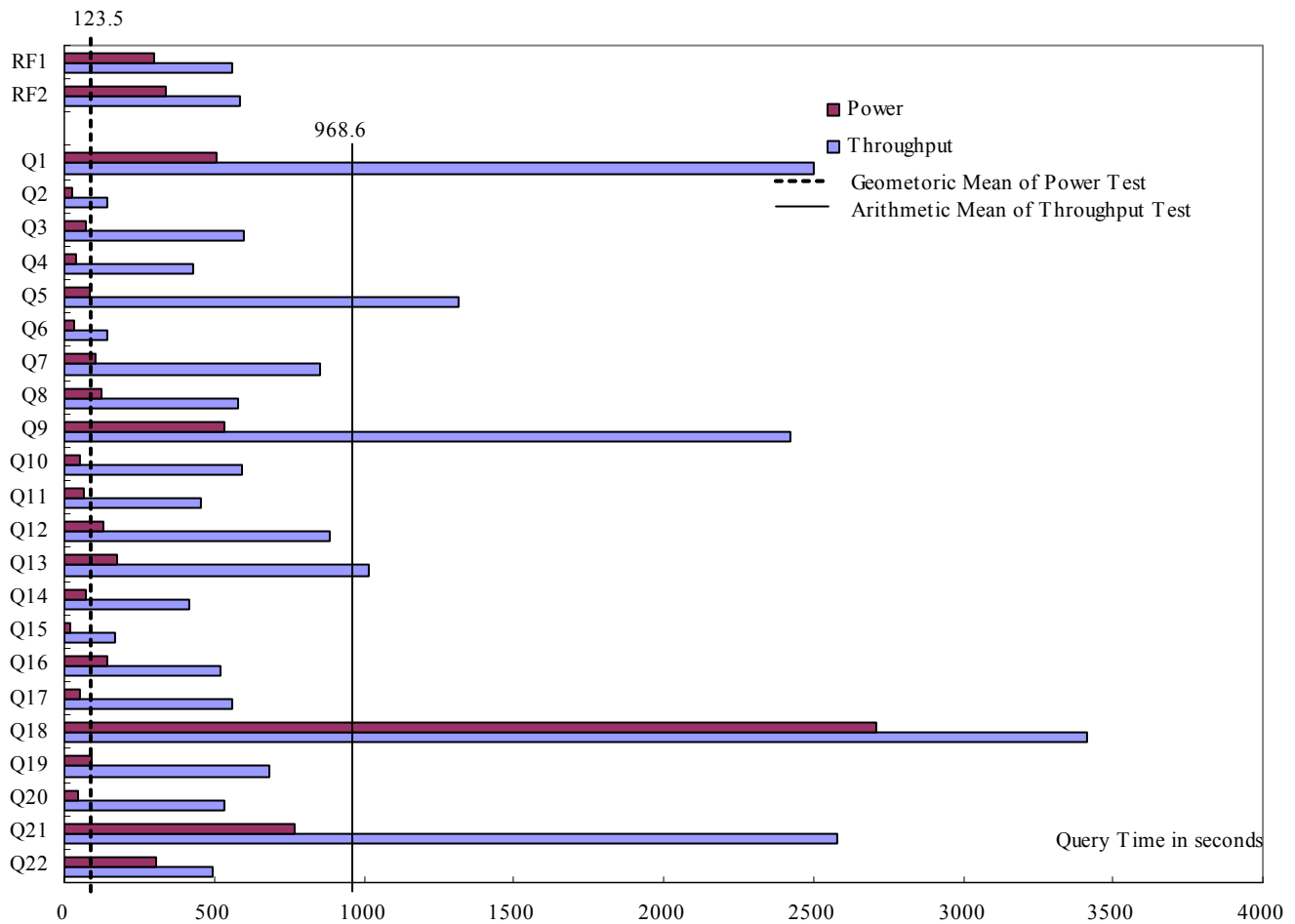
**1000 GB**

Microsoft SQL Server  
2005 Enterprise  
Edition 64-bit

Microsoft®  
Windows® Server 2003,  
Datacenter Edition for 64-bit  
Itanium-based Systems SP1

Microsoft®  
Visual Studio  
.NET 2003

**Dec 7, 2005**



Database Load Time = 10:34:00

Load include backup:Y

Disk Size/Database Size = 25.16

RAID(Base table only):N

RAID(Base tables and auxiliary data structures):N

RAID(All):N

### System Configuration:

Total Processors/Cores/Threads

32/32/32

Intel® Itanium® 2 1.6GHz 9MB L3 cache

Memory

128GB

Main Memory

Disk Controllers

45

QLogic™ QLA2340

Disk Drives

1

SCSI HBA

Total Disk Storage

755

36GB FC

36GB SCSI

25,160 GB



# NEC Express5800/1320Xe (32 SMP)

TPC-H Rev.2.1.0

Report Date:Jul 19, 2005

Revision Date:Nov 10, 2005

Description	Part Number	Third Party Brand	Pricing	Unit Price	Qty	Extended Price	3-yr Mnt. Price
<b>Server Hardware</b>							
Express5800/1320Xe system (32 way model)	850200716	NEC	1	975,106	1	975,106	201,380
Base Original 32(Express5800/1320Xe base system)					1	-	-
Itanium2 1.6GHz/9M cache					32	-	-
Cell Card Original					8	-	-
2GB Memory Option (4 x 512MB DIMMs)					64	-	-
Core PCI box					1	-	-
Base PCI box					3	-	-
PCI Cable					8	-	-
Expansion Cabinet					1	-	-
36GB Ultra 320/m SCSI HDD 10000RPM					1	-	-
10/100/1000Mb Ether card (Intel Pro1000XT)					1	-	-
Ultra160 SCSI card (Adaptec 39160)					1	-	-
Windows Server 2003, Data Center Edition					32	-	-
<b>NEC Express5800/120Rg-2(for System Management)</b>							
120Rg-2 base rack svr, one XEON processor, 3.0 GHz/1MB cache	850174001	NEC	1	3,799	1	3,799	-
1GB (2 x 512MB) interleaved memory DDR333 SDRAM	062-02466-000	NEC	1	999	1	999	-
36.4GB SCSI HDD (1")	062-02012-000	NEC	1	399	1	399	-
CD-ROM, 2 x On-board LAN, KB/MS	Included	NEC	1	-	1	-	-
3 years of warranty service to 4-hour response, 7x24	DE-0000-1095-7244	NEC	1	1,599	1	-	1,599
CTX CRT VL510 15	VL510	CTX	3	109	2	218	-
FC HBA QLA2340 (+10% spares)	QLA2340-CK	QLogic	3	824	50	41,200	-
					<b>Subtotal</b>	<b>1,021,721</b>	<b>202,979</b>
<b>Disk Subsystem</b>							
NEC Storage S2300 Basic Unit	850171001	NEC	1	33,999	23	781,977	-
2 RAID_Cntrl, 1GB Cache, 1DE, w/o drives							
1GB(2 x 512MB) PC133 SDRAM memory	062-02301-000	NEC	1	1,999	3	5,997	-
S2300 DE (+10% spares)	062-02402-000	NEC	1	7,999	31	247,969	-
36GB 15K rpm FC HDD (+10% spares)	062-02431-000	NEC	1	579	831	481,149	-
3 yr Telephone Upgrade Hdw & Storage	IS-THSU-1095-0724	NEC	1	1,499	23	-	34,477
42U Rackframe	050-01790-000	NEC	1	1,799	5	8,995	-
FC Cable 10MLC-LC (+10% spares)	062-02304-000	NEC	1	200	50	10,000	-
					<b>Subtotal</b>	<b>1,536,087</b>	<b>34,477</b>
<b>Server Software</b>							
Microsoft SQL Server 2005 Enterprise Edition (64bit)	810-04793	Microsoft	2	8,487	1	8,487	-
Microsoft SQL Server 2005 Client Licenses	359-01911	Microsoft	2	156	45	7,020	-
Microsoft Windows 2003 Standard Server	P73-00295	Microsoft	2	719	1	719	-
Visual Studio .NET 2003 Professional Special Edition	659-00390	Microsoft	2	799	1	799	-
Microsoft Problem Resolution Service		Microsoft	2	245	1	-	245
					<b>Subtotal</b>	<b>17,025</b>	<b>245</b>
					<b>TOTAL</b>	<b>2,574,833</b>	<b>237,701</b>

NEC brand total(Pricing 1-NEC)						2,516,390	237,456
NEC brand Large Purchase Cash Prepay Discount	-45%					-1,132,376	-106,855

<b>Notes:</b>		
Pricing: 1-NEC 2-Microsoft 3-Compuview Microsystems		3-Yr. Cost of Ownership: <b>\$1,573,303</b>
		QphH@1TB: <b>22967.3</b>
		\$/ QphH@1TB: <b>\$68.51</b>

**Results and methodology audited by Francois Raab of InfoSizing, Inc. (www.sizing.com)**

Prices used in TPC benchmarks reflect the actual prices a customer would pay for a one-time purchase of the stated components. Individually negotiated discounts are not permitted. Special prices based on assumptions about past or future purchases are not permitted. All discounts reflects standard pricing policies for the listed components. For complete details, see the pricing sections of the TPC benchmark specifications. If you find that the stated prices are not available according to these terms, please inform the TPC at pricing@tpc.org. Thank you.



### Numerical Quantities Summary

#### Measurement Results

Scale Factor	1000 GB
Total Data Storage / Database Size	25.16
Start of Database Load	7/9/2005 05:41:19
End of Database Load	7/9/2005 16:15:19
Database Load Time	10:34:00
Query Streams for Throughput Test	7
TPC-H Power	29159.7
TPC-H Throughput	18089.9
Composite Query per Hour Rating (QphH@1000GB)	22967.3
Total System Price Over 3 Years	\$1,573,303
TPC-H Price Performance Metric	\$68.51

#### Measurement Intervals

Measurement Interval in Throughput Test (Ts)	30647 seconds
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#### Duration of Stream Execution:

	Seed	Query Start Date/Time	RF1 Start Date/Time	RF2 Start Date/Time	Query Duration
		Query End Date/Time	RF1 End Date/Time	RF2 End Date/Time	RF Duration
Stream 0	709161519	07/11/2005 07:09:50 07/11/2005 08:52:20	07/11/2005 07:04:08 07/11/2005 07:09:48	07/11/2005 08:52:22 07/11/2005 08:57:22	
Stream 1	709161520	07/11/2005 08:57:28 07/11/2005 14:46:43	07/11/2005 15:14:33 07/11/2005 15:20:39	07/11/2005 15:20:41 07/11/2005 15:27:45	5:49:15 0:13:09
Stream 2	709161521	07/11/2005 08:57:29 07/11/2005 15:14:33	07/11/2005 15:27:58 07/11/2005 15:35:24	07/11/2005 15:35:34 07/11/2005 15:42:54	6:17:05 0:14:46
Stream 3	709161522	07/11/2005 08:57:29 07/11/2005 15:10:05	07/11/2005 15:43:12 07/11/2005 15:51:34	07/11/2005 15:51:52 07/11/2005 16:00:14	6:12:35 0:16:44
Stream 4	709161523	07/11/2005 08:57:30 07/11/2005 15:08:01	07/11/2005 16:00:35 07/11/2005 16:09:42	07/11/2005 16:10:05 07/11/2005 16:19:18	6:10:31 0:18:20
Stream 5	709161524	07/11/2005 08:57:31 07/11/2005 14:59:34	07/11/2005 16:19:44 07/11/2005 16:29:32	07/11/2005 16:30:01 07/11/2005 16:40:17	6:02:03 0:20:03
Stream 6	709161525	07/11/2005 08:57:32 07/11/2005 14:38:25	07/11/2005 16:40:46 07/11/2005 16:51:30	07/11/2005 16:52:05 07/11/2005 17:03:10	5:40:53 0:21:50
Stream 7	709161526	07/11/2005 08:57:33 07/11/2005 14:11:17	07/11/2005 17:03:43 07/11/2005 17:15:27	07/11/2005 17:16:09 07/11/2005 17:28:15	5:13:43 0:23:50



TPC-H Timing Intervals (in seconds):

Query	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Stream 0	505.5	23.6	70.8	41.6	87.5	29.9	106.5	125.2
Stream 1	1938.1	137.8	458.4	350.4	1705.9	128.2	671.4	366.7
Stream 2	3313.3	238.7	512.8	221.5	723.8	208.1	1284.6	663.6
Stream 3	2912.0	90.9	118.7	601.4	2033.7	171.1	876.7	483.9
Stream 4	3341.2	115.3	148.1	366.2	338.8	89.5	499.2	696.0
Stream 5	2424.6	254.0	253.9	519.8	789.0	166.2	984.5	724.4
Stream 6	2244.1	91.6	2511.8	575.3	1199.7	132.0	453.7	599.4
Stream 7	1337.6	88.8	180.2	391.8	2398.9	99.0	1205.2	526.9
Min Qi	1337.6	88.8	118.7	221.5	338.8	89.5	453.7	366.7
Max Qi	3341.2	254.0	2511.8	601.4	2398.9	208.1	1284.6	724.4
Avg Qi	2501.6	145.3	597.7	432.3	1312.8	142.0	853.6	580.1
Query	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16
Stream 0	534.5	51.2	67.7	130.2	173.0	71.2	21.4	141.0
Stream 1	3999.5	602.1	247.5	1387.5	1156.1	133.8	168.3	474.6
Stream 2	2118.2	878.3	207.0	1404.1	987.4	1540.8	214.0	669.7
Stream 3	2376.5	419.7	500.6	278.2	728.4	175.1	197.8	528.5
Stream 4	1479.5	754.9	885.8	712.9	1632.8	164.2	112.4	561.4
Stream 5	2715.9	658.8	532.7	692.5	1195.7	305.0	291.7	433.5
Stream 6	2554.4	591.8	359.3	1074.7	702.8	461.5	107.9	592.0
Stream 7	1719.8	221.6	468.6	663.8	724.1	129.1	86.7	401.2
Min Qi	1479.5	221.6	207.0	278.2	702.8	129.1	86.7	401.2
Max Qi	3999.5	878.3	885.8	1404.1	1632.8	1540.8	291.7	669.7
Avg Qi	2423.4	589.6	457.4	887.7	1018.2	415.6	168.4	523.0
Query	Q17	Q18	Q19	Q20	Q21	Q22	RF1	RF2
Stream 0	50.3	2706.9	90.9	48.2	766.5	306.5	340.0	300.2
Stream 1	498.7	2771.0	430.2	327.6	2257.3	744.4	665.1	423.8
Stream 2	562.6	3196.4	496.8	1346.8	1398.9	437.3	445.7	440.6
Stream 3	788.4	5099.1	367.7	583.8	2585.6	437.4	502.3	502.1
Stream 4	1369.2	2858.5	1173.6	281.2	4191.8	458.9	546.7	552.9
Stream 5	244.3	4305.1	1195.1	189.3	2294.1	552.6	587.9	615.4
Stream 6	169.8	2761.0	436.2	301.0	2191.4	341.7	644.5	665.4
Stream 7	273.3	2911.2	672.0	717.8	3130.0	475.8	704.2	725.4
Min Qi	169.8	2761.0	367.7	189.3	1398.9	341.7	445.7	423.8
Max Qi	1369.2	5099.1	1195.1	1346.8	4191.8	744.4	704.2	725.4
Avg Qi	558.0	3414.6	681.7	535.4	2578.4	492.6	585.2	560.8



Benchmark Sponsor: Jun Suzuki  
NEC Corporation  
1-10 Nisshincho  
Fuchu-City, Tokyo 183-8501, Japan

July 15, 2005

I verified the TPC Benchmark™ H performance of the following configuration:

Platform: NEC Express5800/1320Xe (32 SMP)  
Database Manager: Microsoft SQL Server 2005 Enterprise Edition 64-bit  
Operating System: Microsoft Windows Server 2003 Datacenter Edition for 64-bit

The results were:

CPU (Speed)	Memory	Disks	QphH@1,000GB
NEC Express5800/1320Xe			
32 x Intel Itanium 2 (1.6 GHz)	9 MB L3 Cache 128 GB Main	755 x 36 GB ext. 1 x 36 GB int.	<b>22,967.3</b>

In my opinion, this performance result was produced in compliance with the TPC's requirements for the benchmark. The following verification items were given special attention:

- The database records were defined with the proper layout and size
- The database population was generated using DBGEN
- The database was properly scaled to 1TB (1,000 GB) and populated accordingly
- The compliance of the database auxiliary data structures was verified
- The database load time was correctly measured and reported
- The required ACID properties were verified and met

- The query input variables were generated by QGEN
- The query text was produced using minor modifications and no query variant
- The execution of the queries against the SF1 database produced compliant answers
- A compliant implementation specific layer was used to drive the tests
- The throughput tests involved 7 query streams
- The ratio between the longest and the shortest query was such that no query timing was adjusted
- The execution times for queries and refresh functions were correctly measured and reported
- The repeatability of the measured results was verified
- The required amount of database log was configured
- The system pricing was verified for major components and maintenance
- The major pages from the FDR were verified for accuracy

Additional Audit Notes:

None.

Respectfully Yours,

A handwritten signature in black ink, appearing to read "François Raab", with a long horizontal flourish extending to the right.

François Raab  
President



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# *Preface*

## **Document Overview**

This report documents the methodology and results of the TPC Benchmark™ H (TPC-H) test conducted on the NEC Express5800/1320Xe using Microsoft SQL Server 2005 Enterprise Edition 64-bit, in conformance with the requirements of the TPC Benchmark™ H Standard Specification Revision 2.1.0. The tests documented in this report were sponsored by NEC Corporation. The operating system used for the benchmark was Microsoft Windows Server 2003, Datacenter Edition for 64-bit Itanium-based Systems, Service Pack 1. The Transaction Processing Performance Council (TPC) developed the TPC-H Benchmark. The TPC Benchmark™ H Standard represents an effort by NEC Corporation and other members of the Transaction Processing Performance Council (TPC) to create an industry-wide benchmark for evaluating the performance and price/performance of decision support systems, and to disseminate objective, verifiable performance data to the data processing industry. A certified audit of these measurements and the reported results was performed by Francois Raab of InfoSizing, Inc. (Colorado Springs, CO). He has verified compliance with the relevant TPC Benchmark™ H specifications; audited the benchmark configuration, environment, and methodology used to produce and validate the test results; and audited the pricing model used to calculate the price/performance. The auditor's letter of attestation is attached to the Executive Summary and precedes this section.

## ***TPC Benchmark™ H Overview***

The TPC Benchmark™ H (TPC-H) is a decision support benchmark. It consists of a suite of business oriented ad-hoc queries and concurrent updates. The queries and the data populating the database have been chosen to have broad industry-wide relevance while maintaining a sufficient degree of ease of implementation. This benchmark illustrates decision support systems that:

- Examine large volumes of data;
- Execute queries with a high degree of complexity;
- Give answers to critical business questions.

TPC-H evaluates the performance of various decision support systems by the execution of sets of queries against a standard database under controlled conditions. The TPC-H queries:

- Give answers to real-world business questions;
- Simulate generated ad-hoc queries (e.g., via a point and click GUI interface);
- Are far more complex than most OLTP transactions;
- Include a rich breadth of operators and selectivity constraints;
- Generate intensive activity on the part of the database server component of the system under test;
- Are executed against a database complying to specific population and scaling requirements;
- Are implemented with constraints derived from staying closely synchronized with an on-line production database.

The TPC-H operations are modeled as follows:

- The database is continuously available 24 hours a day, 7 days a week, for ad-hoc queries from multiple end users and updates against all tables, except possibly during infrequent (e.g., once a month) maintenance sessions;
- The TPC-H database tracks, possibly with some delay, the state of the OLTP database through on-going updates which batch together a number of modifications impacting some part of the decision support database;
- Due to the world-wide nature of the business data stored in the TPC-H database, the queries and the updates may be executed against the database at any time, especially in relation to each other. In addition, this mix of queries and updates is subject to specific ACIDity requirements, since queries and updates may execute concurrently;
- To achieve the optimal compromise between performance and operational requirements the database administrator can set, once and for all, the locking levels and the concurrent scheduling rules for queries and updates.

The minimum database required to run the benchmark holds business data from 10,000 suppliers. It contains almost ten million rows representing a raw storage capacity of about 1 gigabyte. Compliant benchmark implementations may also use one of the larger permissible database populations (e.g., 1000 gigabytes), as defined in Clause 4.1.3.

The performance metric reported by TPC-H is called the TPC-H Composite Query-per-Hour Performance Metric (QphH@Size), and reflects multiple aspects of the capability of the system to process queries. These aspects include the selected database size against which the queries are executed, the query processing power when queries are submitted by a single stream, and the query throughput when queries are submitted by multiple concurrent users. The TPC-H Price/Performance metric is expressed as \$/QphH@Size. To be compliant with the TPC-H standard, all references to TPC-H results for a given configuration must include all required reporting components. *The TPC believes that comparisons of TPC-H results measured against different database sizes are misleading and discourages such comparisons.*

The TPC-H database must be implemented using a commercially available database management system (DBMS) and the queries executed via an interface using dynamic SQL. The specification provides for variants of SQL, as implementers are not required to have implemented a specific SQL standard in full.

TPC-H uses terminology and metrics that are similar to other benchmarks, originated by the TPC and others. Such similarity in terminology does not in any way imply that TPC-H results are comparable to other benchmarks. The only benchmark results comparable to TPC-H are other TPC-H results compliant with the same revision.

Despite the fact that this benchmark offers a rich environment representative of many decision support systems, this benchmark does not reflect the entire range of decision support requirements. In addition, the extent to which a customer can achieve the results reported by a vendor is highly dependent on how closely TPC-H approximates the customer application. The relative performance of systems derived from this benchmark does not necessarily hold for other workloads or environments. Extrapolations to any other environment are not recommended.

Benchmark results are highly dependent upon workload, specific application requirements, and systems design and implementation. Relative system performance will vary as a result of these and other factors. Therefore, TPC-H should not be used as a substitute for a specific customer application benchmarking when critical capacity planning and/or product evaluation decisions are contemplated.

Benchmark sponsors are permitted several possible system designs, provided that they adhere to the model described in Clause 6. A full disclosure report (FDR) of the implementation details, as specified in Clause 8, must be made available along with the reported results.

## ***General Implementation Guidelines***

The purpose of TPC benchmarks is to provide relevant, objective performance data to industry users. To achieve that purpose, TPC benchmark specifications require that benchmark tests be implemented with systems, products, technologies and pricing that:

- Are generally available to users;
- Are relevant to the market segment that the individual TPC benchmark models or represents (e.g. TPC-H models and represents complex, high data volume, decision support environments);
- Would plausibly be implemented by a significant number of users in the market segment the benchmark models or represents.

## ***Related Product Information***

The TPC Benchmark™ H Standard requires that test sponsors provide a Full Disclosure Report in addition to published results. You can obtain copies of the test results as well as additional copies of this full disclosure report by sending a request to the following address:

Transaction Processing Performance Council  
Presidio of San Francisco  
Building 572B (surface)  
P.O. Box 29920 (mail) San Francisco, CA 94129-0920  
Voice: 415-561-6272  
Fax: 415-561-6120  
Email: [info@tpc.org](mailto:info@tpc.org)

# 1. General Items

## 1.1 Benchmark Sponsor

*A statement identifying the benchmark sponsor(s) and other participating companies must be provided.*

NEC Corporation is the sponsor of this TPC-H benchmark. The benchmark implementation was developed by Microsoft and NEC. The benchmark was conducted at NEC in Fuchu, Tokyo.

## 1.2 Parameter Settings

*Settings must be provided for all customer-tunable parameters and options which have been changed from the defaults found in actual products, including but not limited to:*

- *Data Base tuning options;*
- *Optimizer/Query execution options;*
- *Query Processing tool/language configuration parameters;*
- *Recovery/commit options;*
- *Consistency/locking options;*
- *Operating system and configuration parameters;*
- *Configuration parameters and options for any other software component incorporated into the pricing structure;*
- *Compiler optimization options.*

**Comment 1:** *In the event that some parameters and options are set multiple times, it must be easily discernible by an interested reader when the parameter or option was modified and what new value it received each time. The TPC Executive Summary Statement is included at the beginning of this report.*

**Comment 2:** *This requirement can be satisfied by providing a full list of all parameters and options, as long as all those that have been modified from their default values have been clearly identified and these parameters and options are only set once.*

Details of system and database configurations and parameters are provided in Appendixes A and B.

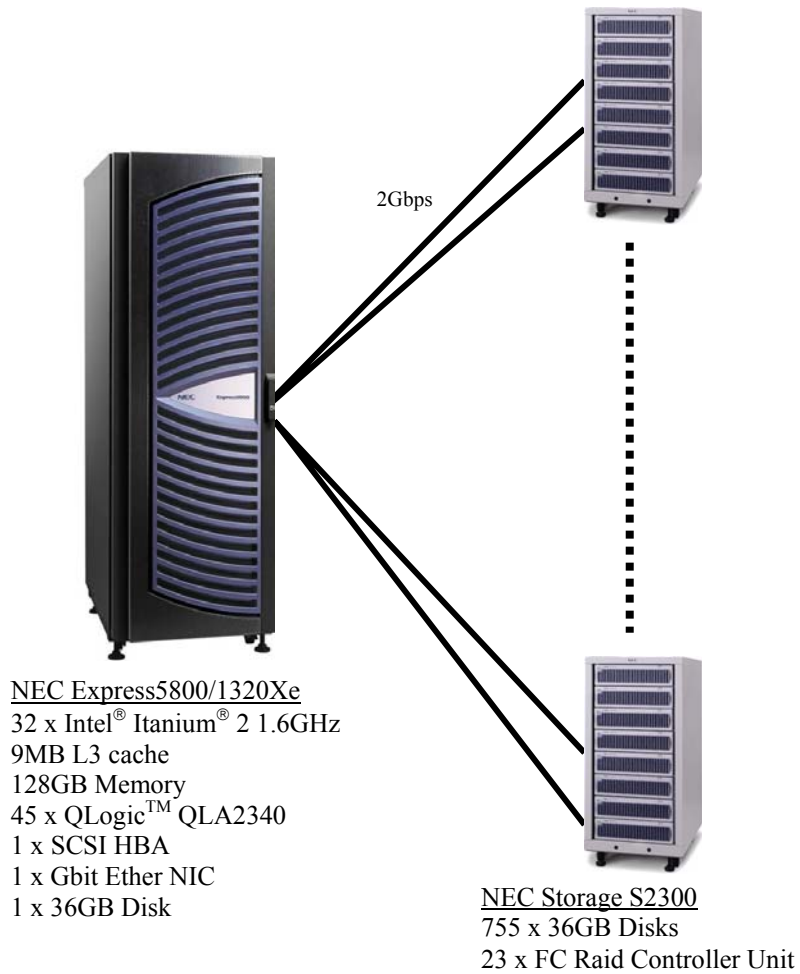
## 1.3 Configuration Diagrams

*Diagrams of both measured and priced configurations must be provided, accompanied by a description of the differences. This includes, but is not limited to:*

- *Number and type of processors;*
- *Size of allocated memory, and any specific mapping/partitioning of memory unique to the test;*
- *Number and type of disk units (and controllers, if applicable);*
- *Number of channels or bus connections to disk units, including their protocol type;*
- *Number of LAN (e.g. Ethernet) connections, including routers, work stations, terminals, etc., that were physically used in the test or are incorporated into the pricing structure;*
- *Type and run-time execution location of software components (e.g., DBMS, query processing tools/languages, middle-ware components, software drivers, etc.).*

The configuration diagram for the tested and priced system is provided on the following page.

**Figure1.1: Express5800/1320Xe, Tested and Priced Configurations**



## 2 Clause 1 : Logical Database Design

### 2.1 Table Definitions

Listings must be provided for all table definition statements and all other statements used to setup the test and qualification databases.

Appendix B contains the scripts that create the tables and indexes for the TPC-H database.

### 2.2 Database Organization

The physical organization of tables and indices, within the test and qualification databases, must be disclosed. If the column ordering of any table is different from that specified in Clause 1.4, it must be noted.

Clustered indexes were used. See Appendix B, which contains the database and table creation statements.

### 2.3 Horizontal Partitioning

Horizontal partitioning of base tables or auxiliary structures created by database directives is allowed. Groups of rows from a table or auxiliary structure may be assigned to different files, disks, or areas. If this assignment is a function of data in the table or auxiliary structure, the assignment must be based on the value of a partitioning field. A partitioning field must be one and only one of the following:

- A primary
- A foreign
- A single date column

Some partitioning schemes require the use of directives that specify explicit values for the partitioning field. If such directives are used they must satisfy the following conditions:

- They may not rely on any knowledge of the data stored in the table except the minimum and maximum values of columns used for the partitioning field.
- Within the limitations of integer division, they must define each partition to accept an equal portion of the range between the minimum and maximum values of the partitioning column(s).
- The directives must allow the insertion of values of the partitioning column(s) outside the range covered by the minimum and maximum values.

Multiple-level partitioning of base tables or auxiliary structures is allowed only if each level of partitioning satisfies the conditions stated above and each level references only one partitioning field as defined above. If implemented, the details of such partitioning must be disclosed.

Horizontal partitioning was not used. See Appendix B, which contains the database and table creation statements.

### 2.4 Vertical Partitioning

Vertical partitioning of tables is not allowed. For example, groups of columns of one row shall not be assigned to files, disks, or areas different from those storing the other columns of that row. The row must be processed as an atomic series of contiguous columns.

**Comment:** The effect of vertical partitioning is to reduce the effective row size accessed by the system. Given the synthetic nature of this benchmark, the effect of vertical partitioning is achieved by the choice of row sizes. No further vertical partitioning of the data set is allowed. Specifically, the above Clause prohibits assigning one or more of the columns not accessed by the TPC-H query set to a vertical partition.

Vertical partitioning was not used. See Appendix B, which contains the database and table creation statements.

## 2.5 Replication

*Any replication of physical objects must be disclosed and must conform to the requirements of Clause 1.5.6.*

No replication was used. See Appendix B, which contains the database and table creation statements.



## 3 Clause 2 : QUERIES AND UPDATE FUNCTIONS

### 3.1 Query Language

*The query language used to implement the queries must be identified.*

SQL was the query language used to implement all queries.

### 3.2 Random Number Generation

*The method of verification for the random number generation must be described unless the supplied DBGEN and QGEN were used.*

DBGEN Version 1.3.0 and QGEN version 1.3.0 were used to generate random numbers for these runs.

### 3.3 Substitution Parameters

*The method used to generate values for substitution parameters must be disclosed. If QGEN is not used for this purpose, then the source code of any non-commercial tool used must be disclosed. If QGEN is used, the version number, release number, modification number and patch level of QGEN must be disclosed.*

The supplied QGEN version 1.3.0 was used.

### 3.4 Query Text and Output Data from Qualification Database

*The executable query text used for query validation must be disclosed along with the corresponding output data generated during the execution of the query text against the qualification database. If minor modifications (see Clause 2.2.3) have been applied to any functional query definitions or approved variants in order to obtain executable query text, these modifications must be disclosed and justified. The justification for a particular minor query modification can apply collectively to all queries for which it has been used. The output data for the power and throughput tests must be made available electronically upon request.*

Appendix C contains the query text and query output. The following allowed minor query modifications were used in this implementation:

- The “dateadd” function is used to perform date arithmetic in Q1, Q4, Q5, Q6, Q10, Q12, Q14 , Q15 and Q20.
- The “datepart” function is used to extract part of a date (“YY”) in Q7, Q8 and Q9.
- The “top” function is used to restrict the number of output rows in Q2, Q3, Q10, Q18 and Q21.
- The “count\_big” function is used in place of the “count” function in Q1.

### 3.5 Query Substitution Parameters and Seeds

*All the query substitution parameters used during the performance test must be disclosed in tabular format, along with the seeds used to generate these parameters.*

Appendix D contains the seed and query substitution parameters.

### 3.6 Query Isolation Level

*The isolation level used to run the queries must be disclosed. If the isolation level does not map closely to one of the isolation levels defined in Clause 3.4, additional descriptive detail must be provided.*

The queries and transactions were run with the isolation level “Level 1.”

### 3.7 Source Code of Refresh Functions

*The details of how the refresh functions were implemented must be disclosed (including source code of any non-commercial program used).*

The refresh function is part of the implementation-specific driver code included in Appendix E.

## 4 Clause 3 : DATABASE SYSTEM PROPERTIES

### 4.1 Atomicity

*The system under test must guarantee that transactions are atomic; the system will either perform all individual operations on the data, or will assure that no partially completed operations leave any effects on the data.*

#### 4.1.1 Completed Transaction

*Perform the ACID transaction for a randomly selected set of input data and verify that the appropriate rows have been changed in the ORDER, LINEITEM, and HISTORY tables.*

1. The total price from the ORDER table and the extended price from the LINEITEM table were retrieved for a randomly selected order key.
2. The ACID transaction was performed using the order key from Step 1.
3. The ACID transaction was committed.
4. The total price from the ORDER table and the extended price from the LINEITEM table were retrieved for the same order key used in Step 1. It was verified that the appropriate rows had been inserted.

#### 4.1.2 Aborted Transaction

*Perform the ACID transaction for a randomly selected set of input data, substituting a ROLLBACK of the transaction for the COMMIT of the transaction. Verify that the appropriate rows have not been changed in the ORDER, LINEITEM, and HISTORY tables.*

1. The total price from the ORDER table and the extended price from the LINEITEM table were retrieved for a randomly selected order key.
2. The ACID transaction was performed using the order key from Step 1. The transaction was stopped prior to the commit.
3. The ACID transaction was ROLLED BACK.
4. The total price from the ORDER table and the extended price from the LINEITEM table were retrieved for the same order key used in Step 1. It was verified that the appropriate rows had not been changed.

### 4.2 Consistency

*Consistency is the property of the application that requires any execution of transactions to take the database from one consistent state to another.*

#### 4.2.1 Consistency Test

*Verify that ORDER and LINEITEM tables are initially consistent, submit the required number of ACID transactions with randomly selected input parameters, and re-verify the consistency of the ORDER and LINEITEM tables.*

The consistency of the ORDER and LINEITEM tables was verified based on randomly selected values of the column O\_ORDERKEY.

1. ACID queries were executed to verify the initial consistent state of the ORDER and LINEITEM tables.
2. More than 100 ACID transactions were submitted from each of 8 execution streams.
3. ACID queries were re-executed to verify the consistent state of the ORDER and LINEITEM tables after the ACID transaction streams.
4. The consistency of the ORDER and LINEITEM tables was re-verified.

To guarantee arithmetic function portability and consistency of results, the following query was executed to verify the consistency between the ORDER and LINEITEM tables:

```
SELECT DISTINCT(o.O_ORDERKEY),
cast(o.O_TOTALPRICE as decimal(20,3)),
l.L_ORDERKEY,
cast(sum(cast( cast( cast( cast(L_EXTENDEDPRICE as decimal(20,3))*100 as integer) as
```

decimal(20,3)) \* (1- cast(L\_DISCOUNT as decimal(20,3))) as integer)  
\* (1 + cast(L\_TAX as decimal(20,3))) as integer) as decimal(20,3))/100) as decimal(20,3))

### 4.3 Isolation

*Operations of concurrent transactions must yield results which are indistinguishable from the results which would be obtained by forcing each transaction to be serially executed to completion in some order.*

#### 4.3.1 Read-Write Conflict with Commit

*Demonstrate isolation for the read-write conflict of a read-write transaction and a read-only transaction when the read-write transaction is committed.*

1. An ACID transaction was started for a randomly selected O\_KEY, L\_KEY, and DELTA. The ACID transaction was suspended prior to COMMIT.
2. An ACID query was started for the same O\_KEY used in Step 1. The ACID query did not see the uncommitted changes made by the ACID transaction.
3. The ACID transaction was COMMITTED.
4. The ACID query completed.

#### 4.3.2 Read-Write Conflict with Rollback

*Demonstrate isolation for the read-write conflict of a read-write transaction and a read-only transaction when the read-write transaction is rolled back.*

1. An ACID transaction was started for a randomly selected O\_KEY, L\_KEY, and DELTA. The ACID transaction was suspended prior to ROLLBACK.
2. An ACID query was started for the same O\_KEY used in Step 1. The ACID query did not see the uncommitted changes made by the ACID transaction.
3. The ACID transaction was ROLLED BACK.
4. The ACID query completed.

#### 4.3.3 Write-Write Conflict with Commit

*Demonstrate isolation for the write-write conflict of two update transactions when the first transaction is committed.*

1. An ACID transaction, T1, was started for a randomly selected O\_KEY, L\_KEY, and DELTA. The ACID transaction was suspended prior to COMMIT.
2. Another ACID transaction, T2, was started using the same O\_KEY and L\_KEY and a randomly selected DELTA.
3. T2 waited.
4. T1 was allowed to COMMIT and T2 completed.
5. It was verified that  $T2.L\_EXTENDEDPRICE = T1.L\_EXTENDEDPRICE + (DELTA * (T1.L\_EXTENDEDPRICE / T1.L\_QUANTITY))$ .

#### 4.3.4 Write-Write Conflict with Rollback

*Demonstrate isolation for the write-write conflict of two update transactions when the first transaction is rolled back.*

1. An ACID transaction, T1, was started for a randomly selected O\_KEY, L\_KEY, and DELTA. The ACID transaction was suspended prior to ROLLBACK.
2. Another ACID transaction, T2, was started using the same O\_KEY and L\_KEY and a randomly selected DELTA.
3. T2 waited
4. T1 was allowed to ROLLED BACK and T2 completed
5. It was verified that  $T2.L\_EXTENDEDPRICE = T1.L\_EXTENDEDPRICE$ .

#### 4.3.5 Concurrent Progress of Read and Write on Different Tables

*Demonstrate the ability of read and write transactions affecting different database tables to make progress concurrently.*

1. An ACID transaction, T1, was started for a randomly selected O\_KEY, L\_KEY, and DELTA. T1 was suspended prior to COMMIT.
2. Another ACID transaction, T2 was started using random values for PS\_PARTKEY and PS\_SUPPKEY.
3. ACID transaction T2 completed.
4. ACID transaction T1 completed and the appropriate rows in the ORDER, LINEITEM, and HISTORY tables were changed.
5. It was verified that the appropriate rows in the ORDERS, LINEITEM and HISTORY tables have been changed.

### 4.3.6 Read-Only Query Conflict with Update Transaction

*Demonstrate that the continuous submission of arbitrary (read-only) queries against one or more tables of the database does not indefinitely delay update transactions affecting those tables from making progress.*

1. An ACID transaction, T1, was started, executing Q1 against the qualification database. The substitution parameter was chosen from the interval [0..2159] so that the query ran for a sufficient length of time.
2. Before T1 completed, an ACID transaction, T2, was started using randomly selected values of O\_KEY, L\_KEY and DELTA.
3. T2 completed before T1 completed.
4. It was verified that the appropriate rows in the ORDER, LINEITEM and HISTORY tables have been changed.

## 4.4 Durability

*The tested system must guarantee durability: the ability to preserve the effects of committed transactions and insure database consistency after recovery from any one of the failures listed in Clause 3.5.2*

### 4.4.1 Loss of Data and Log

*Guarantee the database and committed updates are preserved across a permanent irrecoverable failure of any single durable medium containing TPC-H database tables or recovery log tables.*

The database log was stored RAID-5 protected storages. Loss of data test and loss of log test were combined to one test and demonstrated on the qualification database.

1. 8 streams of ACID transactions were started.
2. After at least 100 transactions had occurred on each stream and the streams of ACID transactions were still running, one of the RAID-5 set of log part disks was removed. The running continued without any interruptions.
3. One of the RAID-5 set of data part disks was removed.
4. Fibre system reported system error resulted in IO error for SQL database.
5. The 8 streams of ACID transactions failed and recorded their numbers of committed transactions in success files.
6. The transaction log was backed up.
7. Two new drives were used to replace the removed log and data disks.
8. The database was restored to their state prior to the ACID transaction streams..
9. The backed up transaction log was applied.
10. The counts in the success files and the HISTORY table count were compared and the counts matched.

### 4.4.2 Loss of Mirrored write-back cache

*Guarantee the database and committed updates are preserved across a permanent irrecoverable failure of any single durable medium containing TPC-H database tables or recovery log tables.*

The Fibre Array system used for this benchmark has integrated feature of mirrored write-back cache. When a LUN is configured to enable write-back caching, the data on the cache is automatically mirrored on the RAMs in two controller modules, which are powered and protected from loss of power by the controller BBU. Loss of mirrored write-back cache test was demonstrated on the qualification database.

1. 8 streams of ACID transactions were started.
2. After at least 100 transactions had occurred on each stream and the streams of ACID transactions were still running, a controller module, which manages write-back cache of mirrored drives, was pulled off.
3. Fibre system reported system error resulted in IO error for SQL database.
4. Contents on mirrored cache on another controller were automatically saved to temporal disk area and the Fibre Array house was eventually stopped.
5. The 8 streams of ACID transactions failed and recorded their numbers of committed transactions in success files.
6. The Fibre array was re-powered.
7. Saved data was automatically restored to mirrored cache and flushed to drives.
8. The database ran through its recovery mode.
9. The counts in the success files and the HISTORY table count were compared and the counts matched.

### 4.4.3 Loss of System

*Guarantee the database and committed updates are preserved across an instantaneous interruption (systemcrash/system hang) in processing which requires the system to reboot to recover.*

The system crash and memory failure tests were combined.

1. 8 streams of ACID transactions were started.
2. After at least 100 transactions had occurred on each stream and the streams of ACID transactions were still running, the system was powered off.
3. When power was restored the system rebooted and the database was restarted.
4. The database ran through its recovery mode.
5. The counts in the success files and the HISTORY table count were compared and the counts matched.

### 4.4.4 Loss of Memory

*Guarantee the database and committed updates are preserved across failure of all or part of memory (loss of contents).*

The system crash and memory failure tests were combined. See the previous section.

## 5 Clause 4 : Scaling and Database Population

### 5.1 Cardinality of Tables

*The cardinality (e.g., the number of rows) of each table of the test database, as it existed at the completion of the database load (see Clause 4.2.5), must be disclosed.*

Table	# of ROWS
Orders	1,500,000,000
Lineitem	5,999,989,709
Customer	150,000,000
Parts	200,000,000
Supplier	10,000,000
Partsupp	800,000,000
Nation	25
Region	5

### 5.2 Distribution of Tables and Logs Across Media

*The distribution of tables and logs across all media must be explicitly described using a format similar to that shown in the following example for both the tested and priced systems.*

Refer to Appendix G for details of the database layout.

### 5.3 Partitions/Replications Mapping

*The mapping of data base partitions/replications must be explicitly described.*

**Comment:** *The intent is to provide sufficient detail about partitioning and replication to allow independent reconstruction of the test database.*

Database partitioning and replication were not used.

### 5.4 Use of RAID

*Implementations may use some form of RAID . The RAID level used must be disclosed for each device.*

Hardware RAID-5 was used in the implementation for log. Refer to Appendix G for details of RAID configuration.

## 5.5 DBGEN Modifications

The version number, release number, modification number, and patch level of DBGEN must be disclosed. Any modifications to the DBGEN source code must be disclosed. In the event that a program other than DBGEN was used to populate the database, it must be disclosed in its entirety.

The supplied DBGEN 1.3.0 was used for populating the database.

## 5.6 Database Load Time

The database load time for the test database (see Clause 4.3) must be disclosed

The Numerical Quantities summary contains the database load time, which was 10:34:00

## 5.7 Database Storage Ratio

The data storage ratio must be disclosed. It is computed by dividing the total data storage of the priced configuration (expressed inGB) by the size chosen for the test database. The ratio must be reported to the nearest 1/100th, rounded up. For example, a system configured with 96 disks of 2.1 GB capacity for a 100GB test database has a data storage ratio of 2.02.

**Comment:** For the reporting of configured disk capacity, gigabyte (GB) is defined to be  $2^{30}$  bytes. Since disk manufacturers typically report disk size using base ten (i.e.,  $GB = 10^9$ ), it may be necessary to convert the advertised size from base ten to base two.

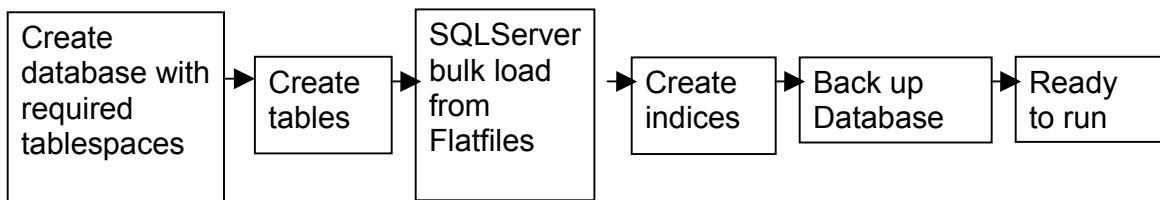
The Numerical Quantities summary contains the data storage ratio (25.16) for the system used.

## 5.8 Database Loading

The details of the database load must be disclosed, including a block diagram illustrating the overall process. Disclosure of the load procedure includes all steps, scripts, input and configuration files required to completely reproduce the test and qualification databases.

The following steps were used to load the database:

- 1 DBGEN version 1.3.0 was used to create flat files.
- 2 SQL Server 2005 was used to define the database, to define tables, and to load the tables via a “bulk insert” command.
- 3 Clustered indexes were created using SQL Server 2005.
- 4 Non clustered indexes were created using SQL Server 2005.
- 5 A database backup was performed to 4 logical devices
- 6 Rows were inserted into the database by running 64 concurrent threads, each of which performed a “bulk insert” operation that loaded one 64th of each of the LINEITEM, ORDERS, PART, PARTSUPP, SUPPLIER and CUSTOMER tables. The NATION and REGION tables were loaded sequentially, each by a single thread.



## 5.9 Qualification Database Configuration

Any differences between the configuration of the qualification database and the test database must be disclosed.

The qualification database was created using scripts identical to those of the test database, except for variances due to the sizes of the two databases.

## **6 Clause 5: Performance Metrics and Execution Rules**

### **6.1 System Activity Between Load and Performance Tests**

*Any system activity on the SUT which takes place between the conclusion of the load test and the beginning of the performance test must be fully disclosed including listings of scripts or command logs.*

Auditor requested queries were run against the database to verify the completeness and correctness of the database load.

### **6.2 Power Test Implementation**

*The details of the steps followed to implement the power test (e.g., system boot, database restart, etc.) must be disclosed.*

The following steps were followed to run the power test.

1. SQL Server 2005 was started.
2. RF1 refresh transactions were run
3. Stream 00 execution was run
4. RF2 refresh transactions were run.

### **6.3 Timing Intervals and Reporting**

*The timing intervals for each query and for both refresh functions must be reported for the power test.*

This information is contained in the Numerical Quantities Summary page in the Executive Summary at the beginning of this report. For convenience, it is repeated in Section 6.10.

### **6.4 Number of Streams in the Throughput Test**

*The number of query streams used for the throughput test must be disclosed*

Seven streams were run for the throughput test

### **6.5 Start and End Date/Time for Each Query Stream**

*The start time and finish time for each query stream must be reported for the throughput test*

This information is contained in the Numerical Quantities Summary page in the Executive Summary at the beginning of this report. For convenience, it is repeated in Section 6.10.

### **6.6 Total Elapsed Time for the Measurement Interval**

*The total elapsed time of the measurement interval must be reported for the throughput test.*

This information is contained in the Numerical Quantities Summary page in the Executive Summary at the beginning of this report. For convenience, it is repeated in Section 6.10.

### **6.7 Refresh Function Start Date/Time and Finish Date/Time**

*The start time and finish time for each refresh function in the refresh stream must be reported for the throughput test.*

This information is contained in the Numerical Quantities Summary page in the Executive Summary at the beginning of this report. For convenience, it is repeated in Section 6.10.

### **6.8 Timing Intervals for Each Query and Each Refresh Function for Each Stream**

*The timing intervals for each query of each stream and for each refresh function must be reported for the throughput test.*

This information is contained in the Numerical Quantities Summary page in the Executive Summary at the beginning of this report. For convenience, it is repeated in Section 6.10.

## 6.9 Performance Metrics

*The computed performance metric, related numerical quantities and the price performance metric must be reported.*

This information is contained in the Numerical Quantities Summary section of the Executive Summary. For convenience, it is repeated in Section 6.10.

## 6.10 The Performance Metric and Numerical Quantities from Both Runs

*The performance metric (QphH) and the numerical quantities (TPC-H Power@Size and TPC-H Throughput@Size) from both of the runs must be disclosed.*

	QppH@1000GB	QthH@1000GB	QphH@1000GB
Run 1	31932.3	18354.0	24209.2
Run 2	29159.7	18089.9	22967.3
% Difference	-9.51%	-1.46%	-5.41%

(Run 2 was reported.)

Tables from Numerical Quantities pages in the Executive Summary of this report:



# Numerical Quantities Summary

## Measurement Results

Scale Factor	1000 GB
Total Data Storage / Database Size	25.16
Start of Database Load	7/9/2005 05:41:19
End of Database Load	7/9/2005 16:15:19
Database Load Time	10:34:00
Query Streams for Throughput Test	7
TPC-H Power	29159.7
TPC-H Throughput	18089.9
Composite Query per Hour Rating (QpH@1000GB)	22967.3
Total System Price Over 3 Years	\$1,573,303
TPC-H Price Performance Metric	\$68.51

## Measurement Intervals

Measurement Interval in Throughput Test (Ts)	30647 seconds
--	---------------

## Duration of Stream Execution:

	Seed	Query Start Date/Time	RF1 Start Date/Time	RF2 Start Date/Time	Query Duration
		Query End Date/Time	RF1 End Date/Time	RF2 End Date/Time	RF Duration
Stream 0	709161519	07/11/2005 07:09:50 07/11/2005 08:52:20	07/11/2005 07:04:08 07/11/2005 07:09:48	07/11/2005 08:52:22 07/11/2005 08:57:22	
Stream 1	709161520	07/11/2005 08:57:28 07/11/2005 14:46:43	07/11/2005 15:14:33 07/11/2005 15:20:39	07/11/2005 15:20:41 07/11/2005 15:27:45	5:49:15 0:13:09
Stream 2	709161521	07/11/2005 08:57:29 07/11/2005 15:14:33	07/11/2005 15:27:58 07/11/2005 15:35:24	07/11/2005 15:35:34 07/11/2005 15:42:54	6:17:05 0:14:46
Stream 3	709161522	07/11/2005 08:57:29 07/11/2005 15:10:05	07/11/2005 15:43:12 07/11/2005 15:51:34	07/11/2005 15:51:52 07/11/2005 16:00:14	6:12:35 0:16:44
Stream 4	709161523	07/11/2005 08:57:30 07/11/2005 15:08:01	07/11/2005 16:00:35 07/11/2005 16:09:42	07/11/2005 16:10:05 07/11/2005 16:19:18	6:10:31 0:18:20
Stream 5	709161524	07/11/2005 08:57:31 07/11/2005 14:59:34	07/11/2005 16:19:44 07/11/2005 16:29:32	07/11/2005 16:30:01 07/11/2005 16:40:17	6:02:03 0:20:03
Stream 6	709161525	07/11/2005 08:57:32 07/11/2005 14:38:25	07/11/2005 16:40:46 07/11/2005 16:51:30	07/11/2005 16:52:05 07/11/2005 17:03:10	5:40:53 0:21:50
Stream 7	709161526	07/11/2005 08:57:33 07/11/2005 14:11:17	07/11/2005 17:03:43 07/11/2005 17:15:27	07/11/2005 17:16:09 07/11/2005 17:28:15	5:13:43 0:23:50

## TPC-H Timing Intervals (in seconds):

Query	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Stream 0	505.5	23.6	70.8	41.6	87.5	29.9	106.5	125.2
Stream 1	1938.1	137.8	458.4	350.4	1705.9	128.2	671.4	366.7
Stream 2	3313.3	238.7	512.8	221.5	723.8	208.1	1284.6	663.6
Stream 3	2912.0	90.9	118.7	601.4	2033.7	171.1	876.7	483.9
Stream 4	3341.2	115.3	148.1	366.2	338.8	89.5	499.2	696.0
Stream 5	2424.6	254.0	253.9	519.8	789.0	166.2	984.5	724.4
Stream 6	2244.1	91.6	2511.8	575.3	1199.7	132.0	453.7	599.4
Stream 7	1337.6	88.8	180.2	391.8	2398.9	99.0	1205.2	526.9
Min Qi	1337.6	88.8	118.7	221.5	338.8	89.5	453.7	366.7
Max Qi	3341.2	254.0	2511.8	601.4	2398.9	208.1	1284.6	724.4
Avg Qi	2501.6	145.3	597.7	432.3	1312.8	142.0	853.6	580.1
Query	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16
Stream 0	534.5	51.2	67.7	130.2	173.0	71.2	21.4	141.0
Stream 1	3999.5	602.1	247.5	1387.5	1156.1	133.8	168.3	474.6
Stream 2	2118.2	878.3	207.0	1404.1	987.4	1540.8	214.0	669.7
Stream 3	2376.5	419.7	500.6	278.2	728.4	175.1	197.8	528.5
Stream 4	1479.5	754.9	885.8	712.9	1632.8	164.2	112.4	561.4
Stream 5	2715.9	658.8	532.7	692.5	1195.7	305.0	291.7	433.5
Stream 6	2554.4	591.8	359.3	1074.7	702.8	461.5	107.9	592.0
Stream 7	1719.8	221.6	468.6	663.8	724.1	129.1	86.7	401.2
Min Qi	1479.5	221.6	207.0	278.2	702.8	129.1	86.7	401.2
Max Qi	3999.5	878.3	885.8	1404.1	1632.8	1540.8	291.7	669.7
Avg Qi	2423.4	589.6	457.4	887.7	1018.2	415.6	168.4	523.0
Query	Q17	Q18	Q19	Q20	Q21	Q22	RF1	RF2
Stream 0	50.3	2706.9	90.9	48.2	766.5	306.5	340.0	300.2
Stream 1	498.7	2771.0	430.2	327.6	2257.3	744.4	665.1	423.8
Stream 2	562.6	3196.4	496.8	1346.8	1398.9	437.3	445.7	440.6
Stream 3	788.4	5099.1	367.7	583.8	2585.6	437.4	502.3	502.1
Stream 4	1369.2	2858.5	1173.6	281.2	4191.8	458.9	546.7	552.9
Stream 5	244.3	4305.1	1195.1	189.3	2294.1	552.6	587.9	615.4
Stream 6	169.8	2761.0	436.2	301.0	2191.4	341.7	644.5	665.4
Stream 7	273.3	2911.2	672.0	717.8	3130.0	475.8	704.2	725.4
Min Qi	169.8	2761.0	367.7	189.3	1398.9	341.7	445.7	423.8
Max Qi	1369.2	5099.1	1195.1	1346.8	4191.8	744.4	704.2	725.4
Avg Qi	558.0	3414.6	681.7	535.4	2578.4	492.6	585.2	560.8

### 6.11 System Activity Between Tests

*Any activity on the SUT that takes place between the conclusion of Run1 and the beginning of Run2 must be fully disclosed including listings of scripts or command logs along with any system reboots or database restarts.*

The following activities took place between the conclusion of Run 1 and the beginning of Run 2:

1. Shutdown SQL Server.
2. Rebooted System.
3. Restarted SQL Server.

## 7 Clause 6 : SUT and Driver Implementation Related Items

### 7.1 Driver

*A detailed textual description of how the driver performs its functions, how its various components interact and any product functionalities or environmental setting on which it relies must be provided. All related source code, scripts and configuration files must be disclosed. The information provided should be sufficient for an independent reconstruction of the driver.*

The TPC-H benchmark was implemented using a Microsoft internal tool called StepMaster. StepMaster is a general purpose test harness which can drive ODBC and shell commands. Within StepMaster, the user designs a workspace corresponding to the sequence of operations (or steps) to be executed. When the workspace is executed, StepMaster records information about the run into a database for post-processing.

StepMaster provides a mechanism for creating parallel streams of execution. This is used in the throughput tests to drive the query and refresh streams.

Each step is timed using a millisecond resolution timer. A timestamp T1 is taken before beginning the operation and a timestamp T2 is taken after completing the operation. These times are recorded in a database for post-processing.

Two types of ODBC connections are supported: static and dynamic. A dynamic connection is used to execute a single operation and is closed when the operation finishes. A static connection is held open until the run completes and may be used to execute more than one step. A connection (either static or dynamic) can only have one outstanding operation at any time.

In TPC-H, static connections are used for the query streams in the power and throughput tests.

StepMaster reads an Access database to determine the sequence of steps to execute. These commands are represented as the Implementation Specific Layer. StepMaster records its execution history, including all timings, in the Access database. Additionally, StepMaster writes a textual log file of execution for each run.

SQL Server operations executed from StepMaster do not gain any performance advantage compared to osql, the command prompt utility for ad hoc, interactive execution of Transact-SQL statements and scripts. Rather, StepMaster simplifies the task of benchmark execution, event timing, and reporting. This was confirmed during the audit.

### 7.2 Implementation-Specific Layer (ISL)

*If an implementation specific layer is used, then a detailed description of how it performs its functions, how its various components interact and any product functionalities or environmental setting on which it relies must be provided. All related source code, scripts and configuration files must be disclosed. The information provided should be sufficient for an independent reconstruction of the implementation specific layer.*

StepMaster program is used to control and track the execution of queries, via commands stored in an external Microsoft Access database. The source of this program is contained in Appendix F. The following steps are performed, to accomplish the Power and Throughput Runs:

#### 1 Power Run

Execute 64 concurrent RF1 threads, each of which will apply a segment of a refresh set generated by dbgen. Each thread submits multiple transactions, where a transaction spans a set of orders and their associated line items.

- Execute the Stream 0 queries, in the prescribed order.
- Execute 32 concurrent RF2 threads, each of which will apply a segment of a refresh set generated by dbgen. Each thread submits multiple transactions, where a transaction spans a set of orders and their associated line items.

#### 2 Throughput Run

- Execute seven concurrent query streams. Each stream executes queries in the prescribed order for the appropriate Stream Id (01-07). Upon completion of each stream, a semaphore is set to indication completion.
- Execute seven consecutive RF1/RF2 transactions, against ascending Refresh sets produced by dbgen. The first RF1 waits on a semaphore prior to beginning its insert operations.

Each step is timed by StepMaster. The timing information, together with an activity log, are stored for later analysis. The inputs and results of steps are stored in text files for later analysis.

## 8 Clause 7 : Pricing Related Items

### 8.1 Hardware and Software Used

*A detailed list of hardware and software used in the priced system must be reported. Each item must have a vendor part number, description, and release/revision level, and indicate General Availability status or committed delivery date. If package pricing is used, contents of the package must be disclosed. Pricing source(s) and effective date(s) of price(s) must also be reported.*

The detailed list of all hardware and software for the priced configuration is listed in the system pricing summary.

### 8.2 Three-Year Cost of System Configuration

*The total 3-year price of the entire configuration must be reported, including: hardware, software, and maintenance charges. Separate component pricing is required.*

The detailed list of 3-years maintenance cost for the priced configuration is listed in the system pricing summary.

### 8.3 Availability Dates

*The committed delivery date for general availability (availability date) of products used in the priced calculations must be reported. When the priced system includes products with different availability dates, the single availability date reported on the first page of the executive summary must be the date by which all components are committed to being available. The full disclosure report must report availability dates individually for at least each of the categories for which a pricing subtotal must be provided (see Clause 7.3.1.4). All availability dates, whether for individual components or for the SUT as a whole, must be disclosed to a precision of 1 day, but the precise format is left to the test sponsor.*

The total system as priced will be available by December 7, 2005.

- “Microsoft SQL Server 2005 Enterprise Edition 64-bit” will be available by December 7, 2005.
- The other products are already available.

## 9 Clause 8 : Audit Related Items

*The auditor’s agency name, address, phone number, and Attestation letter with a brief audit summary report indicating compliance must be included in the full disclosure report. A statement should be included specifying who to contact in order to obtain further information regarding the audit process.*

See pages in the front of this paper for a copy of the auditor’s attestation letter. Further information regarding the audit process may be obtained from Mr. Raab.

# **Appendix A : System and Database Tunable Parameters**

## **Software Level**

Microsoft Windows Server 2003, Datacenter Edition  
for 64-bit Itanium-based Systems, Service Pack 1  
Microsoft SQL Server 2005 Enterprise Edition 64-bit build 1173

## **User Rights Assignment**

The Group Policy Editor was used to modify an entry under  
"Computer Configuration" -> "Windows Settings" -> "Security  
Settings"  
-> "Local Policies" -> "User Rights Assignment".  
The right of "Lock pages in memory" was assigned to the  
Administrator so  
that SQL Server could use large amounts of physical memory.

## **System Information**

System Information report written at: 07/10/05 19:34:51  
System Name: ASAMA  
[System Summary]

Item	Value
OS Name	Microsoft(R) Windows(R) Server 2003, Datacenter Edition for 64-Bit Itanium-based Systems
Version	5.2.3790 Service Pack 1 Build 3790
Other OS Description	Not Available
OS Manufacturer	Microsoft Corporation
System Name	ASAMA
System Manufacturer	NEC
System Model	server u32000
System Type	Itanium (TM) -based System
Processor	ia64 Family 31 Model 2 Stepping 2 GenuineIntel ~1600 Mhz
Processor	ia64 Family 31 Model 2 Stepping 2 GenuineIntel ~1600 Mhz
Processor	ia64 Family 31 Model 2 Stepping 2 GenuineIntel ~1600 Mhz
Processor	ia64 Family 31 Model 2 Stepping 2 GenuineIntel ~1600 Mhz
Processor	ia64 Family 31 Model 2 Stepping 2 GenuineIntel ~1600 Mhz
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Processor	ia64 Family 31 Model 2 Stepping 2 GenuineIntel ~1600 Mhz
Processor	ia64 Family 31 Model 2 Stepping 2 GenuineIntel ~1600 Mhz
Processor	ia64 Family 31 Model 2 Stepping 2 GenuineIntel ~1600 Mhz

BIOS Version/Date	Phoenix Technologies LTD 6.0.0604, 3/2/2005
SM BIOS Version	2.3
Windows Directory	C:\WINDOWS
System Directory	C:\WINDOWS\system32
Boot Device	\Device\HarddiskVolume1
Locale	United States
Hardware Abstraction Layer	Version = "5.2.3790.1830 (srv03_sp1_rtm.050324-1447)"
User Name	ASAMA\Administrator
Time Zone	Tokyo Standard Time
Total Physical Memory	131,040.14 MB
Available Physical Memory	126.40 GB
Total Virtual Memory	128.64 GB
Available Virtual Memory	128.26 GB
Page File Space	2.00 GB

### Microsoft® SQL Server™ 2005 Startup Parameters

```
sqlservr -c -x -E -T834 -T3502

-c
  Start SQL Server independently of the Windows Service Control Manager

-x
  Disable the keeping of CPU time and cache-hit ration statistics.

-E
  increase the number of consecutive extents allocated per file to 4

-T834
  enables behavior that will be on by default in the final
  general availability release of SQL Server 2005. At that time,
  the trace flag will be inoperative.

-T3502
  Prints a message to the log at the beginning and end of each checkpoint.
```

### Microsoft® SQL Server™ 2005 Configuration Parameters

name	run_value	minimum	maximum	config_value
Ad Hoc Distributed Queries	0		1	0
affinity I/O mask	0	-2147483648	2147483647	0
affinity mask	0	-2147483648	2147483647	-1
affinity64 I/O mask	-1	-2147483648	2147483647	0
affinity64 mask	0	-2147483648	2147483647	0
Agent XPs	0	0	1	0
allow updates	0	0	1	1
awe enabled	1	0	1	0
blocked process threshold	0	0	86400	0
c2 audit mode	0	0	1	0
clr enabled	0	0	1	0
cost threshold for parallelism	0	0	32767	0
cross db ownership chaining	0	0	1	0
cursor threshold	0	-1	2147483647	-1

Database Mail XPs	0	1	0
default full-text language	0	2147483647	1033
default language	0	9999	0
default trace enabled	0	1	1
disallow results from triggers	0	1	0
fill factor (%)	0	100	0
ft crawl bandwidth (max)	0	32767	100
ft crawl bandwidth (min)	0	32767	0
ft notify bandwidth (max)	0	32767	100
ft notify bandwidth (min)	0	32767	0
in-doubt xact resolution	0	2	0
index create memory (KB)	704	2147483647	0
lightweight pooling	0	1	1
locks	5000	2147483647	0
max degree of parallelism	0	64	0
max full-text crawl range	0	256	4
max server memory (MB)	16	2147483647	120000
max text repl size (B)	0	2147483647	65536
max worker threads	128	32767	2000
media retention	0	365	0
min memory per query (KB)	512	2147483647	512
min server memory (MB)	0	2147483647	116000
nested triggers	0	1	1
network packet size (B)	512	32767	4096
Ole Automation Procedures	0	1	0
open objects	0	2147483647	0
PH timeout (s)	1	3600	60
precompute rank	0	1	0
priority boost	0	1	0
query governor cost limit	0	2147483647	0
query wait (s)	-1	2147483647	2147483647
recovery interval (min)	0	32767	32767

```

remote access          0      1      1
    1
remote admin connections 0      1      0
    0
remote login timeout (s) 0 2147483647 20
    20
remote proc trans      0      1      0
    0
remote query timeout (s) 0 2147483647 0
    0
Replication XPs        0      1      0
    0
RPC parameter data validation 0      1      0
    0
scan for startup procs 0      1      0
    0
server trigger recursion 0      1      1
    1
set working set size  0      1      0
    0
show advanced options  0      1      1
    1
SMO and DMO XPs        0      1      1
    1
SQL Mail XPs           0      1      0
    0
transform noise words  0      1      0
    0
two digit year cutoff  1753    9999    2049
    2049
user connections        0      32767  0
    0
user options            0      32767  0
    0
Web Assistant Procedures 0      1      0
    0
xp_cmdshell            0      1      0
    0

```

```

--
create clustered index O_ORDERDATE_CLUIDX
on ORDERS(O_ORDERDATE)
with FILLFACTOR=95, SORT_IN_TEMPDB
on GENERAL_FG

alter table NATION add constraint PK_N_NATIONKEY primary key
(N_NATIONKEY)
ON GENERAL_FG

alter table REGION add constraint PK_R_REGIONKEY primary key
(R_REGIONKEY)
ON GENERAL_FG

alter table PART add constraint PK_P_PARTKEY primary key (P_PARTKEY)
ON GENERAL_FG

alter table SUPPLIER add constraint PK_S_SUPPKEY primary key
(S_SUPPKEY)
ON GENERAL_FG

alter table CUSTOMER add constraint PK_C_CUSTKEY primary key
(C_CUSTKEY)
ON GENERAL_FG

alter table PARTSUPP add constraint PK_PS_PARTKEY_PS_SUPPKEY primary
key (PS_PARTKEY, PS_SUPPKEY)
ON GENERAL_FG

alter table ORDERS add constraint PK_O_ORDERKEY primary key
(O_ORDERKEY)
WITH (FILLFACTOR = 95)
ON GENERAL_FG

```

## Appendix B : Database, table and indexes creation

### **CreateClusteredIndexes1.sql**

```

-- File:      CREATECLUSTEREDINDEXES.SQL
--           Microsoft TPC-H Benchmark Kit Ver. 1.00
--           Copyright Microsoft, 1999
--
create clustered index L_SHIPDATE_CLUIDX
on LINEITEM(L_SHIPDATE)
with FILLFACTOR=95, SORT_IN_TEMPDB
on LINEITEM_FG

```

### **CreateClusteredIndexes2.sql**

```

-- File:      CREATECLUSTEREDINDEXES.SQL
--           Microsoft TPC-H Benchmark Kit Ver. 1.00
--           Copyright Microsoft, 1999

```

### **CreateDatabase.sql**

```

-- CreateDatabase
-- for use with StepMaster
-- Uses FileGroups

--
-- Drop the existing database
--
if exists (select name from sysdatabases where name = '%DBNAME%')
drop database %DBNAME%

CREATE DATABASE %DBNAME%
ON PRIMARY
(
    NAME           = %DBNAME%_root,
    FILENAME       = "z:\%DBNAME%_root.mdf",
    SIZE           = 10MB,
    FILEGROWTH     = 10MB),
FILEGROUP LINEITEM_FG
(NAME=%DBNAME%_li_01, FILENAME="z:\dev\c01\", SIZE=80000MB,

```

FILEGROWTH=0),  
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```
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FILEGROWTH=0),
```

```
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FILEGROWTH=0),
(NAME=%DBNAME%_gen_42, FILENAME="z:\dev\m42\", SIZE=40000MB,
FILEGROWTH=0),
(NAME=%DBNAME%_gen_43, FILENAME="z:\dev\m43\", SIZE=40000MB,
FILEGROWTH=0),
(NAME=%DBNAME%_gen_44, FILENAME="z:\dev\m44\", SIZE=40000MB,
FILEGROWTH=0)
LOG ON
(NAME=%DBNAME%_log, FILENAME="z:\dev\log\", SIZE=470000MB, FILEGROWTH=0)
```

### createFK.sql

```
-- create FK
alter table SUPPLIER add constraint FK_S_NATIONKEY foreign key
(S_NATIONKEY) references NATION(N_NATIONKEY)

alter table PARTSUPP add constraint FK_PS_PARTKEY foreign key
(PS_PARTKEY) references PART(P_PARTKEY)

alter table PARTSUPP add constraint FK_PS_SUPPKEY foreign key
(PS_SUPPKEY) references SUPPLIER(S_SUPPKEY)

alter table CUSTOMER add constraint FK_C_NATIONKEY foreign key
(C_NATIONKEY) references NATION (N_NATIONKEY)

alter table ORDERS add constraint FK_O_CUSTKEY foreign key (O_CUSTKEY)
references CUSTOMER (C_CUSTKEY)

alter table NATION add constraint FK_N_REGIONKEY foreign key
(N_REGIONKEY) references REGION (R_REGIONKEY)

alter table LINEITEM add constraint FK_L_ORDERKEY foreign key
(L_ORDERKEY) references ORDERS (O_ORDERKEY)

alter table LINEITEM add constraint FK_L_PARTKEY foreign key (L_PARTKEY)
references PART (P_PARTKEY)

alter table LINEITEM add constraint FK_L_SUPPKEY foreign key (L_SUPPKEY)
references SUPPLIER (S_SUPPKEY)

alter table LINEITEM add constraint FK_L_PARTKEY_SUPPKEY foreign key
(L_PARTKEY,L_SUPPKEY) references PARTSUPP(PS_PARTKEY, PS_SUPPKEY)
```

### createindexesstream1.sql

```
-- File: CREATEINDEXESSTREAM2.SQL
-- Microsoft TPC-H Benchmark Kit Ver. 1.00
-- Copyright Microsoft, 1999
--

create index O_CUSTKEY_IDX
on ORDERS(O_CUSTKEY)
with fillfactor=95, SORT_IN_TEMPDB
```

```

on GENERAL_FG

create index PS_SUPPKEY_IDX
on PARTSUPP(PS_SUPPKEY)
with fillfactor=100, SORT_IN_TEMPDB
on GENERAL_FG

create index N_REGIONKEY_IDX
on NATION(N_REGIONKEY)
with fillfactor=100, SORT_IN_TEMPDB
on GENERAL_FG

create index S_NATIONKEY_IDX
on SUPPLIER(S_NATIONKEY)
with fillfactor=100, SORT_IN_TEMPDB
on GENERAL_FG

```

### createindexesstream2.sql

```

-- File:      CREATEINDEXESSTREAM3.SQL
--           Microsoft TPC-H Benchmark Kit Ver. 1.00
--           Copyright Microsoft, 1999
--
create index L_ORDERKEY_IDX
on LINEITEM(L_ORDERKEY)
with FILLFACTOR=95, SORT_IN_TEMPDB
on LINEITEM_FG

```

### createindexesstream3.sql

```

-- File:      CREATEINDEXESSTREAM4.SQL
--           Microsoft TPC-H Benchmark Kit Ver. 1.00
--           Copyright Microsoft, 1999
--
create index L_PARTKEY_IDX
on LINEITEM(L_PARTKEY)
with FILLFACTOR=95, SORT_IN_TEMPDB
on LINEITEM_FG

```

### CreateTables.sql

```

-- File:      CREATETABLES.SQL
--           Microsoft TPC-H Benchmark Kit Ver. 1.00
--           Copyright Microsoft, 1999
--
create table PART
(P_PARTKEY      int          not null,
 P_NAME        varchar(55)  not null,
 P_MFGR       char(25)      not null,
 P_BRAND       char(10)     not null,
 P_TYPE        varchar(25)  not null,
 P_SIZE        int          not null,

```

```

P_CONTAINER    char(10)     not null,
 P_RETAILPRICE float        not null,
 P_COMMENT     varchar(23)  not null)
on GENERAL_FG

create table SUPPLIER
(S_SUPPKEY     int          not null,
 S_NAME        char(25)     not null,
 S_ADDRESS     varchar(40)  not null,
 S_NATIONKEY   int          not null,
 S_PHONE       char(15)     not null,
 S_ACCTBAL     float        not null,
 S_COMMENT     varchar(101) not null)
on GENERAL_FG

create table PARTSUPP
(PS_PARTKEY    int          not null,
 PS_SUPPKEY    int          not null,
 PS_AVAILQTY   int          not null,
 PS_SUPPLYCOST float        not null,
 PS_COMMENT    varchar(199) not null)
on GENERAL_FG

create table CUSTOMER
(C_CUSTKEY     int          not null,
 C_NAME        varchar(25)  not null,
 C_ADDRESS     varchar(40)  not null,
 C_NATIONKEY   int          not null,
 C_PHONE       char(15)     not null,
 C_ACCTBAL     float        not null,
 C_MKTSEGMENT char(10)     not null,
 C_COMMENT     varchar(117) not null)
on GENERAL_FG

create table ORDERS
(O_ORDERKEY    bigint       not null,
 O_CUSTKEY     int          not null,
 O_ORDERSTATUS char(1)      not null,
 O_TOTALPRICE  float        not null,
 O_ORDERDATE   datetime     not null,
 O_ORDERPRIORITY char(15)  not null,
 O_CLERK       char(15)     not null,
 O_SHIPPRIORITY int         not null,
 O_COMMENT     varchar(79)  not null)
on GENERAL_FG

create table LINEITEM
(L_ORDERKEY    bigint       not null,
 L_PARTKEY     int          not null,
 L_SUPPKEY     int          not null,
 L_LINENUMBER  int          not null,
 L_QUANTITY    float        not null,
 L_EXTENDEDPRICE float      not null,
 L_DISCOUNT  float        not null,
 L_TAX         float        not null,
 L_RETURNFLAG  char(1)      not null,

```

```

L_LINESTATUS char(1) not null,
L_SHIPDATE datetime not null,
L_COMMITDATE datetime not null,
L_RECEIPTDATE datetime not null,
L_SHIPINSTRUCT char(25) not null,
L_SHIPMODE char(10) not null,
L_COMMENT varchar(44) not null)

```

on LINEITEM\_FG

```

create table NATION
(N_NATIONKEY int not null,
N_NAME char(25) not null,
N_REGIONKEY int not null,
N_COMMENT varchar(152) not null)

```

on GENERAL\_FG

```

create table REGION
(R_REGIONKEY int not null,
R_NAME char(25) not null,
R_COMMENT varchar(152) not null)

```

on GENERAL\_FG

## Appendix C : Query text & output

### EXECUTE STREAM 0 QUERY 1

```
-- using 709161519 as a seed to the RNG
```

```
/* TPC_H Query 1 - Pricing Summary Report */
```

```

SELECT L_RETURNFLAG,
L_LINESTATUS,
SUM(L_QUANTITY) AS SUM_QTY,
SUM(L_EXTENDEDPRI) AS SUM_BASE_PRICE,
SUM(L_EXTENDEDPRI*(1-L_DISCOUNT)) AS SUM_DISC_PRICE,
SUM(L_EXTENDEDPRI*(1-L_DISCOUNT)*(1+L_TAX)) AS
SUM_CHARGE,
AVG(L_QUANTITY) AS AVG_QTY,
AVG(L_EXTENDEDPRI) AS AVG_PRICE,
AVG(L_DISCOUNT) AS AVG_DISC,
COUNT_BIG(*) AS COUNT_ORDER
FROM LINEITEM
WHERE L_SHIPDATE <= dateadd(dd, -99, '1998-12-01')
GROUP BY L_RETURNFLAG,
L_LINESTATUS
ORDER BY L_RETURNFLAG,
L_LINESTATUS

```

OUTPUT OF EXECUTE STREAM 0 QUERY 1 (MAX 200 ROWS)

```

-----
L_RETURNFLAG L_LINESTATUS SUM_QTY SUM_BASE_PRICE
SUM_DISC_PRICE SUM_CHARGE AVG_QTY
AVG_PRICE AVG_DISC COUNT_ORDER
-----
-----
A F 37795142625.000000 56673501785584.234000
53839798587427.297000 55993369570997.289000 25.499817
38237.763985 0.050001 1482173068
N F 986801952.000000 1479667227558.557600
1405678573470.135300 1461921779364.505600 25.501145
38237.874035 0.050008 38696378
N O 73971321626.000000
110920317784856.800000 105374331610625.140000 109589344581709.200000
25.500063 38237.454621 0.050000
2900829014
R F 37795090136.000000 56673574737362.266000
53839881845655.844000 55993472963041.328000 25.500062
38237.232887 0.050000 1482156800

```

(4 row(s) affected)

### EXECUTE STREAM 0 QUERY 2

```
-- using 709161519 as a seed to the RNG
```

```
/* TPC_H Query 2 - Minimum Cost Supplier */
```

```

SELECT TOP 100
S_ACCTBAL,
S_NAME,
N_NAME,
P_PARTKEY,
P_MFGR,
S_ADDRESS,
S_PHONE,
S_COMMENT
FROM PART,
SUPPLIER,
PARTSUPP,
NATION,
REGION
WHERE P_PARTKEY = PS_PARTKEY AND
S_SUPPKEY = PS_SUPPKEY AND
P_SIZE = 3 AND
P_TYPE LIKE '%NICKEL' AND
S_NATIONKEY = N_NATIONKEY AND
N_REGIONKEY = R_REGIONKEY AND

```

```

R_NAME = 'AMERICA' AND
PS_SUPPLYCOST = ( SELECT MIN(PS_SUPPLYCOST)
FROM PARTSUPP,
SUPPLIER,
NATION,
REGION
WHERE P_PARTKEY = PS_PARTKEY AND
S_SUPPKEY = PS_SUPPKEY AND
S_NATIONKEY = N_NATIONKEY AND
N_REGIONKEY = R_REGIONKEY AND
R_NAME = 'AMERICA'
)

```

```

ORDER BY S_ACCTBAL DESC,
N_NAME,
S_NAME,
P_PARTKEY

```

OUTPUT OF EXECUTE STREAM 0 QUERY 2 (MAX 200 ROWS)

```

-----
S_ACCTBAL      S_NAME      N_NAME
P_PARTKEY      P_MFGR      S_ADDRESS
S_PHONE        S_COMMENT
-----
-----
9999.960000      Supplier#009221036      PERU
11721032      Manufacturer#4      fSeq01C8QI2fWCsEdCPTwJA0hGb6
27-309-249-5197 foxes outside the ironic platelets mold
9999.950000      Supplier#003048364      UNITED STATES
130548350      Manufacturer#4      hAaoxzk,2hIfE2DZ
34-138-508-9045 pinto beans sleep after the
9999.940000      Supplier#002504406      UNITED STATES
20004403      Manufacturer#4      edAB7ywJP G5uxiCZv
jklK9mmx4Ins2dZXzYThO 34-478-809-6218 quickly regular realms cajole
boldly silent frets. enticingly even packages haggl
9999.900000      Supplier#001640420      CANADA
56640409      Manufacturer#3      1Fwm89SQpfOTx
13-238-373-9309 furiously ironic platelets nag doggedly bold sheaves.
fluffily regular
9999.850000      Supplier#001550283      CANADA
81550282      Manufacturer#3      ok1,Fx,cOb18VoOL e8iRnhGJ4,9vA3YeS
13-150-276-2234 pending theodolites haggle quickly up the fi
9999.840000      Supplier#000516826      BRAZIL
110516825      Manufacturer#1      n8vprD19Z18L7PASbHvqh8rcT
12-633-838-6002 requests should boost quietly. enticing, busy ideas are
at the slyly unusual accoun
9999.830000      Supplier#009479540      UNITED STATES
64479527      Manufacturer#5      Z1,BGFjrNa8a3x0ET14
34-278-455-6755 unusual packages nag slyly about the carefully ironi
9999.770000      Supplier#007531080      ARGENTINA
165031063      Manufacturer#2      DODLTeWaHHWM4E381gBn,8m

```

```

11-782-980-8613 quickly even accounts wake quietly. regular instructions
nag quick pinto beans. even d
9999.770000      Supplier#003399749      CANADA
95899721      Manufacturer#3      hPRqUSenMWR4,bwE
13-829-682-6726 permanent platelets haggle carefully. fluffily final
deposits cajole s
9999.770000      Supplier#004236952      UNITED STATES
151736936      Manufacturer#4      ia8pSYi6zcpPuhSH4hNIx
34-595-540-4080 slyly special accounts sleep alongside of
9999.750000      Supplier#005049720      ARGENTINA
177549668      Manufacturer#2      oMabWr8FUMyd9Cs
11-190-223-7146 final ideas along the furiously final packages wake
along the slyly ironic fox
9999.740000      Supplier#001202651      UNITED STATES
66202638      Manufacturer#1      d0O53ZoTkCSby sQfndZDzYjCKFlaGBJ60
34-899-540-3132 fluffily bold ideas at the even dolphins sleep slyly abo
9999.740000      Supplier#001202651      UNITED STATES
146202622      Manufacturer#5      d0O53ZoTkCSby sQfndZDzYjCKFlaGBJ60
34-899-540-3132 fluffily bold ideas at the even dolphins sleep slyly abo
9999.690000      Supplier#002022549      PERU
199522529      Manufacturer#3
U9MJHVHpJizatvPJLXzLn3GVJZEZ,M4XZuoo 27-519-481-4204 instructions
haggle quickly even packages-- silent requests thrash furiously s
9999.680000      Supplier#004162824      ARGENTINA
56662808      Manufacturer#3      wzUWtkvm7tDQSy
11-853-280-8366 accounts wake. final ideas are across the ironic braids.
slyly
9999.670000      Supplier#007068432      PERU
162068399      Manufacturer#4      ZJnQ8CFIGSqjeATLz7fSxCZR sjVQx
27-406-676-4017 enticing requests sleep slyly according to the
9999.620000      Supplier#000486550      UNITED STATES
42986537      Manufacturer#4      KAm,JLRe5,4N9OS,AU89Ri c01wef n
34-768-794-9431 silently even packages haggle blith
9999.590000      Supplier#004562771      PERU
177062719      Manufacturer#5      3RtkNMMrEsmNDY
27-952-369-8286 carefully final ideas nag ca
9999.560000      Supplier#008565043      CANADA
36065039      Manufacturer#5      bYLUTa5gC9
13-496-970-9884 special, final requests dazzle sly
9999.560000      Supplier#008565043      CANADA
163565010      Manufacturer#1      bYLUTa5gC9
13-496-970-9884 special, final requests dazzle sly
9999.540000      Supplier#000160476      PERU
57660470      Manufacturer#4      IE6 fLlJJein6cpnqGmTnzBvb
27-157-890-8986 final pinto beans engage furiously across the slyly
regular deposits. furiously regular cour
9999.420000      Supplier#000915079      CANADA
30915078      Manufacturer#2      GbIsyZ3ktYA9u,
13-792-114-2589 instructions sleep fluffily against the bold deposit
9999.400000      Supplier#001063831      UNITED STATES
1063830      Manufacturer#1      InIllNHOVSUIPuP7XZA
34-860-728-8241 slyly unusual pinto beans along the instructions cajole
fluffily blithely ironic requests.
9999.380000      Supplier#006336159      PERU
63836152      Manufacturer#2      83Q8TLp7zmeSUHvZSgf9sao07V

```

27-888-521-8070 bold excuses are carefully carefully regular pinto beans. accounts abo  
9999.340000 Supplier#003445829 CANADA  
105945798 Manufacturer#5 69ow061TzROT b78gF0M86Ln d  
13-144-560-6163 final, unusual ideas across the carefully ironic ideas are blithely final packa  
9999.310000 Supplier#005105574 PERU  
87605549 Manufacturer#1 XoDdRyaK5F55VVVHgekKv44X  
27-959-973-1780 even foxes shall have to are doggedly. ironically pending foxes use blithe  
9999.290000 Supplier#006564285 UNITED STATES  
129064248 Manufacturer#1 zHt6NxWqw,  
34-686-602-6005 express, unusual patterns sleep slyly about the regular, ironic requests. final epita  
9999.270000 Supplier#005614119 PERU  
83114110 Manufacturer#1 CYTG4NfSWxv  
27-204-148-5919 blithely regular excuses haggle furiously unusu  
9999.230000 Supplier#009312584 UNITED STATES  
74312569 Manufacturer#1 boxOxtKf2x  
34-937-986-1435 final, regular accounts haggle beyond  
9999.220000 Supplier#006639986 ARGENTINA  
46639985 Manufacturer#2 powderNUOXLB  
11-768-902-3515 ironic grouches sleep quickly bold foxes. carefully regular platelets aroun  
9999.190000 Supplier#004296886 ARGENTINA  
134296885 Manufacturer#5  
z9yZ2Q5QUov8dAnZMIRGBBsJWeToXKB3jErAAjb 11-265-564-9888 carefully unusual instructions boost bli  
9999.180000 Supplier#005642216 BRAZIL  
143142201 Manufacturer#5 jiOFrSD92yBjpKyQwAucBkedPZJlH  
12-185-640-8257 quickly even accounts wake! qui  
9999.160000 Supplier#000301353 UNITED STATES  
27801350 Manufacturer#5 Capcxh5J Y5GB1RBpVivM3kBv6OAt6kO  
34-425-160-1662 quiet deposits are furiously. ironic foxes wake carefully. express accounts integrate among  
9999.150000 Supplier#002993716 ARGENTINA  
107993695 Manufacturer#4 OqK6ertyecXKoWYlJiwR  
11-457-563-8430 furiously ironic requests cajole across the fluffily brave pac  
9999.040000 Supplier#008039192 BRAZIL  
75539184 Manufacturer#4 2LKgQU3HG0RGK,gbev3kzgz1Xv lvJa  
12-805-152-4237 slyly final pinto beans boost carefully. slyly special pinto beans breach fluffily ironic deposits.  
9999.040000 Supplier#001771154 PERU  
84271129 Manufacturer#5  
mrd27zU5kltW7pfYocMebmGHo5iaGXWkfpFEAZ7a 27-659-815-2441 furiously bold platelets wake af  
9999.020000 Supplier#009974798 ARGENTINA  
92474770 Manufacturer#3 fSuH  
Q8Tst8cjqaEnhA0AajPWGJXkz5wloitzdN 11-934-743-9985 silent requests against the regular,  
9999.020000 Supplier#009974798 ARGENTINA  
182474743 Manufacturer#2 fSuH  
Q8Tst8cjqaEnhA0AajPWGJXkz5wloitzdN 11-934-743-9985 silent requests against the regular,  
9999.020000 Supplier#009974798 ARGENTINA  
184974761 Manufacturer#5 fSuH  
Q8Tst8cjqaEnhA0AajPWGJXkz5wloitzdN 11-934-743-9985 silent requests against the regular,  
9999.010000 Supplier#009335033 BRAZIL  
91835005 Manufacturer#2 5BiOyaKcobQWKT,5r8PfUnWf37YXlBo  
12-133-201-8040 carefully pending packages according to the specia  
9998.990000 Supplier#005313769 CANADA  
20313764 Manufacturer#4 CT8GKZ 7FEYC  
13-837-599-8597 regular foxes sleep packages. furiously express r  
9998.930000 Supplier#008753574 CANADA  
66253567 Manufacturer#4 xvJ5XO7kP3kz7gvIi7K1HCzzWq7BhA16yL  
13-384-922-8127 furiously sly sentiments doubt carefully carefully final packages  
9998.900000 Supplier#002420507 CANADA  
49920502 Manufacturer#4 p4FU9Yezm4wSCZY4ItN800xU91h59vV  
13-524-590-2034 special pinto beans cajole carefully above the carefully unusual ideas?  
9998.890000 Supplier#007063152 CANADA  
47063151 Manufacturer#4 C2S0,sacRVwP8PHRk  
13-772-518-5495 carefully final dependencies detect carefully atop the quick  
9998.870000 Supplier#004988891 ARGENTINA  
162488874 Manufacturer#1 7Lg509W7NAq,TZdWqfD  
11-731-441-7683 accounts wake furiously. fluffily  
9998.870000 Supplier#003918645 BRAZIL  
56418629 Manufacturer#5 IG0nFK6iP0JryZx9c  
12-114-383-9377 never regular deposits unwind blithely alon  
9998.810000 Supplier#007126419 BRAZIL  
59626403 Manufacturer#3 cbXtzvZqAb4  
12-349-160-8460 carefully enticing accounts sleep among the packages. platelets use fluffil  
9998.760000 Supplier#002318134 UNITED STATES  
4818133 Manufacturer#4 bc5mq3XlG  
34-674-794-6554 regularly even accounts mold. blithely reg  
9998.750000 Supplier#007174304 BRAZIL  
179674252 Manufacturer#4 nBdEzRCjNrCb3,slutse9S50kWzf3 k  
12-197-903-4488 regular, ironic theodolites boost carefully qu  
9998.730000 Supplier#006716967 CANADA  
146716966 Manufacturer#5  
Zr22tLGWd2d8qPofVsUFSd0nlKbPUBMTORW4 13-385-851-3370 final, express requests haggle accounts. doggedly silent packages among the slyly  
9998.720000 Supplier#009058968 BRAZIL  
54058957 Manufacturer#2 iKKBj,pGt03IN  
12-284-895-9664 furiously express accounts haggle slyly. ruthless deposits affix furiously f  
9998.660000 Supplier#001952899 BRAZIL  
104452868 Manufacturer#2  
bn8lcIvW61qx0N2YM0CqaVVYVNdZtQ2RhqCNk34 12-311-209-4197 final, enticing requests haggle slyly. c  
9998.590000 Supplier#007401399 UNITED STATES  
57401398 Manufacturer#3  
fld9o510cqbSno5tMny3lSSGSAmwZKoF6y7Ngw3 34-135-925-9056 slyly regular theodolites haggle. slyly express ideas haggle quickly blithely iro  
9998.560000 Supplier#001378181 CANADA  
106378160 Manufacturer#2 vMX9yn3 RyehIQBW,33ydu

13-814-203-6713 regular, final dolphins about the ironic, regular requests cajole slyly final instructions. blith  
9998.550000 Supplier#002198436 UNITED STATES  
54698420 Manufacturer#3 uwgWa6RVGfzZhFme1  
34-246-120-4855 pending requests wake around the ironic requests. blithely unusual a  
9998.540000 Supplier#001650666 ARGENTINA  
116650643 Manufacturer#2 91kNAqEPB,KBzbH,ngOetX8hRjFW3  
11-114-133-9746 regular packages according t  
9998.510000 Supplier#000780621 PERU  
58280615 Manufacturer#1 tv35ddgSnF p,JwwUebkjAqQh ZPnyazop  
27-821-909-3031 slyly final packages haggle except the fluffily regular ideas. slyly close accounts are busily afte  
9998.490000 Supplier#009321459 BRAZIL  
199321458 Manufacturer#1 OhkQnoiaWNEY  
12-248-708-7545 blithely silent dependencies wake carefully about the closely special packages. fluffy foxes  
9998.490000 Supplier#006320095 CANADA  
128820058 Manufacturer#2 NV13jh4ZLigHeWUjh6  
13-799-793-7602 final theodolites maintain furiously special platelets. blithely  
9998.470000 Supplier#007096900 BRAZIL  
112096877 Manufacturer#4  
w65VuCUHhB0XbBND5S8arFQTsrgmkiK4Mwt 12-542-918-8199 deposits cajole furiously. slyly silent packages nag fu  
9998.460000 Supplier#002245432 ARGENTINA  
154745386 Manufacturer#2 VmKR nuAezHG4jbH3GNYjj196ADVTX  
11-716-535-2235 ironic theodolites hinder carefully carefully final platelets. deposits sleep furiously regular dep  
9998.450000 Supplier#008215146 CANADA  
48215145 Manufacturer#2 9S9MsVgHkLUb9  
13-402-151-8663 blithely pending pinto beans detect slyly  
9998.410000 Supplier#000873517 CANADA  
133373477 Manufacturer#1 O5dlffLGw9n362Bskp3Ln 5Jbt  
13-275-940-2918 ironic foxes cajole fluffily. carefully pending tithes a  
9998.380000 Supplier#007440488 PERU  
167440487 Manufacturer#3  
21gBPQsZSDSN3M3Ydvr8So5zFxC2szedkOoP3o, 27-451-401-6685 furiously final packages past the silent requests nag carefully bold requests. ironically reg  
9998.360000 Supplier#008117001 CANADA  
65616994 Manufacturer#4 q47oZx4mDir  
13-122-782-3811 carefully final foxes across the carefully pending foxes was blithely slyly final deposits. qu  
9998.360000 Supplier#002605367 PERU  
65105348 Manufacturer#3 8d,DG76fJoH7cZ1BtQwZPvHSwydj62rp2v  
27-480-596-4298 regular, final dolphins sleep enticingly pea  
9998.340000 Supplier#003967725 BRAZIL  
46467712 Manufacturer#3 Ke4Rq79RgHN hVW  
12-767-262-6607 ironic platelets haggle blithely against the  
9998.300000 Supplier#006700294 CANADA  
84200285 Manufacturer#3 mEn5f4HD4bzu  
13-984-264-1736 furiously express ideas sleep furiously packages. slyly special accounts are blithely al  
9998.250000 Supplier#007588263 UNITED STATES  
190088205 Manufacturer#4 IRqh3yzzfzjyqV9  
34-116-690-3641 carefully busy packages along the blithely express acco  
9998.220000 Supplier#002794075 CANADA  
140294060 Manufacturer#4 miSJ4PlLTJ  
13-241-146-2771 furiously pending gifts nag slyly ironic foxes. final patterns haggle fluffily ironic notornis  
9998.170000 Supplier#001441379 PERU  
101441378 Manufacturer#5 dejddrcONv510ylWLpN  
27-362-487-5288 even accounts cajole carefully slyly regular patterns: foxes sleep about the slyly  
9998.150000 Supplier#003201956 CANADA  
110701944 Manufacturer#3 uHYyuxRCkyfns  
13-996-742-4306 furiously special deposits wake? busy g  
9998.120000 Supplier#000465493 BRAZIL  
5465492 Manufacturer#1 Xg8LxdWkaBwt6Yx1LoIP9XBZV  
12-658-346-3171 carefully final dolphins wake bravely above the slyly even theodolites. blithely daring deposits are  
9998.110000 Supplier#007585825 UNITED STATES  
172585790 Manufacturer#3 kCs3E86nf8b  
34-236-294-3821 carefully final multipliers wake. blithely b  
9998.100000 Supplier#004505308 BRAZIL  
174505307 Manufacturer#5 mLQ1wxsCb3mxKzVziqkzWfW3  
12-354-934-4300 ruthlessly bold ideas solve along the brave foxes. slyly p  
9998.080000 Supplier#000685991 PERU  
183185936 Manufacturer#4 ukq3um9NPh  
27-652-459-1189 pending accounts sleep fluffily regular dependencies. finally even foxes  
9998.080000 Supplier#000685991 PERU  
198185971 Manufacturer#1 ukq3um9NPh  
27-652-459-1189 pending accounts sleep fluffily regular dependencies. finally even foxes  
9998.020000 Supplier#008712495 BRAZIL  
143712466 Manufacturer#1 Okxap7apQpGyFxxJIOFkQJCNQnb  
12-621-617-6364 quickly express ideas according to the requests cajole carefully even waters. packages sleep  
9998.020000 Supplier#000110258 CANADA  
145110229 Manufacturer#3 mqjWDMkDBI8F CWBeLb11  
13-881-801-7435 ironic excuses run carefully regular platelets. furiously pending pinto beans breach ca  
9998.020000 Supplier#007088922 UNITED STATES  
67088921 Manufacturer#3 10v5u26dxQJxFQyDWWNVg  
34-673-746-6580 special deposits along the quickly final pinto beans are against the foxes. qui  
9998.010000 Supplier#003662672 ARGENTINA  
88662655 Manufacturer#2 qJ8OhMbfTbD2nrттfM, WaYesCJqt  
11-522-913-5628 foxes after the carefully ironic  
9997.890000 Supplier#007224802 UNITED STATES  
144724787 Manufacturer#3 bFn gpd21,eu  
34-597-864-4445 quickly even accounts could have to snooze according to the slyly final instruct  
9997.880000 Supplier#003142176 BRAZIL  
53142175 Manufacturer#5  
qwQU6J0110uJLletuSyLZMtmkfSGBnhMP8L 12-597-750-3682 idle, unusual

accounts sublate above the express deposits. slyly regular deposits use  
 reques  
 9997.880000 Supplier#009592808 BRAZIL  
 119592807 Manufacturer#4 1FoXh8e0K8wAWyKshNdZqc  
 12-851-526-7486 slyly regular platelets above the carefully regular  
 requests sleep slyly among the unusual accounts.  
 9997.830000 Supplier#007661124 CANADA  
 97661123 Manufacturer#4 i0  
 6RGy5pQ9MhZeVdZG4F0PvSa4oj3AxEk1HwI 13-344-753-1235 asymptotes haggle  
 regular requests. finally regular packages sleep furiously  
 9997.800000 Supplier#004641764 BRAZIL  
 174641763 Manufacturer#1 Dyd2Ca3,MQ9yl pmnQilw  
 12-231-283-4890 slyly careful dolphins haggle blithely. furiously  
 special warhorses are above the express foxes.  
 9997.800000 Supplier#006574186 BRAZIL  
 46574185 Manufacturer#5  
 PFvAKJoxvv3ivTeMETukiBsKVUN6,ldkqhz,BJ 12-263-289-5662 quickly silent  
 requests with the slyly b  
 9997.800000 Supplier#006574186 BRAZIL  
 141574157 Manufacturer#1  
 PFvAKJoxvv3ivTeMETukiBsKVUN6,ldkqhz,BJ 12-263-289-5662 quickly silent  
 requests with the slyly b  
 9997.780000 Supplier#002428056 PERU  
 132428055 Manufacturer#4 EzNXaaSG0yhyuZxMwS4uhuXdglwJ3  
 27-822-179-8667 special, brave dugouts believe after the ironic  
 instructions. express, bo  
 9997.780000 Supplier#009440928 UNITED STATES  
 11940924 Manufacturer#1 y4i101dBJs,zkWqdGSACmhPcaMaU04D  
 34-105-772-6224 always ironic theodolites wake! packages nag carefully  
 fluffily bold excuses.  
 9997.680000 Supplier#001263511 BRAZIL  
 151263510 Manufacturer#4  
 BPbtWyqubI7L8wwFYgqn1aHsNPLUfxcY,9 ,GNW 12-227-589-3997 boldly ironic  
 platelets are according to the slyly special requests. carefully bol  
 9997.660000 Supplier#005465278 ARGENTINA  
 37965268 Manufacturer#4 wbFfMXuKd7MBxLEXs896 mza8plT9bQG  
 11-802-335-2772 blithely final instructions integrate. sly  
 9997.640000 Supplier#001649270 PERU  
 69149263 Manufacturer#5 ZV7HF44ekEV7cUXG6JueCwotAlGqf73w  
 BxuQqWn 27-356-450-1961 fluffily furious accounts boost blithely  
 fluffily ironic deposits. quickly ironic accounts ar  
 9997.640000 Supplier#001649270 PERU  
 84149245 Manufacturer#4 ZV7HF44ekEV7cUXG6JueCwotAlGqf73w  
 BxuQqWn 27-356-450-1961 fluffily furious accounts boost blithely  
 fluffily ironic deposits. quickly ironic accounts ar  
 9997.640000 Supplier#001649270 PERU  
 139149256 Manufacturer#1 ZV7HF44ekEV7cUXG6JueCwotAlGqf73w  
 BxuQqWn 27-356-450-1961 fluffily furious accounts boost blithely  
 fluffily ironic deposits. quickly ironic accounts ar  
 9997.610000 Supplier#000670242 UNITED STATES  
 130670241 Manufacturer#5 OpsQbMMjDjfnMxrlm9F1JwNWy7hGd3g  
 34-950-338-4147 blithely pending dugouts are quickly. furiously ironic  
 courts are fluffily around the b  
 9997.570000 Supplier#006105304 UNITED STATES  
 116105303 Manufacturer#2 yxLobNWOJiCFm83BCbT6GO6ObPNC0qt

dipXDseY 34-110-824-1462 slyly final accounts across the carefully  
 regular depo  
 9997.560000 Supplier#005361729 PERU  
 85361728 Manufacturer#4 7CpyQw6GoskQRW  
 27-766-715-4629 furiously final instructions nag slyly regular  
 instructions. carefully regular requests sleep car  
 9997.490000 Supplier#005369447 UNITED STATES  
 105369446 Manufacturer#4 r5qtjNm2If5ZD5X2b6aIhgTqRq9QF  
 34-972-283-8969 blithely even deposits above the carefully bold requests  
 are furiously furiously  
 9997.450000 Supplier#007160670 UNITED STATES  
 9660669 Manufacturer#5 INNALYBwwyotij70iskqILUeJGhyybA7  
 34-983-213-6921 pending accounts among the even

(100 row(s) affected)

EXECUTE STREAM 0 QUERY 3

-- using 709161519 as a seed to the RNG

/\* TPC\_H Query 3 - Shipping Priority \*/

```

SELECT TOP 10
  L_ORDERKEY,
  SUM(L_EXTENDEDPRI*(1-L_DISCOUNT)) AS REVENUE,
  O_ORDERDATE,
  O_SHIPPRIORITY
FROM CUSTOMER,
  ORDERS,
  LINEITEM
WHERE C_MKTSEGMENT = 'BUILDING' AND
  C_CUSTKEY = O_CUSTKEY AND
  L_ORDERKEY = O_ORDERKEY AND
  O_ORDERDATE < '1995-03-12' AND
  L_SHIPDATE > '1995-03-12'
GROUP BY L_ORDERKEY,
  O_ORDERDATE,
  O_SHIPPRIORITY
ORDER BY REVENUE DESC,
  O_ORDERDATE
```

OUTPUT OF EXECUTE STREAM 0 QUERY 3 (MAX 200 ROWS)

L_ORDERKEY	REVENUE	O_ORDERDATE
4087332039	511061.335800	1995-03-04 00:00:00.000 0
1319897249	503401.950800	1995-03-05 00:00:00.000 0

```

3110793058      498209.768200      1995-02-25 00:00:00.000 0
2036965252      495852.869200      1995-03-03 00:00:00.000 0
1980912577      493605.465900      1995-02-14 00:00:00.000 0
4803840546      492521.943000      1995-02-18 00:00:00.000 0
3407391428      491379.518600      1995-03-09 00:00:00.000 0
4421781703      491191.204200      1995-03-11 00:00:00.000 0
5289035781      488004.581200      1995-03-11 00:00:00.000 0
5530172133      487671.662300      1995-02-07 00:00:00.000 0

```

(10 row(s) affected)

**EXECUTE STREAM 0 QUERY 4**

-- using 709161519 as a seed to the RNG

/\* TPC\_H Query 4 - Order Priority Checking \*/

```

SELECT O_ORDERPRIORITY,
       COUNT(*)           AS ORDER_COUNT
FROM   ORDERS
WHERE  O_ORDERDATE      >= '1994-10-01' AND
       O_ORDERDATE      < dateadd (mm, 3, '1994-10-01') AND
       EXISTS (
         SELECT *
         FROM   LINEITEM
         WHERE  L_ORDERKEY = O_ORDERKEY AND
                L_COMMITDATE < L_RECEIPTDATE
       )
GROUP BY O_ORDERPRIORITY
ORDER BY O_ORDERPRIORITY

```

OUTPUT OF EXECUTE STREAM 0 QUERY 4 (MAX 200 ROWS)

```

O_ORDERPRIORITY ORDER_COUNT
-----
1-URGENT         10529937
2-HIGH           10531253
3-MEDIUM        10530877
4-NOT SPECIFIED 10531110
5-LOW            10530528

```

(5 row(s) affected)

**EXECUTE STREAM 0 QUERY 5**

-- using 709161519 as a seed to the RNG

/\* TPC\_H Query 5 - Local Supplier Volume \*/

```

SELECT N_NAME,
       SUM(L_EXTENDEDPRI*(1-L_DISCOUNT)) AS REVENUE
FROM   CUSTOMER,
       ORDERS,
       LINEITEM,
       SUPPLIER,
       NATION,
       REGION
WHERE  C_CUSTKEY      = O_CUSTKEY AND
       L_ORDERKEY     = O_ORDERKEY AND
       L_SUPPKEY      = S_SUPPKEY AND
       C_NATIONKEY    = S_NATIONKEY AND
       S_NATIONKEY    = N_NATIONKEY AND
       N_REGIONKEY    = R_REGIONKEY AND
       R_NAME         = 'AFRICA' AND
       O_ORDERDATE    >= '1995-01-01' AND
       O_ORDERDATE    < DATEADD (YY, 1, '1995-01-01')
GROUP BY N_NAME
ORDER BY REVENUE DESC

```

OUTPUT OF EXECUTE STREAM 0 QUERY 5 (MAX 200 ROWS)

```

N_NAME           REVENUE
-----
MOROCCO          53096274143.559860
ETHIOPIA         52996226516.343658
MOZAMBIQUE       52939281129.099747
ALGERIA          52786047101.832672
KENYA            52747047155.011261

```

(5 row(s) affected)

**EXECUTE STREAM 0 QUERY 6**

-- using 709161519 as a seed to the RNG

/\* TPC\_H Query 6 - Forecasting Revenue Change \*/

```

SELECT SUM(L_EXTENDEDPRI*L_DISCOUNT) AS REVENUE
FROM   LINEITEM
WHERE  L_SHIPDATE     >= '1995-01-01' AND
       L_SHIPDATE     < dateadd (yy, 1, '1995-01-01') AND
       L_DISCOUNT    BETWEEN 0.08 - 0.01 AND 0.08 + 0.01 AND
       L_QUANTITY     < 24

```



OUTPUT OF EXECUTE STREAM 0 QUERY 6 (MAX 200 ROWS)

REVENUE  
-----  
164559340496.362550

(1 row(s) affected)

**EXECUTE STREAM 0 QUERY 7**

-- using 709161519 as a seed to the RNG

/\* TPC\_H Query 7 - Volume Shipping \*/

```

SELECT SUPP_NATION,
       CUST_NATION,
       L_YEAR,
       SUM(VOLUME) AS REVENUE
FROM   (
  SELECT N1.N_NAME AS SUPP_NATION,
         N2.N_NAME AS CUST_NATION,
         datepart(yy,L_SHIPDATE) AS L_YEAR,
         L_EXTENDEDPRI*(1-L_DISCOUNT) AS VOLUME
  FROM   SUPPLIER,
         LINEITEM,
         ORDERS,
         CUSTOMER,
         NATION N1,
         NATION N2
  WHERE  S_SUPPKEY = L_SUPPKEY AND
         O_ORDERKEY = L_ORDERKEY AND
         C_CUSTKEY = O_CUSTKEY AND
         S_NATIONKEY = N1.N_NATIONKEY AND
         C_NATIONKEY = N2.N_NATIONKEY AND
         (
           (N1.N_NAME = 'SAUDI ARABIA' AND
            N2.N_NAME = 'ALGERIA')
          OR
           (N1.N_NAME = 'ALGERIA' AND
            N2.N_NAME = 'SAUDI ARABIA')
         ) AND
         L_SHIPDATE BETWEEN '1995-01-01' AND '1996-12-
31'
)
GROUP BY SUPP_NATION,
         CUST_NATION,
         L_YEAR
ORDER BY SUPP_NATION,
         CUST_NATION,
         L_YEAR

```

OUTPUT OF EXECUTE STREAM 0 QUERY 7 (MAX 200 ROWS)

SUPP_NATION	CUST_NATION	L_YEAR	REVENUE
ALGERIA	SAUDI ARABIA	1995	52904852381.327576
ALGERIA	SAUDI ARABIA	1996	53093677843.536354
SAUDI ARABIA	ALGERIA	1995	53063934520.347321
SAUDI ARABIA	ALGERIA	1996	53154837238.795456

(4 row(s) affected)

**EXECUTE STREAM 0 QUERY 8**

-- using 709161519 as a seed to the RNG

/\* TPC\_H Query 8 - National Market Share \*/

```

SELECT O_YEAR,
       SUM(CASE
         WHEN NATION = 'ALGERIA'
         THEN VOLUME
         ELSE 0
         END) / SUM(VOLUME) AS MKT_SHARE
FROM   (
  SELECT datepart(yy,O_ORDERDATE) AS O_YEAR,
         L_EXTENDEDPRI * (1-L_DISCOUNT) AS VOLUME,
         N2.N_NAME AS NATION
  FROM   PART,
         SUPPLIER,
         LINEITEM,
         ORDERS,
         CUSTOMER,
         NATION N1,
         NATION N2,
         REGION
  WHERE  P_PARTKEY = L_PARTKEY AND
         S_SUPPKEY = L_SUPPKEY AND
         L_ORDERKEY = O_ORDERKEY AND
         O_CUSTKEY = C_CUSTKEY AND
         C_NATIONKEY = N1.N_NATIONKEY AND
         N1.N_REGIONKEY = R_REGIONKEY AND
         R_NAME = 'AFRICA' AND
         S_NATIONKEY = N2.N_NATIONKEY AND
         O_ORDERDATE BETWEEN '1995-01-01' AND '1996-12-
31' AND
         P_TYPE = 'PROMO BURNISHED BRASS'
)
GROUP BY O_YEAR

```

ORDER BY O\_YEAR

OUTPUT OF EXECUTE STREAM 0 QUERY 8 (MAX 200 ROWS)

O_YEAR	MKT_SHARE
1995	0.040111
1996	0.039991

(2 row(s) affected)

EXECUTE STREAM 0 QUERY 9

-- using 709161519 as a seed to the RNG

/\* TPC\_H Query 9 - Product Type Profit Measure \*/

```

SELECT NATION,
       O_YEAR,
       SUM(AMOUNT) AS SUM_PROFIT
FROM   (
  SELECT N_NAME
  AS NATION,
       datepart(yy, O_ORDERDATE)
  AS O_YEAR,
       L_EXTENDEDPRI*(1-L_DISCOUNT)-
  PS_SUPPLYCOST*L_QUANTITY AS AMOUNT
  FROM PART,
       SUPPLIER,
       LINEITEM,
       PARTSUPP,
       ORDERS,
       NATION
  WHERE S_SUPPKEY = L_SUPPKEY AND
        PS_SUPPKEY = L_SUPPKEY AND
        PS_PARTKEY = L_PARTKEY AND
        P_PARTKEY  = L_PARTKEY AND
        O_ORDERKEY = L_ORDERKEY AND
        S_NATIONKEY = N_NATIONKEY AND
        P_NAME     LIKE '%snow%'
  )
AS PROFIT
GROUP BY NATION,
         O_YEAR
ORDER BY NATION,
         O_YEAR DESC

```

OUTPUT OF EXECUTE STREAM 0 QUERY 9 (MAX 200 ROWS)

NATION	O_YEAR	SUM_PROFIT
ALGERIA	1998	21615480355.725086
ALGERIA	1997	36854246068.613884
ALGERIA	1996	36956459574.748116
ALGERIA	1995	36919580022.155319
ALGERIA	1994	36814520821.667793
ALGERIA	1993	36935595792.232643
ALGERIA	1992	36888524297.457428
ARGENTINA	1998	21624839631.452637
ARGENTINA	1997	36964792151.934242
ARGENTINA	1996	36921560691.470642
ARGENTINA	1995	36916104913.517227
ARGENTINA	1994	36871191212.540115
ARGENTINA	1993	36865331254.769073
ARGENTINA	1992	37017420708.454414
BRAZIL	1998	21704674600.773319
BRAZIL	1997	36929449672.255455
BRAZIL	1996	36988651355.684792
BRAZIL	1995	36928342741.456696
BRAZIL	1994	36918209666.605789
BRAZIL	1993	36942696370.852135
BRAZIL	1992	37073646779.319206
CANADA	1998	21670557295.717213
CANADA	1997	37021176160.577187
CANADA	1996	37058112951.308945
CANADA	1995	36991811360.299690
CANADA	1994	37001630029.024849
CANADA	1993	37035297363.603958
CANADA	1992	37117565629.436142
CHINA	1998	21587904522.087841
CHINA	1997	36828320355.277542
CHINA	1996	36922195406.335037
CHINA	1995	36745545733.647804
CHINA	1994	36834390825.101730
CHINA	1993	36862713461.443771
CHINA	1992	36895554213.998398
EGYPT	1998	21628943509.053307
EGYPT	1997	36985606469.079636
EGYPT	1996	37039731604.396599
EGYPT	1995	36974004155.494759
EGYPT	1994	36949341464.171471
EGYPT	1993	36905911004.244980
EGYPT	1992	36972746086.185341
ETHIOPIA	1998	21546934484.999680
ETHIOPIA	1997	36881266893.007088
ETHIOPIA	1996	37026562331.720535
ETHIOPIA	1995	36957549688.097656
ETHIOPIA	1994	36856730257.653305
ETHIOPIA	1993	36862112337.623375
ETHIOPIA	1992	36979586892.827835
FRANCE	1998	21645719691.101437
FRANCE	1997	36933310889.994850
FRANCE	1996	36911058449.018555

FRANCE	1995	36848914604.824646	KENYA	1995	36830698274.556839
FRANCE	1994	36844173267.559464	KENYA	1994	36721806783.659645
FRANCE	1993	36902622528.199303	KENYA	1993	36785877292.561211
FRANCE	1992	36932447239.990044	KENYA	1992	36880882499.037811
GERMANY	1998	21669201804.173851	MOROCCO	1998	21615759778.558842
GERMANY	1997	36956632112.186104	MOROCCO	1997	36851256531.774521
GERMANY	1996	37100431947.241882	MOROCCO	1996	37012384283.234734
GERMANY	1995	36961437571.517647	MOROCCO	1995	36880512994.066055
GERMANY	1994	36928620143.177979	MOROCCO	1994	36821767639.801529
GERMANY	1993	36972831787.982788	MOROCCO	1993	36855066114.277153
GERMANY	1992	37041641137.310570	MOROCCO	1992	36965141653.764969
INDIA	1998	21539882149.483345	MOZAMBIQUE	1998	21612548087.537067
INDIA	1997	36732087265.790916	MOZAMBIQUE	1997	36913048494.736450
INDIA	1996	36907798741.224136	MOZAMBIQUE	1996	37013463323.386948
INDIA	1995	36821415252.848312	MOZAMBIQUE	1995	36813116784.489456
INDIA	1994	36744895805.045074	MOZAMBIQUE	1994	36890326267.535988
INDIA	1993	36721246331.454483	MOZAMBIQUE	1993	36896784445.960358
INDIA	1992	36868657810.038780	MOZAMBIQUE	1992	36912820854.758209
INDONESIA	1998	21621624174.206787	PERU	1998	21638494727.486599
INDONESIA	1997	36869044610.286011	PERU	1997	36945251867.308151
INDONESIA	1996	37028404803.770370	PERU	1996	37009467852.969208
INDONESIA	1995	36914507727.120247	PERU	1995	36914336895.288223
INDONESIA	1994	36896220505.588524	PERU	1994	36978803399.625015
INDONESIA	1993	36902553749.892006	PERU	1993	36947949813.701653
INDONESIA	1992	36923943706.326607	PERU	1992	37120445751.336082
IRAN	1998	21668013311.690464	ROMANIA	1998	21737565817.854137
IRAN	1997	36946372475.597382	ROMANIA	1997	36905330956.342697
IRAN	1996	36991250321.419395	ROMANIA	1996	37115270545.295647
IRAN	1995	36967313712.160049	ROMANIA	1995	36993610732.185196
IRAN	1994	36951265428.884193	ROMANIA	1994	36918578862.439545
IRAN	1993	36907092853.054649	ROMANIA	1993	37037968636.798920
IRAN	1992	37037256951.502533	ROMANIA	1992	37091333229.622551
IRAQ	1998	21675629991.871616	RUSSIA	1998	21534167072.190090
IRAQ	1997	37007567043.309441	RUSSIA	1997	36803640824.455475
IRAQ	1996	36984496393.566246	RUSSIA	1996	36889998424.855759
IRAQ	1995	36928335291.274323	RUSSIA	1995	36861190447.620461
IRAQ	1994	36925019062.866302	RUSSIA	1994	36773967266.201149
IRAQ	1993	36857107565.009041	RUSSIA	1993	36797771208.543259
IRAQ	1992	37043731062.874352	RUSSIA	1992	36942811825.214302
JAPAN	1998	21555649495.567146	SAUDI ARABIA	1998	21643864600.437149
JAPAN	1997	36826629991.386185	SAUDI ARABIA	1997	36895394433.882454
JAPAN	1996	36930010507.208153	SAUDI ARABIA	1996	36959593077.955734
JAPAN	1995	36865251791.392952	SAUDI ARABIA	1995	36903123290.725517
JAPAN	1994	36900566194.364677	SAUDI ARABIA	1994	36967586809.860023
JAPAN	1993	36913735048.766365	SAUDI ARABIA	1993	36883284956.989616
JAPAN	1992	36972159491.229118	SAUDI ARABIA	1992	36973597607.563042
JORDAN	1998	21616766568.377132	UNITED KINGDOM	1998	21639240061.244648
JORDAN	1997	36875672813.702492	UNITED KINGDOM	1997	36855812621.835480
JORDAN	1996	37025885083.971359	UNITED KINGDOM	1996	36972916419.483879
JORDAN	1995	36858036230.174889	UNITED KINGDOM	1995	36933154697.693924
JORDAN	1994	36935526344.922264	UNITED KINGDOM	1994	36927745129.251717
JORDAN	1993	36817057425.316956	UNITED KINGDOM	1993	36781346327.717087
JORDAN	1992	36957995693.377037	UNITED KINGDOM	1992	36972498731.489380
KENYA	1998	21561788084.341164	UNITED STATES	1998	21622677150.585590
KENYA	1997	36799137312.078529	UNITED STATES	1997	36832313445.098381
KENYA	1996	36936422162.394699	UNITED STATES	1996	37005911222.467361

```

UNITED STATES      1995      36895096880.165337
UNITED STATES      1994      36877072676.103767
UNITED STATES      1993      36848819025.201126
UNITED STATES      1992      36979891334.227989
VIETNAM            1998      21613624081.431007
VIETNAM            1997      37030483060.647957
VIETNAM            1996      36965948877.560242
VIETNAM            1995      36888676082.489227
VIETNAM            1994      36924562143.037041
VIETNAM            1993      36913637809.580986
VIETNAM            1992      37034981164.127701

```

(175 row(s) affected)

**EXECUTE STREAM 0 QUERY 10**

-- using 709161519 as a seed to the RNG

/\* TPC\_H Query 10 - Returned Item Reporting \*/

```

SELECT TOP 20
  C_CUSTKEY,
  C_NAME,
  SUM(L_EXTENDEDPRI*(1-L_DISCOUNT)) AS REVENUE,
  C_ACCTBAL,
  N_NAME,
  C_ADDRESS,
  C_PHONE,
  C_COMMENT
FROM
  CUSTOMER,
  ORDERS,
  LINEITEM,
  NATION
WHERE
  C_CUSTKEY = O_CUSTKEY AND
  L_ORDERKEY = O_ORDERKEY AND
  O_ORDERDATE >= '1994-09-01' AND
  O_ORDERDATE < dateadd(mm, 3, '1994-09-01') AND
  L_RETURNFLAG = 'R' AND
  C_NATIONKEY = N_NATIONKEY
GROUP BY
  C_CUSTKEY,
  C_NAME,
  C_ACCTBAL,
  C_PHONE,
  N_NAME,
  C_ADDRESS,
  C_COMMENT
ORDER BY
  REVENUE DESC

```

OUTPUT OF EXECUTE STREAM 0 QUERY 10 (MAX 200 ROWS)

```

C_CUSTKEY  C_NAME              C_ADDRESS              REVENUE              C_ACCTBAL
N_NAME
C_PHONE    C_COMMENT
-----
-----
-----
85945340   Customer#085945340   922735.597500
5041.830000   EGYPT
2cijdvQhd3Dlx8kpxPF9uUD6cPaaubzbs05oxk  14-512-535-7062 quickly bold
requests are slyly accounts. furiously close accounts
44719916   Customer#044719916   903034.468800
1650.310000   JORDAN              b53s6C11IKmjhV
23-254-748-5111 slyly pending accounts about the regular, special ideas
are against t
33814789   Customer#033814789   823510.256400
6164.050000   CHINA
CaacRmLA1Ov3TxBEdq7asrNPv4k2CvHwv      28-511-123-5250 ironic, regular
courts are blithely special deposits. slyly dogged requests
24647566   Customer#024647566   789108.071500   -
301.400000   MOZAMBIQUE          dj0waS9KJq4Z
26-289-968-6599 fluffy, bold foxes haggle furi
126700723   Customer#126700723   771868.809800
6436.520000   JORDAN              uTWxBkMCPpl,,a85IWD0
23-528-334-8781 carefully even packages are carefully up the fluffily
final theodolites: carefull
102656944   Customer#102656944   771330.207800
5117.250000   EGYPT
7eJbsO6VmaK9bQ50rA3fBT                  14-108-802-5684 fluffily
pending ideas sleep furiously.
104254756   Customer#104254756   767374.136400
8625.320000   ROMANIA            avu1VyG5IpavEJf
29-597-952-6846 ideas haggle fluffily across the slyly silent
instructions. bold accounts cajole slyly alongside of the spe
148904174   Customer#148904174   766072.024200
2567.440000   ROMANIA            7WJzI92yS2M8sa5a30zTw
VxKJ      29-395-698-2850 carefully regular deposits cajole
125277409   Customer#125277409   758221.541300
6478.720000   INDIA
qO,oxLJhrGLh9d8vug,OY2O,DHJ9R9qN,PGuwrF 18-434-450-4817 packages play
slyly. regular foxes could promise carefully
118648649   Customer#118648649   753475.718300
5867.160000   ETHIOPIA           4UoRpTSl2qY1Es,KQYqVd
15-917-214-1354 blithely ironic instructions are. slyly regular
dependencies sleep carefully even courts.
40763051   Customer#040763051   751532.089900
456.580000   MOROCCO
F2RHb0QKzITE4A61TcEMaM9PVuJ            25-377-659-7384 excuses affix
slyly. deposits cajole car
91764698   Customer#091764698   750894.175500
8929.950000   MOZAMBIQUE
BlcW51GPiVC4a6AhzYZOJHslrylYlcsBt      26-698-380-4021 final deposits
cajole upon the furiously even asymptotes. final ideas wake. regularly
final ideas wake carefully

```

```

127440757 Customer#127440757 749977.889800
7713.090000 CHINA
CPf1ElWYx6Bezdz2pubuPBvpxlNPC7EIRl 28-498-216-6047 foxes nag
stealthily on the furiously regular pinto beans. slyly
72514198 Customer#072514198 742800.097600
162.650000 ARGENTINA
OnXlxzic15ZHoe0Ya7U1tm9aYzgAtOkVpzte 11-171-563-9251 ironic deposits
sleep blithely. pla
143024666 Customer#143024666 742272.107700
2144.890000 MOROCCO
WZnnfckbr3KruTlfY30yBL4fZz7 25-653-831-2631 final pearls
haggle across the daringly idle deposits. dep
31245436 Customer#031245436 738134.762100
6680.760000 EGYPT D 3xEYi4MCasav67g
14-449-670-3880 unusual accounts breach blithely across the stealthily
bold foxes. blithely ironic accounts cajol
108250901 Customer#108250901 737769.130800
7475.230000 ETHIOPIA 96M8kwb2lapioKp
15-403-367-4448 quickly express pinto beans haggle blithely bold
requests. slyly unusual accounts su
70707499 Customer#070707499 735294.466000
4944.420000 IRAN 4z6Z363
EOfDDU2dcxs8XJbgNRIjUsO 20-283-256-4071 slyly special accounts
affix carefully blithely regular theodolites-- carefully daring requests
integra
112189999 Customer#112189999 730391.592100
2382.460000 INDIA 0TlahC
xRNwviFcTvauQfiR 18-460-548-2723 ironic requests use
dependencies. furiously special foxes
28338533 Customer#028338533 727695.471900
2520.090000 INDONESIA ocx2PomRq1pCo
19-683-705-2671 blithely final foxes sleep furiously. carefully regular
deposits wake alo

```

(20 row(s) affected)

**EXECUTE STREAM 0 QUERY 11**

-- using 709161519 as a seed to the RNG

/\* TPC\_H Query 11 - Important Stock Identification \*/

```

SELECT PS_PARTKEY,
SUM(PS_SUPPLYCOST*PS_AVAILQTY) AS VALUE
FROM PARTSUPP,
SUPPLIER,
NATION
WHERE PS_SUPPKEY = S_SUPPKEY AND
S_NATIONKEY = N_NATIONKEY AND
N_NAME = 'IRAN'
GROUP BY PS_PARTKEY
HAVING SUM(PS_SUPPLYCOST*PS_AVAILQTY) >

```

```

( SELECT SUM(PS_SUPPLYCOST*PS_AVAILQTY) *
0.0000001000
FROM PARTSUPP,
SUPPLIER,
NATION
WHERE PS_SUPPKEY = S_SUPPKEY AND
S_NATIONKEY = N_NATIONKEY AND
N_NAME = 'IRAN'
)
ORDER BY VALUE DESC

```

OUTPUT OF EXECUTE STREAM 0 QUERY 11 (MAX 200 ROWS)

```

-----
PS_PARTKEY VALUE
-----
136360260 26813836.050000
41482524 24772411.680000
64358008 24659750.720000
14001764 24365333.730000
34276233 24359720.120000
168093253 24141026.780000
86820700 23829612.870000
132017990 23760742.790000
17190942 23474864.850000
44422722 23375376.890000
80873626 23057144.390000
32209700 22949796.560000
133849110 22913248.340000
124259451 22839782.790000
183096025 22791615.620000
9190571 22752828.550000
131209855 22617600.520000
95392685 22563164.380000
117291190 22509078.840000
79564802 22400768.310000
199204250 22317716.660000
85893578 22282978.560000
157942687 22184554.830000
113823481 22162724.900000
107121339 22109148.060000
48333577 22080566.390000
93107257 22056244.980000
172255063 21997012.200000
180655806 21973810.940000
41166278 21952268.040000
40554470 21926580.250000
112806493 21916060.560000
126175475 21893254.530000
72471388 21886947.180000
134136371 21877479.880000
60875385 21875211.600000
45277438 21849992.990000

```

89486512 21792364.410000  
153799772 21757658.190000  
133400100 21715343.590000  
94560586 21700885.340000  
1280641 21665698.980000  
72771757 21664556.970000  
23474149 21658078.400000  
128298300 21643792.090000  
171062311 21602781.550000  
78583486 21591367.520000  
72708559 21590523.370000  
8052126 21571140.070000  
112992012 21551830.370000  
30628174 21514996.010000  
84037798 21459387.200000  
156025898 21456932.130000  
34085480 21452079.820000  
138199284 21410822.230000  
54450035 21409829.110000  
153015381 21395841.840000  
129426153 21388785.840000  
107935189 21378454.880000  
85666823 21315306.760000  
139967449 21271699.990000  
98908212 21268008.980000  
157195498 21264952.360000  
65829808 21261216.080000  
187291231 21177036.630000  
83837217 21173872.730000  
91086423 21166831.150000  
186362593 21158074.860000  
117628772 21155018.110000  
85338991 21143564.460000  
40085845 21108252.070000  
130100454 21083101.180000  
159979103 21048249.550000  
126638554 21047425.010000  
103524699 21018735.000000  
51281233 20999904.900000  
147902171 20991999.180000  
165014480 20989466.820000  
69404919 20964828.540000  
154693503 20950319.170000  
152219181 20924459.620000  
20511929 20899095.730000  
182740662 20894563.710000  
13686899 20836918.990000  
179948649 20836777.920000  
94226262 20833745.200000  
122777795 20828779.580000  
149662763 20826443.080000  
88968927 20821998.400000  
130035221 20818804.360000  
1148997 20817757.090000  
145366453 20807117.870000  
123221498 20803372.260000

176333390 20787787.480000  
1033136 20773626.040000  
115330671 20747684.970000  
157559619 20740410.730000  
44069685 20739877.070000  
169865076 20727084.580000  
113985164 20725682.000000

[931465 more rows]

140065389 8013735.000000  
113932891 8013732.500000  
104228076 8013730.140000  
73497157 8013730.000000  
192217606 8013728.800000  
36042376 8013725.560000  
12024096 8013720.840000  
4582626 8013718.350000  
154552485 8013715.140000  
107602942 8013711.420000  
178624876 8013710.360000  
61175549 8013708.660000  
143222456 8013707.860000  
60274250 8013707.850000  
139152882 8013707.520000  
43653213 8013707.150000  
82708859 8013705.570000  
105602838 8013704.750000  
53008703 8013704.290000  
110573966 8013703.170000  
118552937 8013701.630000  
86471209 8013700.500000  
118728017 8013700.480000  
191615697 8013698.420000  
79996815 8013698.400000  
189429 8013697.590000  
20571382 8013694.630000  
42726811 8013693.720000  
30301522 8013693.240000  
148473274 8013691.800000  
28607745 8013691.110000  
127071726 8013688.640000  
81708049 8013688.200000  
97664386 8013688.020000  
57701403 8013685.290000  
124304862 8013684.700000  
120440070 8013684.450000  
118314594 8013683.130000  
121444803 8013680.380000  
8604090 8013680.240000  
60393980 8013680.010000  
71780916 8013679.010000  
105765793 8013678.720000  
21047461 8013674.970000  
122795148 8013671.900000  
193759539 8013670.000000

157160293 8013668.900000  
 121171189 8013668.000000  
 156341926 8013667.470000  
 122842225 8013667.200000  
 31693240 8013667.200000  
 108995818 8013666.930000  
 71193282 8013664.920000  
 21404508 8013662.700000  
 66320889 8013660.600000  
 128795063 8013659.220000  
 44385801 8013657.600000  
 93423264 8013653.340000  
 183496488 8013651.430000  
 76392530 8013651.280000  
 72807071 8013650.400000  
 187256248 8013649.420000  
 107358431 8013647.800000  
 6879091 8013646.150000  
 1964110 8013645.750000  
 196802990 8013645.120000  
 74014625 8013643.600000  
 78928542 8013642.040000  
 129132048 8013641.370000  
 168499737 8013638.490000  
 193512000 8013635.980000  
 109970941 8013635.300000  
 118759402 8013635.280000  
 29012954 8013629.220000  
 4727797 8013628.050000  
 155456044 8013623.600000  
 194453706 8013622.800000  
 94274708 8013620.760000  
 35888512 8013620.520000  
 180290773 8013619.600000  
 93344385 8013617.600000  
 177315638 8013617.480000  
 57776103 8013616.450000  
 89654588 8013615.030000  
 30903504 8013614.420000  
 22810172 8013613.820000  
 146792330 8013612.720000  
 72938575 8013611.100000  
 8935408 8013609.960000  
 144697606 8013609.800000  
 154648541 8013609.510000  
 148409529 8013609.000000  
 148437488 8013605.180000  
 106321955 8013603.960000  
 101979970 8013603.610000  
 171223978 8013602.940000  
 59433558 8013600.900000  
 92165557 8013599.720000  
 62694247 8013595.600000  
 79072343 8013595.200000

(931665 row(s) affected)

**EXECUTE STREAM 0 QUERY 12**

```
-----
-- using 709161519 as a seed to the RNG

/* TPC_H Query 12 - Shipping Modes and Order Priority */

SELECT L_SHIPMODE,
       SUM( CASE WHEN O_ORDERPRIORITY = '1-URGENT' OR
                  O_ORDERPRIORITY = '2-HIGH'
                THEN 1
                ELSE 0
              END) AS HIGH_LINE_COUNT,
       SUM( CASE WHEN O_ORDERPRIORITY <> '1-URGENT' AND
                  O_ORDERPRIORITY <> '2-HIGH'
                THEN 1
                ELSE 0
              END) AS LOW_LINE_COUNT
FROM   ORDERS,
       LINEITEM
WHERE  O_ORDERKEY = L_ORDERKEY AND
       L_SHIPMODE IN ('REG AIR','RAIL') AND
       L_COMMITDATE < L_RECEIPTDATE AND
       L_SHIPDATE < L_COMMITDATE AND
       L_RECEIPTDATE >= '1994-01-01' AND
       L_RECEIPTDATE < dateadd(yy, 1, '1994-01-01')
GROUP BY L_SHIPMODE
ORDER BY L_SHIPMODE
```

OUTPUT OF EXECUTE STREAM 0 QUERY 12 (MAX 200 ROWS)

```
-----
L_SHIPMODE HIGH_LINE_COUNT LOW_LINE_COUNT
-----
RAIL        6240014          9353799
REG AIR     6241948          9356351
```

(2 row(s) affected)

**EXECUTE STREAM 0 QUERY 13**

```
-----
-- using 709161519 as a seed to the RNG

/* TPC_H Query 13 - Customer Distribution */

SELECT C_COUNT,
       COUNT(*) AS CUSTDIST
```

```

FROM      (
  SELECT  C_CUSTKEY,
          COUNT(O_ORDERKEY)
  FROM    CUSTOMER left outer join ORDERS on
          C_CUSTKEY      = O_CUSTKEY      AND
          O_COMMENT      not like '%pending%requests%'
  GROUP  BY    C_CUSTKEY
)
GROUP BY  C_COUNT
ORDER BY  CUSTDIST      DESC,
          C_COUNT       DESC

```

OUTPUT OF EXECUTE STREAM 0 QUERY 13 (MAX 200 ROWS)

```

-----
C_COUNT  CUSTDIST
-----
0         50000004
10        10800158
11        9393911
9         9348940
20        7722061
19        7284297
21        7054930
8         6198587
12        6031043
18        5951513
22        5510886
17        4242283
23        3645410
7         3170515
13        2887708
16        2646907
24        2017485
15        1553640
14        1419962
6         1256275
25        920471
5         380764
26        337044
27        96951
4         87066
28        21105
3         14539
29        3305
2         1741
30        376
1         88
31        34
32        1

```

(33 row(s) affected)

**EXECUTE STREAM 0 QUERY 14**

```

-----
-- using 709161519 as a seed to the RNG

/* TPC_H Query 14 - Promotion Effect */

SELECT 100.00 * SUM (
          CASE WHEN P_TYPE LIKE 'PROMO%'
              THEN L_EXTENDEDPRI* (1-L_DISCOUNT)
              ELSE 0
          END) / SUM(L_EXTENDEDPRI* (1-L_DISCOUNT))

          AS PROMO_REVENUE
FROM    LINEITEM,
        PART
WHERE   L_PARTKEY      = P_PARTKEY      AND
        L_SHIPDATE     >= '1994-08-01'  AND
        L_SHIPDATE     < dateadd(mm, 1, '1994-08-01')

```

OUTPUT OF EXECUTE STREAM 0 QUERY 14 (MAX 200 ROWS)

```

-----
PROMO_REVENUE
-----
16.675586

(1 row(s) affected)

```

**EXECUTE STREAM 0 QUERY 15**

```

-----
-- using 709161519 as a seed to the RNG

/* TPC_H Query 15 - Create View for Top Supplier Query */

CREATE VIEW REVENUE0 (SUPPLIER_NO, TOTAL_REVENUE)
AS
SELECT L_SUPPKEY,
       SUM(L_EXTENDEDPRI* (1-L_DISCOUNT))
FROM   LINEITEM
WHERE  L_SHIPDATE     >= '1996-07-01' AND
       L_SHIPDATE     < dateadd(mm, 3, '1996-07-01')
GROUP BY L_SUPPKEY
GO

/* TPC_H Query 15 - Top Supplier */

SELECT S_SUPPKEY,
       S_NAME,
       S_ADDRESS,

```



```

S_PHONE,
TOTAL_REVENUE
FROM SUPPLIER,
REVENUE0
WHERE S_SUPPKEY = SUPPLIER_NO AND
TOTAL_REVENUE = ( SELECT MAX(TOTAL_REVENUE)
FROM REVENUE0
)
ORDER BY S_SUPPKEY
DROP VIEW REVENUE0

```

```

P_BRAND,
P_TYPE,
P_SIZE

```

OUTPUT OF EXECUTE STREAM 0 QUERY 16 (MAX 200 ROWS)

P_BRAND	P_TYPE	P_SIZE	SUPPLIER_CNT
Brand#15	SMALL BRUSHED BRASS	11	4784
Brand#23	SMALL BRUSHED COPPER	15	4775
Brand#21	STANDARD PLATED NICKEL	42	4755
Brand#12	LARGE ANODIZED BRASS	21	4740
Brand#25	STANDARD PLATED NICKEL	21	4739
Brand#35	LARGE BRUSHED STEEL	41	4723
Brand#23	STANDARD POLISHED COPPER	47	4715
Brand#14	SMALL PLATED NICKEL	41	4709
Brand#41	MEDIUM ANODIZED TIN	41	4700
Brand#15	MEDIUM ANODIZED BRASS	41	4695
Brand#45	LARGE ANODIZED NICKEL	21	4691
Brand#54	LARGE PLATED STEEL	41	4683
Brand#35	ECONOMY BRUSHED STEEL	11	4682
Brand#52	MEDIUM BURNISHED STEEL	48	4679
Brand#54	STANDARD BRUSHED BRASS	46	4673
Brand#53	MEDIUM BRUSHED STEEL	47	4670
Brand#54	MEDIUM ANODIZED BRASS	21	4668
Brand#53	ECONOMY POLISHED COPPER	11	4667
Brand#31	ECONOMY PLATED COPPER	47	4665
Brand#33	STANDARD PLATED NICKEL	47	4664
Brand#13	ECONOMY BRUSHED BRASS	11	4658
Brand#42	LARGE POLISHED BRASS	46	4657
Brand#44	ECONOMY BRUSHED TIN	47	4657
Brand#42	ECONOMY ANODIZED TIN	47	4656
Brand#44	ECONOMY PLATED NICKEL	21	4655
Brand#41	SMALL BURNISHED COPPER	21	4653
Brand#55	LARGE PLATED BRASS	21	4652
Brand#44	LARGE ANODIZED NICKEL	42	4651
Brand#51	MEDIUM BRUSHED COPPER	11	4648
Brand#15	PROMO BURNISHED TIN	46	4646
Brand#32	MEDIUM POLISHED COPPER	11	4644
Brand#11	STANDARD BURNISHED TIN	41	4640
Brand#14	STANDARD PLATED TIN	47	4639
Brand#31	ECONOMY ANODIZED NICKEL	46	4639
Brand#14	LARGE POLISHED TIN	21	4637
Brand#51	PROMO PLATED COPPER	46	4637
Brand#12	STANDARD POLISHED COPPER	11	4636
Brand#41	PROMO BRUSHED STEEL	46	4636
Brand#15	ECONOMY BRUSHED BRASS	48	4635
Brand#33	ECONOMY BRUSHED NICKEL	21	4635
Brand#31	STANDARD BURNISHED STEEL	46	4633
Brand#44	MEDIUM POLISHED TIN	21	4633
Brand#45	SMALL BURNISHED BRASS	21	4633
Brand#25	MEDIUM BURNISHED TIN	11	4630

OUTPUT OF EXECUTE STREAM 0 QUERY 15 (MAX 200 ROWS)

```

S_SUPPKEY S_NAME S_ADDRESS
S_PHONE TOTAL_REVENUE
-----
1864998 Supplier#001864998 01a9Me5aArPkvVVhpi1EAA
13-359-860-1588 3653564.759900

```

(1 row(s) affected)

EXECUTE STREAM 0 QUERY 16

-- using 709161519 as a seed to the RNG

/\* TPC\_H Query 16 - Parts/Supplier Relationship \*/

```

SELECT P_BRAND,
P_TYPE,
P_SIZE,
COUNT(DISTINCT PS_SUPPKEY) AS SUPPLIER_CNT
FROM PARTSUPP,
PART
WHERE P_PARTKEY = PS_PARTKEY AND
P_BRAND <> 'Brand#43' AND
P_TYPE NOT LIKE 'SMALL POLISHED%'
AND
P_SIZE IN (48, 41, 46, 11, 47, 21, 42, 15) AND
PS_SUPPKEY NOT IN ( SELECT S_SUPPKEY
FROM SUPPLIER
WHERE S_COMMENT LIKE
'%Customer%Complaints%'
)
GROUP BY P_BRAND,
P_TYPE,
P_SIZE
ORDER BY SUPPLIER_CNT DESC,

```

Brand#33	MEDIUM BURNISHED TIN	11	4630
Brand#23	PROMO BURNISHED NICKEL	41	4628
Brand#22	PROMO POLISHED COPPER	42	4627
Brand#35	STANDARD PLATED BRASS	42	4627
Brand#52	ECONOMY POLISHED NICKEL	48	4627
Brand#14	PROMO POLISHED COPPER	21	4626
Brand#25	MEDIUM ANODIZED COPPER	15	4626
Brand#32	LARGE POLISHED COPPER	15	4626
Brand#45	LARGE POLISHED COPPER	42	4625
Brand#23	MEDIUM PLATED STEEL	42	4624
Brand#51	ECONOMY ANODIZED NICKEL	11	4624
Brand#53	PROMO PLATED TIN	47	4624
Brand#23	ECONOMY PLATED NICKEL	46	4623
Brand#24	STANDARD ANODIZED STEEL	15	4622
Brand#25	MEDIUM BURNISHED NICKEL	42	4622
Brand#55	MEDIUM BRUSHED STEEL	48	4622
Brand#31	PROMO BURNISHED BRASS	48	4621
Brand#12	MEDIUM ANODIZED STEEL	47	4620
Brand#12	PROMO POLISHED TIN	47	4619
Brand#15	LARGE BURNISHED STEEL	42	4618
Brand#35	STANDARD PLATED BRASS	46	4617
Brand#51	PROMO ANODIZED TIN	42	4617
Brand#53	SMALL BRUSHED TIN	46	4617
Brand#14	PROMO BURNISHED STEEL	42	4616
Brand#35	MEDIUM BRUSHED STEEL	47	4615
Brand#54	PROMO BRUSHED STEEL	11	4614
Brand#11	SMALL PLATED NICKEL	11	4613
Brand#25	ECONOMY PLATED STEEL	11	4613
Brand#35	MEDIUM BURNISHED NICKEL	15	4613
Brand#53	MEDIUM ANODIZED BRASS	41	4613
Brand#53	SMALL BRUSHED NICKEL	47	4613
Brand#54	LARGE PLATED STEEL	46	4613
Brand#32	LARGE ANODIZED STEEL	46	4611
Brand#12	PROMO POLISHED COPPER	47	4610
Brand#34	ECONOMY ANODIZED BRASS	11	4610
Brand#11	ECONOMY ANODIZED COPPER	11	4609
Brand#23	SMALL BURNISHED NICKEL	21	4609
Brand#44	LARGE ANODIZED TIN	41	4609
Brand#45	STANDARD POLISHED COPPER	21	4609
Brand#54	PROMO PLATED STEEL	47	4609
Brand#14	LARGE BURNISHED BRASS	42	4608
Brand#25	ECONOMY BRUSHED COPPER	15	4608
Brand#44	SMALL ANODIZED STEEL	21	4608
Brand#45	STANDARD PLATED NICKEL	42	4607
Brand#12	SMALL BRUSHED COPPER	41	4606
Brand#15	LARGE PLATED BRASS	46	4606
Brand#42	ECONOMY ANODIZED TIN	42	4606
Brand#54	MEDIUM PLATED STEEL	42	4606
Brand#22	SMALL BURNISHED NICKEL	46	4604
Brand#32	LARGE POLISHED STEEL	41	4603
Brand#35	LARGE BRUSHED NICKEL	46	4603
Brand#51	MEDIUM BRUSHED NICKEL	11	4603
Brand#15	LARGE ANODIZED STEEL	41	4602
Brand#23	PROMO BURNISHED NICKEL	15	4602
Brand#25	ECONOMY PLATED STEEL	41	4602
Brand#24	ECONOMY PLATED STEEL	47	4601

[27640 more rows]

Brand#41	LARGE POLISHED STEEL	21	3933
Brand#13	SMALL BURNISHED STEEL	41	3931
Brand#22	ECONOMY BURNISHED NICKEL	15	3931
Brand#25	ECONOMY BURNISHED TIN	48	3931
Brand#13	LARGE PLATED NICKEL	42	3930
Brand#21	MEDIUM BURNISHED TIN	46	3930
Brand#31	SMALL BRUSHED STEEL	15	3930
Brand#42	ECONOMY ANODIZED STEEL	42	3930
Brand#45	PROMO POLISHED NICKEL	11	3930
Brand#53	STANDARD BURNISHED NICKEL	15	3930
Brand#22	STANDARD ANODIZED BRASS	42	3929
Brand#31	PROMO BURNISHED NICKEL	42	3929
Brand#14	MEDIUM POLISHED COPPER	21	3928
Brand#15	SMALL BRUSHED TIN	47	3928
Brand#44	ECONOMY PLATED BRASS	21	3928
Brand#12	STANDARD BURNISHED NICKEL	48	3927
Brand#14	STANDARD BRUSHED STEEL	11	3927
Brand#42	MEDIUM POLISHED NICKEL	11	3927
Brand#22	ECONOMY ANODIZED STEEL	47	3926
Brand#31	PROMO BURNISHED COPPER	46	3926
Brand#32	SMALL PLATED COPPER	41	3926
Brand#42	ECONOMY POLISHED NICKEL	11	3926
Brand#52	STANDARD ANODIZED NICKEL	42	3926
Brand#31	MEDIUM BRUSHED BRASS	21	3925
Brand#44	LARGE POLISHED COPPER	11	3924
Brand#14	SMALL PLATED NICKEL	47	3923
Brand#33	LARGE BURNISHED COPPER	11	3923
Brand#35	ECONOMY BURNISHED NICKEL	46	3923
Brand#45	STANDARD BRUSHED COPPER	47	3923
Brand#52	SMALL BRUSHED STEEL	46	3923
Brand#54	LARGE BURNISHED TIN	48	3923
Brand#54	PROMO BURNISHED BRASS	21	3923
Brand#13	ECONOMY PLATED NICKEL	21	3922
Brand#33	STANDARD BURNISHED COPPER	15	3922
Brand#34	ECONOMY BRUSHED BRASS	41	3922
Brand#51	LARGE POLISHED COPPER	47	3922
Brand#22	ECONOMY ANODIZED COPPER	46	3921
Brand#22	MEDIUM PLATED BRASS	15	3921
Brand#32	MEDIUM BRUSHED STEEL	47	3920
Brand#44	MEDIUM PLATED COPPER	46	3920
Brand#21	ECONOMY PLATED TIN	21	3919
Brand#22	MEDIUM PLATED BRASS	41	3919
Brand#25	STANDARD BRUSHED STEEL	46	3919
Brand#22	PROMO POLISHED COPPER	46	3917
Brand#53	LARGE ANODIZED BRASS	21	3917
Brand#25	LARGE PLATED COPPER	21	3916
Brand#35	MEDIUM POLISHED TIN	41	3916
Brand#13	ECONOMY POLISHED TIN	48	3915
Brand#15	LARGE ANODIZED TIN	47	3915
Brand#45	PROMO POLISHED COPPER	11	3915
Brand#12	MEDIUM PLATED BRASS	11	3914
Brand#12	PROMO ANODIZED BRASS	48	3914
Brand#23	MEDIUM POLISHED TIN	15	3914

Brand#35	SMALL PLATED BRASS	41	3914
Brand#52	SMALL PLATED BRASS	11	3914
Brand#53	STANDARD BRUSHED NICKEL	21	3914
Brand#42	PROMO PLATED NICKEL	46	3913
Brand#52	ECONOMY BURNISHED STEEL	47	3912
Brand#35	PROMO BRUSHED STEEL	48	3910
Brand#11	MEDIUM BRUSHED NICKEL	47	3905
Brand#34	STANDARD BRUSHED COPPER	11	3905
Brand#15	PROMO ANODIZED COPPER	42	3904
Brand#14	PROMO BRUSHED STEEL	21	3903
Brand#23	ECONOMY POLISHED BRASS	42	3902
Brand#42	ECONOMY ANODIZED NICKEL	42	3902
Brand#31	LARGE BRUSHED STEEL	47	3901
Brand#41	SMALL ANODIZED COPPER	42	3901
Brand#33	ECONOMY PLATED TIN	41	3899
Brand#12	PROMO PLATED TIN	46	3895
Brand#14	SMALL BRUSHED STEEL	15	3895
Brand#22	STANDARD PLATED COPPER	46	3895
Brand#33	MEDIUM POLISHED COPPER	46	3895
Brand#44	LARGE BRUSHED TIN	46	3895
Brand#45	STANDARD POLISHED COPPER	47	3894
Brand#55	LARGE POLISHED COPPER	41	3892
Brand#31	MEDIUM PLATED STEEL	42	3891
Brand#42	STANDARD ANODIZED BRASS	48	3890
Brand#45	LARGE POLISHED NICKEL	15	3890
Brand#15	MEDIUM PLATED BRASS	46	3886
Brand#21	MEDIUM BRUSHED TIN	48	3885
Brand#24	SMALL BRUSHED STEEL	47	3884
Brand#25	ECONOMY POLISHED STEEL	41	3883
Brand#35	PROMO BURNISHED STEEL	48	3881
Brand#44	LARGE BRUSHED COPPER	48	3880
Brand#12	ECONOMY POLISHED STEEL	11	3878
Brand#13	ECONOMY ANODIZED NICKEL	41	3875
Brand#12	LARGE PLATED NICKEL	15	3868
Brand#45	PROMO ANODIZED BRASS	48	3866
Brand#55	PROMO ANODIZED NICKEL	41	3866
Brand#44	MEDIUM ANODIZED BRASS	48	3865
Brand#24	ECONOMY BRUSHED NICKEL	42	3863
Brand#25	LARGE BRUSHED COPPER	42	3862
Brand#51	ECONOMY PLATED NICKEL	15	3861
Brand#14	PROMO POLISHED STEEL	42	3860
Brand#31	SMALL PLATED BRASS	21	3857
Brand#23	ECONOMY BURNISHED BRASS	47	3855
Brand#54	ECONOMY POLISHED COPPER	42	3855
Brand#15	ECONOMY BURNISHED NICKEL	21	3850
Brand#24	ECONOMY BRUSHED STEEL	21	3842
Brand#51	STANDARD POLISHED BRASS	42	3825

(27840 row(s) affected)

EXECUTE STREAM 0 QUERY 17

-----

-- using 709161519 as a seed to the RNG

/\* TPC\_H Query 17 - Small-Quantity-Order Revenue \*/

```

SELECT SUM(L_EXTENDEDPRICE)/7.0      AS AVG_YEARLY
FROM   LINEITEM,
      PART
WHERE  P_PARTKEY      = L_PARTKEY      AND
      P_BRAND        = 'Brand#32'      AND
      P_CONTAINER    = 'JUMBO JAR'     AND
      L_QUANTITY     < (              SELECT 0.2 * AVG(L_QUANTITY)
                                      FROM    LINEITEM
                                      WHERE  L_PARTKEY      = P_PARTKEY
                                      )

```

OUTPUT OF EXECUTE STREAM 0 QUERY 17 (MAX 200 ROWS)

-----

```

AVG_YEARLY
-----
308377279.188572

```

(1 row(s) affected)

EXECUTE STREAM 0 QUERY 18

-----

-- using 709161519 as a seed to the RNG

/\* TPC\_H Query 18 - Large Volume Customer \*/

```

SELECT TOP 100
      C_NAME,
      C_CUSTKEY,
      O_ORDERKEY,
      O_ORDERDATE,
      O_TOTALPRICE,
      SUM(L_QUANTITY)
FROM   CUSTOMER,
      ORDERS,
      LINEITEM
WHERE  O_ORDERKEY IN (              SELECT L_ORDERKEY
                                      FROM    LINEITEM
                                      GROUP  BY      L_ORDERKEY HAVING
                                      SUM(L_QUANTITY) > 313
                                      )      AND
      C_CUSTKEY      = O_CUSTKEY      AND
      O_ORDERKEY     = L_ORDERKEY
GROUP BY C_NAME,
      C_CUSTKEY,
      O_ORDERKEY,
      O_ORDERDATE,

```

ORDER BY O\_TOTALPRICE DESC,  
O\_ORDERDATE

Customer#006292942 6292942 1290258885 1994-03-12  
00:00:00.000 572437.010000 321.000000  
Customer#074772199 74772199 63125379 1997-07-20  
00:00:00.000 572437.010000 321.000000  
Customer#114100846 114100846 3023811459 1998-07-22  
00:00:00.000 571357.620000 320.000000  
Customer#006413804 6413804 3242971905 1994-04-07  
00:00:00.000 570492.980000 320.000000  
Customer#133341095 133341095 788704869 1994-08-16  
00:00:00.000 570492.980000 320.000000  
Customer#102912673 102912673 2837733026 1994-01-02  
00:00:00.000 569434.530000 321.000000  
Customer#134691712 134691712 1610599520 1997-10-06  
00:00:00.000 569434.530000 321.000000  
Customer#133785118 133785118 4291381154 1992-06-18  
00:00:00.000 569054.710000 316.000000  
Customer#112517252 112517252 3924886883 1994-04-27  
00:00:00.000 568933.980000 319.000000  
Customer#061802131 61802131 2697753377 1995-10-29  
00:00:00.000 568933.980000 319.000000  
Customer#044241475 44241475 1470619847 1996-09-21  
00:00:00.000 568933.980000 319.000000  
Customer#113583799 113583799 2902156486 1995-09-21  
00:00:00.000 568854.260000 324.000000  
Customer#038863337 38863337 1607224230 1994-03-24  
00:00:00.000 568840.670000 334.000000  
Customer#046048465 46048465 366258304 1996-07-14  
00:00:00.000 567537.510000 329.000000  
Customer#057251914 57251914 2432171076 1996-12-07  
00:00:00.000 566568.110000 314.000000  
Customer#149815216 149815216 2334116806 1994-09-13  
00:00:00.000 566098.850000 332.000000  
Customer#077326036 77326036 15517356 1995-06-08  
00:00:00.000 566098.850000 332.000000  
Customer#046566512 46566512 4788383842 1996-04-06  
00:00:00.000 566098.850000 332.000000  
Customer#091040488 91040488 2110959363 1995-04-28  
00:00:00.000 565887.090000 317.000000  
Customer#115301575 115301575 5928465858 1997-02-04  
00:00:00.000 563439.720000 326.000000  
Customer#119408293 119408293 5619984103 1992-10-13  
00:00:00.000 563357.700000 319.000000  
Customer#001248484 1248484 3165717091 1995-04-30  
00:00:00.000 563357.700000 319.000000  
Customer#013429135 13429135 1872272804 1995-03-26  
00:00:00.000 563243.570000 319.000000  
Customer#097607102 97607102 4790242983 1997-03-10  
00:00:00.000 563116.750000 318.000000  
Customer#090495487 90495487 323219458 1994-04-02  
00:00:00.000 562799.450000 315.000000  
Customer#036889892 36889892 1905938080 1993-02-27  
00:00:00.000 562402.380000 325.000000  
Customer#098308942 98308942 4360205092 1997-01-21  
00:00:00.000 562402.380000 325.000000  
Customer#090585199 90585199 2482928707 1996-03-24  
00:00:00.000 562276.160000 320.000000

OUTPUT OF EXECUTE STREAM 0 QUERY 18 (MAX 200 ROWS)

C_NAME	C_CUSTKEY	O_ORDERKEY	O_ORDERDATE
Customer#101152111	101152111	1499040929	1998-03-11
00:00:00.000 602901.810000		321.000000	
Customer#102538214	102538214	3953307941	1998-05-27
00:00:00.000 602901.810000		321.000000	
Customer#107212873	107212873	1538557767	1995-10-20
00:00:00.000 589263.480000		322.000000	
Customer#136074337	136074337	5516355846	1995-11-17
00:00:00.000 586650.130000		336.000000	
Customer#024921106	24921106	5402410403	1992-02-02
00:00:00.000 584508.950000		330.000000	
Customer#100007089	100007089	415729891	1994-07-26
00:00:00.000 583283.020000		314.000000	
Customer#030259576	30259576	2869996903	1996-09-10
00:00:00.000 583283.020000		314.000000	
Customer#144300041	144300041	4344889121	1995-09-27
00:00:00.000 582708.250000		328.000000	
Customer#016933177	16933177	2447829637	1997-08-30
00:00:00.000 581920.150000		333.000000	
Customer#054491287	54491287	3674963143	1997-09-11
00:00:00.000 581920.150000		333.000000	
Customer#122878553	122878553	1220696131	1998-04-09
00:00:00.000 581920.150000		333.000000	
Customer#110364508	110364508	5820154436	1997-06-18
00:00:00.000 580547.980000		332.000000	
Customer#066344690	66344690	5289178852	1994-05-16
00:00:00.000 580219.550000		321.000000	
Customer#011795269	11795269	1809812544	1992-01-14
00:00:00.000 577631.360000		318.000000	
Customer#119133178	119133178	2882403394	1994-12-01
00:00:00.000 576680.710000		336.000000	
Customer#101782231	101782231	284878243	1997-10-10
00:00:00.000 575916.570000		323.000000	
Customer#040659991	40659991	2582628006	1994-08-19
00:00:00.000 575441.420000		314.000000	
Customer#114480628	114480628	806935329	1993-02-18
00:00:00.000 573772.880000		316.000000	
Customer#134568274	134568274	3261202341	1997-05-02
00:00:00.000 573772.880000		316.000000	
Customer#057135973	57135973	3634131526	1996-03-09
00:00:00.000 573612.250000		340.000000	
Customer#108596293	108596293	4971659427	1993-06-23
00:00:00.000 572437.010000		321.000000	

Customer#032640217	32640217	4547412257	1992-01-11	Customer#136939639	136939639	4820564706	1995-03-04
00:00:00.000	562120.220000	317.000000		00:00:00.000	555705.110000	316.000000	
Customer#080510425	80510425	2777712454	1993-04-16	Customer#029197682	29197682	556564384	1997-04-03
00:00:00.000	562106.830000	326.000000		00:00:00.000	555417.110000	329.000000	
Customer#017403719	17403719	423230980	1992-09-15	Customer#035449906	35449906	76781762	1994-08-08
00:00:00.000	562085.830000	318.000000		00:00:00.000	555398.300000	315.000000	
Customer#049659511	49659511	4119752935	1994-04-10	Customer#104884310	104884310	2205983105	1993-04-05
00:00:00.000	562045.580000	318.000000		00:00:00.000	555123.550000	321.000000	
Customer#076828936	76828936	532736640	1993-07-22	Customer#053391886	53391886	5887383623	1994-10-25
00:00:00.000	561511.910000	316.000000		00:00:00.000	555123.550000	321.000000	
Customer#091717477	91717477	320200161	1996-09-01	Customer#144237256	144237256	5848428038	1993-10-24
00:00:00.000	561431.530000	330.000000		00:00:00.000	554790.370000	315.000000	
Customer#047220364	47220364	1982527973	1994-12-07	Customer#030230605	30230605	2407578273	1996-06-23
00:00:00.000	561204.520000	315.000000		00:00:00.000	554777.990000	325.000000	
Customer#096201739	96201739	3209661479	1996-09-24	Customer#037840516	37840516	5964461156	1993-06-30
00:00:00.000	561204.520000	315.000000		00:00:00.000	554689.260000	316.000000	
Customer#013054039	13054039	4975580870	1996-07-01	Customer#136089292	136089292	4304142341	1993-06-14
00:00:00.000	561173.500000	329.000000		00:00:00.000	554615.440000	329.000000	
Customer#059832857	59832857	4825742372	1998-04-08	Customer#129126850	129126850	622741799	1996-07-04
00:00:00.000	560575.030000	319.000000		00:00:00.000	554615.440000	329.000000	
Customer#076289411	76289411	4350253191	1994-09-28	Customer#147909305	147909305	4880519171	1993-07-30
00:00:00.000	560441.160000	315.000000		00:00:00.000	553988.730000	321.000000	
Customer#147063353	147063353	5577386721	1995-05-13	Customer#086021252	86021252	1994154529	1995-12-19
00:00:00.000	560441.160000	315.000000		00:00:00.000	553986.520000	321.000000	
Customer#133573564	133573564	2885899650	1996-09-03	Customer#130403542	130403542	4022104130	1992-01-07
00:00:00.000	559731.490000	314.000000		00:00:00.000	553813.760000	321.000000	
Customer#123849082	123849082	988981827	1995-05-03	Customer#060653332	60653332	515060481	1992-06-02
00:00:00.000	559704.270000	314.000000		00:00:00.000	553586.910000	315.000000	
Customer#086362393	86362393	3443248839	1997-11-26	Customer#079179442	79179442	3225457446	1992-10-09
00:00:00.000	559704.270000	314.000000		00:00:00.000	553552.590000	327.000000	
Customer#081595000	81595000	682000385	1995-06-21	Customer#049232639	49232639	4282470017	1992-11-18
00:00:00.000	559541.320000	332.000000		00:00:00.000	553518.570000	327.000000	
Customer#006559966	6559966	5990476196	1994-02-06	Customer#077461813	77461813	1478668323	1997-04-24
00:00:00.000	558925.240000	315.000000		00:00:00.000	553410.180000	330.000000	
Customer#099574822	99574822	1315257057	1997-06-27	Customer#133157893	133157893	1084335783	1996-01-07
00:00:00.000	558502.810000	325.000000		00:00:00.000	553217.430000	315.000000	
Customer#102439495	102439495	228076418	1995-11-15	Customer#048014495	48014495	475161217	1994-10-15
00:00:00.000	558304.460000	326.000000		00:00:00.000	553102.520000	324.000000	
Customer#004362080	4362080	5813700580	1993-10-09	Customer#065091115	65091115	4716326021	1993-09-04
00:00:00.000	558256.930000	323.000000		00:00:00.000	553062.680000	329.000000	
Customer#021719195	21719195	2184700704	1994-08-01	Customer#132724502	132724502	2939224930	1998-02-09
00:00:00.000	557469.760000	320.000000		00:00:00.000	552912.050000	315.000000	
Customer#104478572	104478572	2476661153	1992-05-12	Customer#116730493	116730493	107481504	1992-04-09
00:00:00.000	557263.200000	319.000000		00:00:00.000	552844.500000	325.000000	
Customer#022718488	22718488	4291148678	1996-11-19	Customer#113904524	113904524	2561748516	1996-09-29
00:00:00.000	557043.740000	316.000000		00:00:00.000	552844.500000	325.000000	
Customer#039951961	39951961	5260646310	1995-03-21				
00:00:00.000	556923.900000	317.000000					
Customer#115545764	115545764	4033512804	1995-09-10				
00:00:00.000	556923.900000	317.000000					
Customer#113809822	113809822	5446531366	1993-09-28				
00:00:00.000	556636.270000	316.000000					
Customer#022472743	22472743	2992264354	1994-12-04				
00:00:00.000	556636.270000	316.000000					
Customer#137100640	137100640	4219397860	1998-01-06				
00:00:00.000	556636.270000	316.000000					

(100 row(s) affected)

**EXECUTE STREAM 0 QUERY 19**

-----

-- using 709161519 as a seed to the RNG

/\* TPC\_H Query 19 - Discounted Revenue \*/

```
SELECT SUM(L_EXTENDEDPRI* (1 - L_DISCOUNT)) AS REVENUE
FROM LINEITEM,
PART
WHERE (
    P_PARTKEY = L_PARTKEY
    AND
    P_BRAND = 'Brand#45'
    AND
    P_CONTAINER IN ( 'SM CASE', 'SM BOX', 'SM PACK', 'SM
PKG')
    AND
    L_QUANTITY >= 4
    AND
    L_QUANTITY <= 4 + 10
    AND
    P_SIZE BETWEEN 1 AND 5
    AND
    L_SHIPMODE IN ('AIR', 'AIR REG')
    AND
    L_SHIPINSTRUCT = 'DELIVER IN PERSON'
)
OR
(
    P_PARTKEY = L_PARTKEY
    AND
    P_BRAND = 'Brand#54'
    AND
    P_CONTAINER IN ( 'MED BAG', 'MED BOX', 'MED PKG', 'MED
PACK')
    AND
    L_QUANTITY >= 16
    AND
    L_QUANTITY <= 16 + 10
    AND
    P_SIZE BETWEEN 1 AND 10
    AND
    L_SHIPMODE IN ('AIR', 'AIR REG')
    AND
    L_SHIPINSTRUCT = 'DELIVER IN PERSON'
)
OR
(
    P_PARTKEY = L_PARTKEY
    AND
    P_BRAND = 'Brand#53'
    AND
    P_CONTAINER IN ( 'LG CASE', 'LG BOX', 'LG PACK', 'LG
PKG')
    AND
    L_QUANTITY >= 26
    AND
    L_QUANTITY <= 26 + 10
    AND
    P_SIZE BETWEEN 1 AND 15
    AND
    L_SHIPMODE IN ('AIR', 'AIR REG')
    AND
    L_SHIPINSTRUCT = 'DELIVER IN PERSON'
)
```

OUTPUT OF EXECUTE STREAM 0 QUERY 19 (MAX 200 ROWS)

```
-----
REVENUE
-----
3845288207.690199
(1 row(s) affected)
```

EXECUTE STREAM 0 QUERY 20

-- using 709161519 as a seed to the RNG

/\* TPC\_H Query 20 - Potential Part Promotion \*/

```
SELECT S_NAME,
S_ADDRESS
FROM SUPPLIER,
NATION
WHERE S_SUPPKEY IN (
    SELECT PS_SUPPKEY
    FROM PARTSUPP
    WHERE PS_PARTKEY in (
        SELECT P_PARTKEY
        FROM
        PART
        WHERE
        P_NAME like 'salmon%'
    )
    AND
    PS_AVAILQTY > (
        SELECT 0.5 * sum(L_QUANTITY)
        FROM
        LINEITEM
        WHERE
        L_PARTKEY = PS_PARTKEY AND
        L_SUPPKEY = PS_SUPPKEY AND
        L_SHIPDATE >= '1997-01-01' AND
        L_SHIPDATE < dateadd(yy,1,'1997-01-01')
    )
    AND
    S_NATIONKEY = N_NATIONKEY AND
    N_NAME = 'PERU'
)
ORDER BY S_NAME
```

OUTPUT OF EXECUTE STREAM 0 QUERY 20 (MAX 200 ROWS)

S_NAME	S_ADDRESS
Supplier#000000008	9Sq4bBH2FQEmafOocY45sRtXo6yuoG
Supplier#000000392	5YSB73Q4LMC9648IF1GGJAP
Supplier#000000536	dzf PbgzKpWBDim5S1BSPLBNzxFpxZNUe
Supplier#000000538	KBZ0RSdGTVJQPbWau6x
Supplier#000000541	Nxggufcm ,hR
Supplier#000000641	0L8yoIwSCP4EJyESI 6bVH9k
Supplier#000000735	7FqUrdaC732vBX3J7ruv0W4 Jfpx84
Supplier#000000763	rpZRD,h5XXPIOe6bX1KqgwbPpON
Supplier#000000833	ig2vYxu,8xwEz10UFA4t5VJ
Supplier#000000905	WAGJHr1OUm95U5
Supplier#000001000	sep4GQHrXe
Supplier#000001049	hJjbktopDAAM
Supplier#000001089	lbAfNAr1HpY2LGSPlcm2dI1pRethjTL
Supplier#000001131	bPrtcG7uO5xNHFFh2omVjC
Supplier#000001307	MPZXf,9fmm0H5Bgtfyv2c74pCy
Supplier#000001380	ROSZK39fNca1
Supplier#000001467	cMpeOPD1hbd015 mppaxRtbtJ7Dza4Q4Y6om
Supplier#000001641	gzc7jnvUL6Bro9j9XPJ4UArgAT VYYFBCxe6V
Supplier#000001865	oul9HB4pB7tz32OMRgOwsYsfrdvr,jm
Supplier#000001961	i5FV1jSc1jj2cpwKaJc
Supplier#000002327	CgGSbx3j1aowZNq
Supplier#000002343	Qy5YodXWVh6o
Supplier#000002379	i6Tq1AwS1Ug6copx4X
Supplier#000002756	VBK81o8gevpj6JnjP
Supplier#000002809	4sJNoIa81MpdL7vvp95IN
Supplier#000002835	rCYshZ3VTcDy
Supplier#000002838	,IDsROC39qrP6m0 oHo
Supplier#000002870	HJKP5aF9yuszsmqQ0t XZj2,8Ca6TxZ9
Supplier#000002909	3uyzaTPXLVpjxQchxEXV0IuWcfNUWnEGO3
Supplier#000003016	VwqWdkQOKILMPkBiXMKBSza d3pdhk79GjOfO
Supplier#000003229	lhFPfZZF8ec
Supplier#000003319	Fmi6ygnVYw68xo IzhyI
Supplier#000003357	PcAiX5 7COE
Supplier#000003382	p6rzU12Gx5FssGd4KAWbk1BNdcgALy20W
Supplier#000003387	vcqIp2f1VzBshqpHHDr2woIsC99Xh kul9z
Supplier#000003511	UmDDRexGzCgfQigAdPq1aKn5E6Xv
Supplier#000003552	PMWgNdKj2YRTgdEazZdqizmj
Supplier#000003638	Iu1lSJAneyE1kkGAY7fj365CJICTFJv5WERx
Supplier#000003910	KDNx2edzTSU6 Az9A
Supplier#000004116	dljIeOzzKqEpczZ1rxdcnUW3
Supplier#000004148	ycg9af69X3Wh2UBtEK5cTgGzT fqRwKOEALJoe
Supplier#000004293	FCJJKQLJkwwqH20m
Supplier#000004332	0nenhluRWEmG3t VAFLaPM41N0NpdT2eRvRKrun
Supplier#000004815	10APqmVAAMIU3ikYtEz79eVWT4VnRpV1
Supplier#000004860	nHZQopTKy77R
Supplier#000004883	58HcU6bYnOMVG1oz4i
Supplier#000004894	cGDsrleyYXpyeA3,jAc
Supplier#000004900	CSG,mmb1pJ,mj8Z
Supplier#000004926	wxNks1eTvneiA PN,gWNF8
Supplier#000005026	QCWzn7yqZuyTPEv3xGzC,
Supplier#000005114	DCuOgHcVIETSqehM
Supplier#000005318	Wp5q,sgolrdt397icDFq5WIwLZVNWv0JqUfkv

Supplier#000005399	duTHo0k0yN5I100tQw,6rqM7h,4e1gF
Supplier#000005487	nEoE4Yph7gDXNGApRdggY4A1
Supplier#000005672	LbqiISwQ8,L98tE0JS7wC0gUNAZdro
Supplier#000005882	tyhkI34H9CzUnixln82w6Wzy
Supplier#000005910	KCTkK928xl2KB4J9e6oWtG9Q
Supplier#000005921	mT5AWmgfG9YhbOUttnn
Supplier#000006095	dj8mhVnCtxiQeC0yecDS
Supplier#000006098	PMFvhiKYqjx4ab
Supplier#000006157	bWwHUuQgVo698rHdr9S7tX2czhAepL3Lp4MU1m6W
Supplier#000006168	AZX0AUGidt4W0BdJHixUCnti8u
Supplier#000006182	b j0rPTZhi,QRpdBbphluCMGziMMNpBv3HA
Supplier#000006558	JWcbxwFjM4HXUy
Supplier#000006902	gbh8Rw2xmQFbnZGxpQU
Supplier#000007022	leVNNqe6onvKaUvrGHQMKz0DnrXJ
Supplier#000007047	4UDtZ,2vtplv74entNaraPT8Ja660w9CS
Supplier#000007088	ngUFUKSPxKzN13sAWbfMhja6bQD7WZOLLinhar3
Supplier#000007134	qeRvNaN0p9MHKs7z0hNd1Yygb7y1
Supplier#000007136	EHhfZc,xLtoM8J0sXt1p7dEugu4Jmvmkms7a9S1B
Supplier#000007141	ISer,Y5xgSg4yyicA6wFV2d
Supplier#000007175	6OGmaJwN7b6eLeH7x4pmCsFmHdzufqCcqxmG0
Supplier#000007180	iN4nfTIHEPRQ2uNas9XKRxZisFyDyWtV 44Kq
Supplier#000007247	JosmE4uT6PQixnmkjqDKetU1XNRp
Supplier#000007277	bV0Y3ewDUBmexWbA8XhWtYl6 BzjRF
Supplier#000007291	kvUtGrc rtJQXYuYU0PITXppPvbxwOcciEvRO1D
Supplier#000007416	U7P6,C42ymp
Supplier#000007635	GgAHV11YHhPiBcPvYlsos3
Supplier#000007764	,ZHHiZEdpRlfnfnTXRv30qFnzhWglrw
Supplier#000007862	rvQsXb ezTrQX5G qLFC2NegdP,LpxCJ
Supplier#000007948	d8aJtC7KA4A1OT
Supplier#000007995	2fs43W1Gi3
Supplier#000008067	OjJTPhvOmI73nG,CyMMj3lR8PcGe
Supplier#000008165	zVzaJslxtnVo
Supplier#000008221	yjDAMaDwWgyfQWT3bys4rz6iipm0SeL6
Supplier#000008378	yuzY2wQ KN08rNGzehM6Cg,yPiqyigN7waPc3r
Supplier#000008420	bNMSwRBINrnsNB6I049
Supplier#000008502	7sWDOClgh15PopqCXg31lxon0XbkDXF
Supplier#000008629	6xEvD9WJffahEGHuMnyUJHYgMP5Fvtuh
Supplier#000008694	Kyg3DxOgIKpV5onB ATSDzFiIz42 0clRrR
Supplier#000008912	L8WkXrFPQqW8IoH
Supplier#000008934	x0EtN3W3X5qm3Fvw3Lls3XzZjeqFfinM7afPFM
Supplier#000008987	eUg7nFSwAPTrQqCIsF6Twp1QtSe98xcexLxZKe3
Supplier#000009361	GlnC 2nWxt
Supplier#000009423	N0Fwn7PKT0vlpkRKDM9Bjmw
Supplier#000009444	K7CLkDGsMENC3
Supplier#000009486	1JELMqGNrvKNxpWV7gUHRA9U
Supplier#000009593	214GzPRCG1yeCKBVe
Supplier#000009703	461W023tsamk5grq9x U
Supplier#000009764	pcQj5Q07Rq5iEGSha8BBpMGFB
[92969 more rows]	
Supplier#009988571	dEqACyVSSi9YSddjxnrX9XkrPs4Wn
Supplier#009988585	Vazqm2L3amo7UuGy5,DYUu5fmLMKdjfpLqMf
Supplier#009988654	ZPhY0t4GksbfrVtB3I6SaDpw1
Supplier#009988701	Tqo3 OJT1PeS6prNndpuP
Supplier#009988722	JhUH,r6sQBQ

Supplier#009988745	r,i,glGbkudba566c2OPH Q36E MEpkXbpE	Supplier#009996319	q8IqDaLS1Y0c7oRh0w7RnozAGB8
Supplier#009989064	rHTYEQmOVeoL0407 AOks5ULd8wuykojEU	Supplier#009996357	ngW5qgV3canhPmA4QSTabYbdt
Supplier#009989133	,t 3OyIwtJLnMGR9GjNwt8AcWxF	Supplier#009996379	GhACVbD3JL4ZCVes nm
Supplier#009989260	Hli4CnjRplDAk3S2p j9IDAUMw zaa4	Supplier#009996405	epw06 PXVJBOcV
Supplier#009989295	DCFZp5D8Fn,yh,UMZSongv0155Ca	Supplier#009996472	jmHw7HzhuqQFMk4T9 ,GN qKlL6KGa R
Supplier#009989757	5cArTyA63jd BRj3PE9DVey3,7sRiUexdm5VCaTb	Supplier#009996593	JQqOsO,AGZqtS2F2xvHmKZL7ZLF7aE9N0s
Supplier#009990055	itmGaAPxmZTpPbeD	Supplier#009996748	n9,ZmTyMTR8aWq
Supplier#009990155	gJgx8DpG,ka,kuuljipJc4YjNf9mimUJ	Supplier#009996783	lsP7kNPuShZmil
Supplier#009990245	oi6ryYv2gV5Yi0	Supplier#009997263	OfMRLDBnWZcgwOoBGSqYT2pkrAMZX7
Supplier#009990489	wf6tm6KiilqCeRLHNfTmx	Supplier#009997446	4YW9aZRuvSl2QwHQLQ7xFGbShF0ffxcjNJCe,
Supplier#009991152	iASkrsbsg5gFWnw bhPHBONbiSu7bnM	Supplier#009997482	HqswT96y6ge3UzzcnWqBRr5rEjggL7URzXgVew
Supplier#009991176	gzPDLXri0Lt5 ErOPg30	Supplier#009997647	vcPjMt,SKarGRoyI24,HrgzX JCSfuuo, Fm
Supplier#009991282	bonWwo5spjP24uYwwZSxJQ700tuAaADqvSZ	Supplier#009997709	Qi9WIWOH57UiOV
Supplier#009991288	BuRkb6xqJgGdCQcQjczclL6gn2aNy8XMEBti	Supplier#009997728	BR0DA3,,SJT954
Supplier#009991361	kb5xvgGqmDX2hSmT2ntb2hLebZS6Af9kgLp2Unc	Supplier#009997871	lw ,eh6 boo5BP4W 9Yf6sWt3bHa
Supplier#009991379	b0 Q087C1NVAY55wEGMw	Supplier#009997936	CtDOcs0P6bzct3Fke9D
Supplier#009991486	YMypnBO5KzT2Itzi2bwdot2NWGYIzhW7tWV c	Supplier#009997970	Fz ZlnGdNmadNastPrz6QQEu3QMNYBxVxIGIAhA
Supplier#009991651	nO552HqJR6iwundOGGbgG	Supplier#009997977	FfK9mL8S1nyun2
Supplier#009991667	B7a3qjZemOD19RjOwceLqdRSvX UX21bhP6c,Ma8	Supplier#009998290	D2H,h0Tz6HTr4SjZGOI,VytwmWkR
Supplier#009991704	iVEqOaO7PsVZ9HWxDBM8	Supplier#009998387	C7p1ZqbrGvzmfJ4r4B1buu
Supplier#009991955	52u6BWUNTHsa60SC	Supplier#009998422	OEulLkMokqgX
Supplier#009991972	rPu7B3BlJRPaVD2wEsE35AuUT055bZtXqvfN3zo4	Supplier#009998463	Kt R YEWxRTW3
Supplier#009992093	84iit41U59vd20FMqy4KQjw	Supplier#009998497	mstkZFeX,JJkHxp7IOZue28X,rFzX6gvNe5cFFH
Supplier#009992303	1KPmpLwANT1scnHlve3,GYNgDdOuSilZm	Supplier#009998510	7Iph5vdhQssXDVDIImm,63
Supplier#009992496	dvM8SsURWwmD d7B	Supplier#009998566	UXxbmE3V0JNrfeL778SGFi0OpW1whxC
Supplier#009992625	kHPpUnCusHBTkGFsv3Y4Dize,wlJl	Supplier#009998579	3VChlTeU67qvKvzoFvL s9JaWR
Supplier#009992660	35YfzZoQLNtLZiRWFiwNzc37ZCB0qIly	Supplier#009998646	vjaon u1V9FdYp ,ncqsooICynarZEyIVe8k
Supplier#009992791	vcYYAvGohMHW2Dc704qDT29ynPEeQ67u2r4K2IA	Supplier#009998914	Hvbl,tqJYi,lxCfQHGAjbsF4u7 YjsLticZgx05d
Supplier#009992839	RLU6CzZ6G5nufQWuxINqY0KgWa6xFCTRkpe43jP	Supplier#009998915	IO1wY0BJVAchVxxPCRCglzdsVIpQFEk7J
Supplier#009993141	KYrxZCLRZrM9Tv Cg	Supplier#009998961	le9PG60fyagr
Supplier#009993282	MIADYIyLjG,HDLheNUgWQLNRjsgMcq	Supplier#009999082	SAzOlWeE7arUbttinhvr4IS8MYmqsgCb0
Supplier#009993448	8u7R0k5Rz3cbGf	Supplier#009999367	P 0oXY81,47ik41ScRfkk0YWis
Supplier#009993493	MP9ADxXXRPYzQZaqWNzWsscJQPzYD3SL5ZU	Supplier#009999432	K4TfivMve77cT
Supplier#009993526	dI2541RemZfYa	Supplier#009999591	t3kx,pLkp50YIpyG5JNHOSiAW1E
Supplier#009993567	ARfksmA4f944EXkPqB31	Supplier#009999691	DcvQ5LxDjx,
Supplier#009993604	5gMZmUXOSYooWGbjXR	Supplier#009999709	jeoeLWWfWf2tYlg9jf
Supplier#009993621	nVKUHR661MxIHRqCAxniR3oQvWno1VpS	Supplier#009999791	SFXvNxnOqZlZT0pPHRMTTXmJHKIDyZ
Supplier#009993734	xwfjd61ydTH	Supplier#009999864	ZDzgfOdq,4JfpYCq4HLGL
Supplier#009993783	T7yGdBoZdzP EUF7A,k9OtB4D0bqhgN	Supplier#009999982	JhayJdzNtc42Uy
Supplier#009994043	avQAI1l81GLioOQmB		
Supplier#009994112	VrvC9uElLxf7X4twHe6XdX5Y7E3lZXc		
Supplier#009994245	NIdCj77J2vnT9r3swG,fARhVrx iBAESLmFA		
Supplier#009994359	CL6Psi64rS5cbh S		
Supplier#009994449	LqAB0cMhHkuTaJS0dDZXwMGKyvejgont,Dwo,OL		
Supplier#009994498	LeEpd9Pspq9w		
Supplier#009994529	Wm2RrvieAb3skbsmeg wDKzgwEcHambdFshUwAfY		
Supplier#009994568	C5 Xv13XDpCETLdIpQHweTKWtmrhc		
Supplier#009994906	hFxIGLHxy0LGF,Fav6yQD		
Supplier#009994989	Mlk0pSqqbxiy27X0tTFsev4		
Supplier#009995165	yjznZjztTF13k		
Supplier#009995346	IacQb61beYF5aKkr,h2HFhi4bIXmriDhrCe4nyq		
Supplier#009995361	BQh4BYogDIv18DBRb1		
Supplier#009995603	,wOsV1QqsyGpl9l		
Supplier#009995854	hxJ7iXlu9Gv		
Supplier#009995955	YoyA3WW2FROK5ErcH7 3		
Supplier#009996179	t,fL95BsSt2AiRb		

(93169 row(s) affected)

**EXECUTE STREAM 0 QUERY 21**

-----

-- using 709161519 as a seed to the RNG

/\* TPC\_H Query 21 - Suppliers Who Kept Orders Waiting \*/

```

SELECT TOP 10
      S_NAME,
      COUNT(*)           AS NUMWAIT
FROM   SUPPLIER,
      LINEITEM L1,

```



```

ORDERS,
NATION
WHERE  S_SUPPKEY          = L1.L_SUPPKEY          AND
O_ORDERKEY          = L1.L_ORDERKEY          AND
O_ORDERSTATUS      = 'F'                      AND
L1.L_RECEIPTDATE    > L1.L_COMMITDATE        AND
EXISTS (            SELECT *
                    FROM   LINEITEM L2
                    WHERE  L2.L_ORDERKEY = L1.L_ORDERKEY          AND
                           L2.L_SUPPKEY  <> L1.L_SUPPKEY
                    )      AND
NOT EXISTS (        SELECT *
                  FROM   LINEITEM L3
                  WHERE  L3.L_ORDERKEY  =
L1.L_ORDERKEY      AND
                  L3.L_SUPPKEY        <>
L1.L_SUPPKEY      AND
                  L3.L_RECEIPTDATE    >
L3.L_COMMITDATE   )      AND
S_NATIONKEY        = N_NATIONKEY  AND
N_NAME              = 'RUSSIA'
GROUP BY           S_NAME
ORDER BY           NUMWAIT DESC,
                  S_NAME
Supplier#002809922      35
Supplier#002833487      35
Supplier#003488420      35
Supplier#003651861      35
Supplier#004963028      35
Supplier#006160623      35
Supplier#006802112      35
Supplier#006975554      35
Supplier#008259760      35
Supplier#009092760      35
Supplier#009202660      35
Supplier#000779417      34
Supplier#001012994      34
Supplier#001515662      34
Supplier#001588886      34
Supplier#002135678      34
Supplier#002270698      34
Supplier#002406409      34
Supplier#003226183      34
Supplier#003425424      34
Supplier#003534124      34
Supplier#004098904      34
Supplier#004603242      34
Supplier#004717579      34
Supplier#004766546      34
Supplier#005047650      34
Supplier#005287906      34
Supplier#005293975      34
Supplier#005597500      34
Supplier#005750909      34
Supplier#006097559      34
Supplier#006850434      34
Supplier#006861302      34
Supplier#007048287      34
Supplier#007133110      34
Supplier#007182589      34
Supplier#007354669      34
Supplier#007412002      34
Supplier#007446120      34
Supplier#007756114      34
Supplier#008698813      34
Supplier#009048273      34
Supplier#009287572      34
Supplier#009597875      34
Supplier#009763656      34
Supplier#000575811      33
Supplier#000643227      33
Supplier#000825847      33
Supplier#000971240      33
Supplier#001207358      33
Supplier#001279168      33
Supplier#001726515      33
Supplier#002293302      33
Supplier#002457947      33
Supplier#002720444      33
Supplier#002779985      33

```

OUTPUT OF EXECUTE STREAM 0 QUERY 21 (MAX 200 ROWS)

-----

```

S_NAME              NUMWAIT
-----
Supplier#006507021  41
Supplier#009648768  40
Supplier#003532420  39
Supplier#001260762  38
Supplier#002143711  38
Supplier#005700281  38
Supplier#007759646  38
Supplier#000286614  37
Supplier#004342060  37
Supplier#005057780  37
Supplier#005888662  37
Supplier#006726018  37
Supplier#008975805  37
Supplier#009190510  37
Supplier#001792487  36
Supplier#002550730  36
Supplier#002559357  36
Supplier#005943159  36
Supplier#006927245  36
Supplier#001632480  35
Supplier#001921857  35
Supplier#002131608  35

```

```

Supplier#002905917      33
Supplier#002939719      33
Supplier#003367207      33
Supplier#003492682      33
Supplier#003506429      33
Supplier#003643251      33
Supplier#003681319      33
Supplier#003827263      33
Supplier#003844162      33
Supplier#003896114      33
Supplier#004251309      33
Supplier#004281631      33
Supplier#004306349      33
Supplier#004514887      33
Supplier#004571695      33
Supplier#004820958      33
Supplier#004893020      33
Supplier#005160971      33
Supplier#005162132      33
Supplier#005172502      33
Supplier#005270222      33
Supplier#005300889      33

```

(100 row(s) affected)

**EXECUTE STREAM 0 QUERY 22**

```

-----
-- using 709161519 as a seed to the RNG

/* TPC_H Query 22 - Global Sales Opportunity */

SELECT  CNTRYCODE,
        COUNT(*)      AS NUMCUST,
        SUM(C_ACCTBAL) AS TOTACCTBAL
FROM    (
        SELECT  SUBSTRING(C_PHONE,1,2) AS CNTRYCODE,
                C_ACCTBAL
        FROM    CUSTOMER
        WHERE   SUBSTRING(C_PHONE,1,2) IN ('27', '13', '20',
        '34', '18', '21', '30')
        AND
        C_ACCTBAL > (
        SELECT
        AVG(C_ACCTBAL)
        FROM
        CUSTOMER
        WHERE
        C_ACCTBAL > 0.00 AND
        SUBSTRING(C_PHONE,1,2) IN ('27', '13', '20', '34', '18', '21',
        '30')
        )
        AND
        NOT EXISTS (
        SELECT *
        FROM   ORDERS
        WHERE  O_CUSTKEY =
C_CUSTKEY

```

```

)
) AS CUSTSALE
GROUP BY CNTRYCODE
ORDER BY CNTRYCODE

```

OUTPUT OF EXECUTE STREAM 0 QUERY 22 (MAX 200 ROWS)

```

-----
CNTRYCODE NUMCUST      TOTACCTBAL
-----
13          910369      6826432638.020080
18          910771      6831032191.280087
20          910975      6832793235.640129
21          908460      6813263461.880045
27          907850      6809823257.479782
30          908691      6815768564.050448
34          909058      6815523395.550270

```

(7 row(s) affected)

## Appendix D : Seed & Query substitution

**STREAM 00 SEED 709161519**

```

1      99
2      3      NICKEL AMERICA
3      BUILDING      1995-03-12
4      1994-10-01
5      AFRICA 1995-01-01
6      1995-01-01      0.08      24
7      SAUDI ARABIA ALGERIA
8      ALGERIA AFRICA PROMO BURNISHED BRASS
9      snow
10     1994-09-01
11     IRAN      0.0000001000
12     REG AIR RAIL      1994-01-01
13     pending requests
14     1994-08-01
15     1996-07-01
16     Brand#43      SMALL POLISHED 48      41      46      11      47
17     21      42      15
18     Brand#32      JUMBO JAR
19     313
20     Brand#45      Brand#54      Brand#53      4      16      26
21     salmon 1997-01-01      PERU
22     RUSSIA
23     27      13      20      34      18      21      30

```

**STREAM 01 SEED 709161520**

21 KENYA  
3 HOUSEHOLD 1995-03-28  
18 314  
5 AMERICA 1995-01-01  
11 UNITED KINGDOM 0.0000001000  
7 JAPAN PERU  
6 1995-01-01 0.05 25  
20 cyan 1995-01-01 GERMANY  
17 Brand#34 JUMBO CAN  
12 SHIP TRUCK 1994-01-01  
16 Brand#23 ECONOMY ANODIZED 38 10 29 15  
44 50 43 36  
15 1994-04-01  
13 pending requests  
10 1993-06-01  
2 41 TIN MIDDLE EAST  
8 PERU AMERICA ECONOMY BRUSHED BRASS  
14 1994-12-01  
19 Brand#42 Brand#32 Brand#52 9 17 22  
9 sandy  
22 13 26 22 11 27 33 18  
1 107  
4 1997-05-01

**STREAM 02 SEED 709161521**

6 1995-01-01 0.03 24  
17 Brand#31 WRAP BOX  
14 1995-03-01  
16 Brand#13 STANDARD BURNISHED 20 33 11 45  
6 2 13 41  
19 Brand#54 Brand#25 Brand#41 4 18 30  
10 1994-03-01  
9 red  
2 29 COPPER ASIA  
15 1996-11-01  
8 INDONESIA ASIA ECONOMY PLATED BRASS  
5 EUROPE 1995-01-01  
22 32 24 12 13 20 10 25  
12 FOB TRUCK 1995-01-01  
7 EGYPT INDONESIA  
13 pending requests  
18 312  
1 115  
4 1995-02-01  
20 orchid 1994-01-01 RUSSIA  
3 AUTOMOBILE 1995-03-14  
11 IRAQ 0.0000001000  
21 FRANCE

**STREAM 03 SEED 709161522**

8 ARGENTINA AMERICA ECONOMY ANODIZED STEEL  
5 MIDDLE EAST 1996-01-01  
4 1997-09-01  
6 1996-01-01 0.08 24  
17 Brand#33 WRAP JAR  
7 VIETNAM ARGENTINA

1 62  
18 313  
22 34 16 19 32 17 24 28  
14 1995-06-01  
9 peru  
10 1995-01-01  
15 1994-07-01  
11 UNITED STATES 0.0000001000  
20 bisque 1997-01-01 IRAQ  
2 16 STEEL MIDDLE EAST  
21 UNITED STATES  
19 Brand#51 Brand#53 Brand#45 9 19 26  
13 unusual requests  
16 Brand#43 MEDIUM POLISHED 45 25 10 24  
16 22 13 46  
12 MAIL TRUCK 1995-01-01  
3 HOUSEHOLD 1995-03-30

**STREAM 04 SEED 709161523**

5 AFRICA 1996-01-01  
21 MOZAMBIQUE  
14 1995-09-01  
19 Brand#53 Brand#41 Brand#44 5 20 22  
15 1997-02-01  
17 Brand#35 WRAP CAN  
12 RAIL TRUCK 1995-01-01  
6 1996-01-01 0.06 25  
4 1995-06-01  
9 olive  
8 CHINA ASIA LARGE POLISHED STEEL  
16 Brand#23 ECONOMY BRUSHED 48 24 13 33  
1 40 22 21  
11 JAPAN 0.0000001000  
2 4 NICKEL ASIA  
10 1993-10-01  
18 315  
1 70  
13 unusual accounts  
7 JORDAN CHINA  
22 11 26 29 23 34 25 21  
3 AUTOMOBILE 1995-03-16  
20 lemon 1996-01-01 ARGENTINA

**STREAM 05 SEED 709161524**

21 INDIA  
15 1994-11-01  
4 1993-03-01  
6 1996-01-01 0.03 24  
7 ETHIOPIA IRAN  
16 Brand#13 SMALL BURNISHED 14 3 25 16  
8 32 48 12  
19 Brand#15 Brand#24 Brand#34 10 10 29  
18 312  
14 1996-01-01  
22 23 18 14 30 25 31 32  
11 ALGERIA 0.0000001000

```

13 unusual accounts
3 FURNITURE 1995-03-01
1 78
2 42 TIN AFRICA
5 AMERICA 1996-01-01
8 IRAN MIDDLE EAST LARGE BURNISHED STEEL
20 spring 1994-01-01 MOZAMBIQUE
12 AIR MAIL 1995-01-01
17 Brand#32 SM BOX
10 1994-07-01
9 midnight

```

**STREAM 06 SEED 709161525**

```

10 1993-04-01
3 MACHINERY 1995-03-18
15 1997-06-01
13 unusual accounts
6 1996-01-01 0.09 24
8 BRAZIL AMERICA MEDIUM BRUSHED STEEL
9 lime
7 RUSSIA BRAZIL
4 1995-10-01
11 JORDAN 0.0000001000
22 32 22 21 12 18 20 16
18 314
12 REG AIR MAIL 1996-01-01
1 86
5 ASIA 1996-01-01
16 Brand#43 LARGE PLATED 4 1 16 25 39
49 6 9
2 30 COPPER ASIA
14 1996-04-01
19 Brand#12 Brand#12 Brand#33 5 11 25
20 forest 1993-01-01 ETHIOPIA
17 Brand#33 SM JAR
21 ALGERIA

```

**STREAM 07 SEED 709161526**

```

18 315
8 ROMANIA EUROPE MEDIUM PLATED COPPER
20 puff 1996-01-01 SAUDI ARABIA
21 PERU
2 18 STEEL AFRICA
4 1993-06-01
22 13 21 28 30 15 20 27
17 Brand#35 SM CAN
1 94
11 ARGENTINA 0.0000001000
9 khaki
19 Brand#14 Brand#45 Brand#32 1 12 22
3 FURNITURE 1995-03-03
13 unusual accounts
5 EUROPE 1997-01-01
7 KENYA ROMANIA
10 1994-01-01
16 Brand#23 PROMO BRUSHED 7 37 36 42 22

```

```

17 8 14
6 1997-01-01 0.06 25
14 1996-07-01
15 1995-02-01
12 SHIP MAIL 1996-01-01

```

## Appendix E : Refresh Function Source Code

### CreateRF1Proc.sql

```

-- File: CREATERF1PROC.SQL
-- Microsoft TPC-H Benchmark Kit Ver. 1.00
-- Copyright Microsoft, 1999
--
IF exists (SELECT name FROM sysobjects WHERE name = 'RF1')
    DROP PROCEDURE RF1
GO
--
-- Create a stored RefreshInsert procedure which will catch the
-- deadlock
-- victim abort and restart the insert transaction.
--
CREATE PROCEDURE RF1
    @current_execution INTEGER, @insert_sets INTEGER,
    @parallel_executions INTEGER, @total_executions INTEGER
AS
BEGIN
    DECLARE @startdate DATETIME
    DECLARE @enddate DATETIME
    DECLARE @edate DATETIME
    DECLARE @rangeStart INTEGER
    DECLARE @rangeSize INTEGER
    DECLARE @range INTEGER
    DECLARE @success INTEGER
    DECLARE @index INTEGER
    DECLARE @div INTEGER
    DECLARE @mod INTEGER
    DECLARE @skip INTEGER
    DECLARE @i INTEGER
    DECLARE @rangeSum INTEGER
    DECLARE @totRangeSize INTEGER
    DECLARE @stmt NCHAR(1000)
    DECLARE @orderSql NCHAR(1000)
    DECLARE @liSql NCHAR(1000)
    SET @skip = @total_executions/@parallel_executions
    SET @div = (@current_execution - 1)/@parallel_executions
    SET @mod = (@current_execution - 1) - @div * @parallel_executions

```

```

SET @index = @mod*@skip + @div + 1

--
-- Get the range for this execution
--
SET @stmt = N'SELECT @sdate = dateadd(day,-1,min(O_ORDERDATE)), @edate =
max(O_ORDERDATE)
        FROM NEWORDERS'
EXEC sp_executesql @stmt,N'@sdate datetime output, @edate datetime
output',@startdate output, @enddate output

IF (@total_executions > @parallel_executions)
    BEGIN
        SET @div = (@index-1)/@skip
        SET @mod = (@index-1) - @div * @skip
        SET @rangeSize = datediff(day, @startdate,
@enddate)/@parallel_executions + 1
        SET @totRangeSize = @rangeSize
        SET @rangeSum = 0
        SET @rangeStart = @div * @rangeSize
        SET @i = @mod
        while (@i > 0)
            BEGIN
                SET @rangeSize = (@totRangeSize - @rangeSum)/2
                SET @rangeSum = @rangeSum + @rangeSize
                SET @rangeStart = @rangeStart + @rangeSize
                SET @insert_sets = @insert_sets/2
                SET @i = @i - 1
            end

        IF (@mod + 1 = @skip) -- last allocation
            SET @rangeSize = @totRangeSize - @rangeSum
        ELSE
            SET @rangeSize = (@totRangeSize - @rangeSum)/2
        IF (@rangeSize < 0)
            SET @rangeSize = 0
        IF (@insert_sets <= 0)
            SET @insert_sets = 1
        end
    ELSE
        BEGIN
            SET @rangeSize = datediff(day, @startdate,
@enddate)/@total_executions
            SET @rangeStart = @rangeSize * (@index - 1)
        end

    SET @startdate = dateadd(day, @rangeStart, @startdate)
    IF (@index < @total_executions)
        SET @enddate = dateadd(day, @rangeSize, @startdate)

    SET @range = datediff(day, @startdate, @enddate) / @insert_sets

--
-- This handles the case when the max-min/insert_sets is less than 1
--

```

```

IF @range = 0
    SET @range = 1

--
-- Generate the two insert statements
--
SET @edate = dateadd(day, @range, @startdate)
SET @orderSql = N'INSERT INTO ORDERS (O_ORDERKEY, O_CUSTKEY,
O_ORDERSTATUS, O_TOTALPRICE,
        O_ORDERDATE, O_ORDERPRIORITY,
O_CLERK, O_SHIPPRIORITY, O_COMMENT)
        (SELECT O_ORDERKEY, O_CUSTKEY, O_ORDERSTATUS,
O_TOTALPRICE,
        O_ORDERDATE, O_ORDERPRIORITY,
O_CLERK, O_SHIPPRIORITY, O_COMMENT
        FROM NEWORDERS
        WHERE O_ORDERDATE > @startdate AND O_ORDERDATE <=
@edate)
        option (loop join) '
SET @liSql = N'INSERT INTO LINEITEM
(L_ORDERKEY,L_PARTKEY,L_SUPPKEY,L_LINENUMBER,L_QUANTITY,
        L_EXTENDEDPRI, L_DISCOUNT, L_TAX,
L_RETURNFLAG, L_LINESTATUS,
        L_SHIPDATE, L_COMMITDATE, L_RECEIPTDATE,
L_SHIPINSTRUCT, L_SHIPMODE, L_COMMENT)
        (SELECT
L_ORDERKEY,L_PARTKEY,L_SUPPKEY,L_LINENUMBER,L_QUANTITY,
        L_EXTENDEDPRI, L_DISCOUNT, L_TAX,
L_RETURNFLAG, L_LINESTATUS,
        L_SHIPDATE, L_COMMITDATE, L_RECEIPTDATE,
L_SHIPINSTRUCT, L_SHIPMODE, L_COMMENT
        FROM NEWLINEITEM, NEWORDERS
        WHERE L_ORDERKEY = O_ORDERKEY AND O_ORDERDATE >
@startdate AND
        O_ORDERDATE <= @edate)
        option (loop join) '

--
-- Loop through the order keys inserting sets into the
-- ORDERS and LINEITEM tables
--
WHILE @startdate < @enddate
    BEGIN
        --
        -- Insert into ORDERS and LINEITEM tables
        --
        INSERT TRANS:
        SET @success = 1
        BEGIN TRANSACTION

        BEGIN TRY
            EXEC sp_executesql @orderSql, N'@startdate datetime,
@edate datetime', @startdate, @edate
            EXEC sp_executesql @liSql, N'@startdate datetime, @edate
datetime', @startdate, @edate
        END TRY
    END

```

```

BEGIN CATCH
    SET @success = 0
    IF (error_number() = 1205)    -- deadlock victim
        PRINT 'Insert deadlock - restarting RF1'
    ELSE
        BEGIN                -- not a deadlock
            PRINT 'Error - Not a deadlock'
            PRINT ERROR_NUMBER()
            PRINT ERROR_SEVERITY()
            PRINT ERROR_MESSAGE()
            PRINT ERROR_STATE()
            PRINT XACT_STATE()
            END
        IF (@@trancount>0)
            ROLLBACK TRANSACTION
    END CATCH

    IF (@success = 0)                -- deadlock - redo the
inserts
        GOTO INSERT_TRANS

    COMMIT TRANSACTION

    SET @startdate = @edate
    SET @edate = dateadd(day, @range, @edate)

    IF (@edate > @enddate)
        SET @edate = @enddate

    END

END

GO

```

## CreateRF2Proc.sql

```

-- File:      CREATERF2PROC.SQL
--            Microsoft TPC-H Benchmark Kit Ver. 1.00
--            Copyright Microsoft, 1999
--
IF exists (SELECT name FROM sysobjects WHERE name = 'RF2')
    DROP PROCEDURE RF2
GO
--
-- Create a stored Refresh Delete procedure which will catch the
-- deadlock
-- victim abort and restart the delete transaction.
--
CREATE PROCEDURE RF2
    @current_execution INTEGER, @delete_sets INTEGER,
    @parallel_executions INTEGER, @total_executions INTEGER
AS
BEGIN

```

```

DECLARE @startdate DATETIME
DECLARE @enddate DATETIME
DECLARE @edate DATETIME
DECLARE @rangeStart INTEGER
DECLARE @rangeSize INTEGER
DECLARE @range INTEGER

declare @success INTEGER
declare @index INTEGER
declare @div INTEGER
declare @mod INTEGER
declare @skip INTEGER
declare @i INTEGER
declare @rangeSum INTEGER
declare @totRangeSize INTEGER
declare @sql NCHAR(1000)
declare @orderSql NCHAR(1000)
declare @liSql NCHAR(1000)

SET @skip = @total_executions/@parallel_executions
SET @div = floor((@current_execution-1)/@parallel_executions)
SET @mod = (@current_execution - 1) - @div * @parallel_executions
SET @index = @mod*@skip + @div + 1

SET @sql = N'SELECT @sdate = dateadd(day,-1,min(O_ORDERDATE)), @edate =
max(O_ORDERDATE)
        FROM MOD_OLDORDERS'
EXEC sp_executesql @sql,N'@sdate datetime output, @edate datetime
output',@startdate output, @enddate output

IF (@total_executions > @parallel_executions)
    BEGIN
        SET @div = (@index-1)/@skip
        SET @mod = (@index-1) - @div * @skip
        SET @rangeSize = datediff(day, @startdate,
@enddate)/@parallel_executions + 1
        SET @totRangeSize = @rangeSize
        SET @rangeSum = 0
        SET @rangeStart = @div * @rangeSize
        SET @i = @mod
        WHILE (@i > 0)
            BEGIN
                SET @rangeSize = (@totRangeSize - @rangeSum)/2
                SET @rangeSum = @rangeSum + @rangeSize
                SET @rangeStart = @rangeStart + @rangeSize
                SET @delete_sets = @delete_sets/2
                SET @i = @i - 1
            END

        IF (@mod + 1 = @skip) -- last allocation
            SET @rangeSize = @totRangeSize - @rangeSum
        ELSE
            SET @rangeSize = (@totRangeSize - @rangeSum)/2
        IF (@rangeSize < 0)
            SET @rangeSize = 0
        IF (@delete_sets <= 0)

```

```

        SET @delete_sets = 1
    END
ELSE
    BEGIN
        SET @rangeSize = datediff(day, @startdate,
@enddate)/@total_executions
        SET @rangeStart = @rangeSize * (@index - 1)
    END

SET @startdate = dateadd(day, @rangeStart, @startdate)
IF (@index < @total_executions)
    SET @enddate = dateadd(day, @rangeSize, @startdate)

SET @range = datediff(day, @startdate, @enddate) / @delete_sets

--
-- This handles the case when the max-min/delete_sets is less than 1
--
IF @range = 0
    SET @range = 1

--
-- Loop through the order keys deleting sets from orders
-- and lineitem tables
--
SET @edate = dateadd(day, @range, @startdate)
SET @liSql = N'DELETE FROM LINEITEM WHERE L_ORDERKEY in
              (SELECT O_ORDERKEY FROM MOD_OLDORDERS
               WHERE O_ORDERDATE > @startdate AND O_ORDERDATE <=
@edate)
              option (loop join)'
SET @orderSql = N'DELETE FROM ORDERS WHERE O_ORDERKEY in
                (SELECT O_ORDERKEY FROM MOD_OLDORDERS
                 WHERE O_ORDERDATE > @startdate AND O_ORDERDATE <=
@edate)
                option (loop join)'

WHILE @startdate < @enddate
    BEGIN

        DELETE_TRANS:
        SET @success = 1
        BEGIN TRANSACTION

        BEGIN TRY
            EXEC sp_executesql @liSql, N'@startdate datetime, @edate
datetime', @startdate, @edate
            EXEC sp_executesql @orderSql, N'@startdate datetime,
@edate datetime', @startdate, @edate
        END TRY
        BEGIN CATCH
            SET @success = 0
            IF (error_number() = 1205) -- deadlock victim
                PRINT 'Insert deadlock - restarting RF2'
            ELSE
                BEGIN -- not a deadlock

```

```

        PRINT 'Error - Not a deadlock'
        PRINT ERROR_NUMBER()
        PRINT ERROR_SEVERITY()
        PRINT ERROR_MESSAGE()
        PRINT ERROR_STATE()
        PRINT XACT_STATE()
        END
        IF (@@trancount>0)
            ROLLBACK TRANSACTION
    END CATCH

    IF (@success = 0) -- deadlock - redo the
inserts
        GOTO DELETE_TRANS

    COMMIT TRANSACTION

    SET @startdate = @edate
    SET @edate = dateadd(day, @range, @edate)

    IF (@edate > @enddate)
        SET @edate = @enddate

    END
END
GO

```

## RF1\_index.sql

```

create clustered index NEWORDERS_CLUIDX
on NEWORDERS (O_ORDERDATE)
on GENERAL_FG

create clustered index NEWLINEITEM_CLUIDX
on NEWLINEITEM (L_ORDERKEY)
on GENERAL_FG

```

## RF1\_init.sql

```

--
-- Create tables to hold RF1 input data
--

if exists (select name from sysobjects where name = 'NEWORDERS')
    drop table NEWORDERS

create table NEWORDERS (O_ORDERKEY bigint not null,
                        O_CUSTKEY int not null,
                        O_ORDERSTATUS char(1) not null,
                        O_TOTALPRICE float not null,
                        O_ORDERDATE datetime not null,
                        O_ORDERPRIORITY char(15) not null,
                        O_CLERK char(15) not null,
                        O_SHIPPRIORITY int not null,

```

```

                                O_COMMENT varchar(79) not null) on
GENERAL_FG

if exists (select name from sysobjects where name = 'NEWLINEITEM')
    drop table NEWLINEITEM
create table NEWLINEITEM (L_ORDERKEY bigint not null,
    L_PARTKEY int not null,
    L_SUPPKEY int not null,
    L_LINENUMBER int not null,
    L_QUANTITY float not null,
    L_EXTENDEDPRICE float not null,
    L_DISCOUNT float not null,
    L_TAX float not null,
    L_RETURNFLAG char(1) not null,
    L_LINESTATUS char(1) not null,
    L_SHIPDATE datetime not null,
    L_COMMITDATE datetime not null,
    L_RECEIPTDATE datetime not null,
    L_SHIPINSTRUCT char(25) not null,
    L_SHIPMODE char(10) not null,
    L_COMMENT varchar(44) not null) on
GENERAL_FG

```

### RF1\_load.sql

```

--
-- Load the insert data for the given segment
--

declare @sql nchar(1000)
declare @set integer

select @set = updateset from TPCH_AUX_TABLE

set @sql = 'bulk insert NEWLINEITEM
    from ''%RF_FLATFILE_DIR%\Lineitem.tbl.u' +
RTRIM(CONVERT(varchar(30),@set))
    + '.*SEGMENT%' with (FieldTerminator = '|',
RowTerminator = '\n',tablock)'
exec sp_executesql @sql

set @sql = 'bulk insert NEWORDERS
    from ''%RF_FLATFILE_DIR%\Orders.tbl.u' +
RTRIM(CONVERT(varchar(30), @set))
    + '.*SEGMENT%' with (FieldTerminator = '|',
RowTerminator = '\n',tablock)'
exec sp_executesql @sql

```

### RF2\_index.sql

```

create clustered index MOD_OLDORDERS_CLUIDX on MOD_OLDORDERS
(O_ORDERDATE)

create index MOD_OLDORDERS_IDX on MOD_OLDORDERS (O_ORDERKEY)

```

### RF2\_init.sql

```

--
-- Create the tables to hold input data for RF2
--

declare @segment integer
declare @sql nchar(1000)

if exists (select name from sysobjects where name = 'MOD_OLDORDERS')
    drop table MOD_OLDORDERS
create table MOD_OLDORDERS (O_ORDERDATE datetime, O_ORDERKEY bigint) on
GENERAL_FG

set @segment = 1
while @segment <= %FILES_PER_UPDATE_SET%
    begin
        set @sql = 'if exists (select name from sysobjects where name =
''OLDORDERS_'
                                +
RTRIM(CONVERT(varchar(30),@segment))+ ''')
                                drop table OLDORDERS_' +
RTRIM(CONVERT(varchar(30),@segment))
        exec sp_executesql @sql
        set @sql = 'create table OLDORDERS_' +
RTRIM(CONVERT(varchar(30),@segment))
        + '(O_ORDERKEY int) on GENERAL_FG'
        exec sp_executesql @sql

        set @segment = @segment + 1
    end

```

### RF2\_load.sql

```

--
-- Load the RF2 data for the given segment
--

declare @set integer
declare @sql nchar(1000)

select @set = updateset from TPCH_AUX_TABLE

set @sql = 'bulk insert OLDORDERS_%SEGMENT%
    from ''%RF_FLATFILE_DIR%\Delete.u' +
RTRIM(CONVERT(varchar(30),@set))
    + '.*SEGMENT%' with (FieldTerminator = '|',
RowTerminator = '\n',tablock)'
exec sp_executesql @sql

insert into MOD_OLDORDERS (O_ORDERDATE, O_ORDERKEY)
    (select B.O_ORDERDATE, B.O_ORDERKEY
    from OLDORDERS_%SEGMENT% A, ORDERS B

```



where A.O\_ORDERKEY = B.O\_ORDERKEY)

## Appendix F : Implementation Specific Layer and Source Code

### F.1 Source Code

#### F.1.1 ExecuteDll

##### Execute.cpp

```
// FILE:      Execute.cpp
//           Microsoft TPC-H Kit Ver. 1.00
//           Copyright Microsoft, 1999
//           All Rights Reserved
//
//
// PURPOSE:   Implementation of CExecute.
// Contact:   Reshma Tharamal (reshmat@microsoft.com)
//
#include "stdafx.h"

#include "ExecuteDll.h"
#include "SMEExecute.h"
#include "Execute.h"

extern SQLHENV henv;

extern SM_Connection_Info *p_Connections;
// Pointer to open connections
extern int iConnectionCount;
// Number of open connections
extern CRITICAL_SECTION hConnections;
// Critical section to serialize access to available connections

#ifdef _TPCH_AUDIT
extern FILE *pfLogFile;
// Log file containing timestamps
extern CRITICAL_SECTION hLogFileWrite;
// Handle to critical section
#endif

////////////////////////////////////
////
// CExecute

char * g_szOdbcOps[] = {
    "SQLAllocHandle",
    "SQLDriverConnect",
```

```
"SQLExecDirect",
"SQLSetStmtAttr",
"SQLCancel",
"SQLNumResultCols",
"SQLDescribeCol",
"SQLColAttribute",
"SQLFetch",
"SQLGetData",
"SQLRowCount",
"SQLMoreResults",
"SQLBindCol"
};

char * CExecError::m_szExecErrorDesc[] = {
    "Connection is already in use."
};

STDMETHODIMP CExecute::InterfaceSupportsErrorInfo(REFIID riid)
{
    static const IID* arr[] =
    {
        &IID_IExecute
    };
    for (int i=0; i < sizeof(arr) / sizeof(arr[0]); i++)
    {
        if (InlineIsEqualGUID(*arr[i],riid))
            return S_OK;
    }
    return S_FALSE;
}

STDMETHODIMP CExecute::put_OutputFile(BSTR newVal)
{
    assert(m_pOutputFile);
    m_OutputFile = newVal;

    HRESULT hr = m_pOutputFile->put_FileName(newVal);
    if FAILED(hr)
    {
        m_pOutputFile->Release();
        m_pOutputFile = NULL;
    }
    return hr;
}

//DEL STDMETHODIMP CExecute::put_LogFile(BSTR newVal)
//DEL {
//DEL assert(m_pLogFile);
//DEL
//DEL m_pLogFile->put_FileName(newVal);
//DEL return S_OK;
//DEL }

STDMETHODIMP CExecute::put_ErrorFile(BSTR newVal)
{
    assert(m_pErrorFile);
```

```

m_ErrorFile = newVal;

HRESULT hr = m_pErrorFile->put_FileName(newVal);
if FAILED(hr)
{
    m_pErrorFile->Release();
    m_pErrorFile = NULL;
}
return hr;
}

STDMETHODIMP CExecute::DoExecute(BSTR szCommand, BSTR szExecutionDtls,
ExecutionType ExecMethod, \
                                BOOL
bNoCount, BOOL bNoExecute, BOOL bParseOnly, BOOL bQuotedIds, \
                                BOOL
bAnsiNulls, BOOL bShowQP, BOOL bStatsTime, BOOL bStatsIO, \
                                long
lRowCount, long lQueryTmout, BSTR szConnection)
{
    HANDLE          hThrd;
    DWORD          tid;

    _CrtSetReportFile(_CRT_WARN, _CRTDBG_FILE_STDOUT);

    m_szCommand = szCommand;
    m_szExecDtls = szExecutionDtls;

    m_ExecMthd = ExecMethod;
    if (m_ExecMthd == execODBC)
    {
        m_bNoCount = bNoCount;
        m_bNoExecute = bNoExecute;
        m_bParseOnly = bParseOnly;
        m_bQuotedIds = bQuotedIds;
        m_bAnsiNulls = bAnsiNulls;
        m_bShowQP = bShowQP;
        m_bStatsTime = bStatsTime;
        m_bStatsIO = bStatsIO;
        m_lRowCount = lRowCount;
        m_lQueryTmout = lQueryTmout;
        m_szConnection = szConnection;
    }

    if((hThrd = CreateThread( 0, 0,
(LPTHREAD_START_ROUTINE)ExecutionThread,
    this, 0, &tid)) == NULL)
        return(RaiseSystemError());

    CloseHandle(hThrd);

    return S_OK;
}

STDMETHODIMP CExecute::Abort()
{

```

```

    if (m_ExecMthd == execShell)
        return(AbortShell());
    else
        return(AbortODBC());
}

void ExecutionThread(LPVOID lpParameter)
{
    CExecute      *MyExecute = (CExecute*)lpParameter;

    MyExecute->m_tElapsedTime = 0;

    GetLocalTime(&MyExecute->m_tStartTime);
    MyExecute->PostMessage(WM_TASK_START, 0, 0);

#ifdef _TPCH_AUDIT
    char          szBuffer[MAXLOGCMBUF];
    char          szFmt[MAXBUFLen];

    sprintf(szFmt, "Start Step: '%%.%ds' at '%d/%d/%d %d:%d:%d:%d'\n",
            MAXLOGCMDLEN,
            MyExecute->m_tStartTime.wMonth, MyExecute->
>m_tStartTime.wDay,
            MyExecute->m_tStartTime.wYear, MyExecute->
>m_tStartTime.wHour,
            MyExecute->m_tStartTime.wMinute, MyExecute->
>m_tStartTime.wSecond,
            MyExecute->m_tStartTime.wMilliseconds);
    if (MyExecute->m_ExecMthd == execShell)
        WriteFileToTpchLog((LPSTR)MyExecute->m_szCommand, szFmt);
    else
    {
        sprintf(szBuffer, szFmt, (LPSTR)MyExecute->m_szCommand);
        WriteToTpchLog(szBuffer);
    }
#endif

    // Initialize the run status for the step to running. The
completion status for
    // the step will be initialized by the Shell and ODBC execution
functions.
    MyExecute->m_StepStatus = gintRunning;

    if (MyExecute->m_ExecMthd == execShell)
        MyExecute->m_tElapsedTime = MyExecute->ExecuteShell();
    else
        MyExecute->m_tElapsedTime = MyExecute->ExecuteODBC();

    // Close the output, log and error files
    if (MyExecute->m_pOutputFile)
        MyExecute->m_pOutputFile->Release();
    MyExecute->m_pOutputFile = NULL;

    MyExecute->m_ExecTime = NULL;

```

```

        GetLocalTime(&MyExecute->m_tEndTime);

#ifdef _TPCH_AUDIT
    sprintf(szFmt, "Complete Step: '%%.%ds' at
'd/%d/%d %d:%d:%d'\n",
        MAXLOGCMDLEN,
        MyExecute->m_tEndTime.wMonth, MyExecute->m_tEndTime.wDay,
        MyExecute->m_tEndTime.wYear, MyExecute->m_tEndTime.wHour,
        MyExecute->m_tEndTime.wMinute, MyExecute->
>m_tEndTime.wSecond,
        MyExecute->m_tEndTime.wMilliseconds);
    if (MyExecute->m_ExecMthd == execShell)
        WriteFileToTpchLog((LPSTR)MyExecute->m_szCommand, szFmt);
    else
    {
        sprintf(szBuffer, szFmt, (LPSTR)MyExecute->m_szCommand);
        WriteToTpchLog(szBuffer);
    }
#endif

    MyExecute->PostMessage(WM_TASK_FINISH, 0, 0);

    return;
}

#ifdef _TPCH_AUDIT

void WriteFileToTpchLog(LPSTR szFile, LPSTR szFmt)
{
    // Reads a maximum of MAXLOGCMDDBUF characters from the command
    file and writes it to the log
    FILE *fpCmd;
    int iRead;
    char szBuf[MAXLOGCMDDBUF];
    char szCmd[MAXLOGCMDLEN];

    if ( pfLogFile != NULL )
    {
        if ( (fpCmd = fopen(szFile, FILE_ACCESS_READ)) != NULL)
        {
            iRead = fread(szCmd, sizeof(char), sizeof(szCmd) /
sizeof(char), fpCmd);
            if (iRead < MAXLOGCMDLEN)
                szCmd[iRead] = '\0';
            else
                szCmd[MAXLOGCMDLEN - 1] = '\0';
            sprintf(szBuf, szFmt, szCmd);
            WriteToTpchLog(szBuf);
            fclose(fpCmd);
        }
    }
}

void WriteToTpchLog(char *szMsg)
{
    if (pfLogFile != NULL)

```

```

    {
        EnterCriticalSection(&hLogFileWrite);
        fprintf(pfLogFile, szMsg);
        LeaveCriticalSection(&hLogFileWrite);
    }

    return;
}
#endif

TC_TIME CExecute::ExecuteShell()
{
    STARTUPINFOA Start;
    PROCESS_INFORMATION proc;
    DWORD exitCode;
    TC_TIME tElapsed = 0;
    _bstr_t szCommand("cmd /c ");
    LPSTR szStartDir;
    CURRENCY Elapsed;

    szCommand += m_szCommand;

    // Redirect output and error information
    szCommand += " > " + m_OutputFile + " 2> " + m_ErrorFile;

    // Initialize the STARTUPINFO structure:
    memset(&Start, 0, sizeof(STARTUPINFOA));
    Start.cb = sizeof(Start);
    Start.dwFlags = STARTF_USESHOWWINDOW;
    Start.wShowWindow = SW_SHOWMINNOACTIVE;

    memset(&proc, 0, sizeof(PROCESS_INFORMATION));

    szStartDir = strcmp((LPCTSTR)m_szExecDtls, "") == 0 ? NULL :
(LPSTR)m_szExecDtls;

    m_ExecTime->Start();

    // Start the shelled application:
    if (!CreateProcessA( NULL, (LPSTR)szCommand, NULL, NULL, FALSE,
        NORMAL_PRIORITY_CLASS, NULL, szStartDir, &Start, &proc ))
    {
        m_StepStatus = gintFailed;
        LogSystemError(m_pErrorFile);

        m_ExecTime->Stop(&Elapsed);
        return((TC_TIME)Elapsed.int64);
    }

    m_hHandle = proc.hProcess;
    // Give the process time to execute and finish
    WaitForSingleObject(m_hHandle, INFINITE);
    m_ExecTime->Stop(&Elapsed);

    if (!GetExitCodeProcess(m_hHandle, &exitCode))
    {

```

```

        m_StepStatus = gintFailed;
        LogSystemError(m_pErrorFile);
    }
    else
        m_StepStatus = gintComplete;

    // Close all open handles to the shelled process
    CloseHandle(m_hHandle);

    return((TC_TIME)Elapsed.int64);
}

STDMETHODIMP CExecute::AbortShell()
{
    if (m_hHandle != SQL_NULL_HSTMT)
        if (!TerminateProcess(m_hHandle, 0))
            return(RaiseSystemError());

    return(S_OK);
}

TC_TIME CExecute::ExecuteODBC()
{
    TC_TIME          tElapsed = 0;
    HDBC             m_hdbc;
    SQLRETURN        rc;
    LPSTR            szCmd;
    CURRENCY         Elapsed;
    BOOL             bDoConnect = FALSE;

    // ODBC specific initialization
    m_hdbc = SQL_NULL_HDBC;

    try
    {
        // Allocate a new connection if we are creating a dynamic
        // the named connection doesn't exist
        InitializeConnection(&m_hdbc, &bDoConnect);

        // Ensure that the connection is valid.
#ifdef _DEBUG
        _CrtDbgReport(_CRT_WARN, NULL, 0, NULL, "Executing
SQLDriverConnect.\n");
#endif

        if (bDoConnect)
        {
            // Allocate connection handle, open a connection
            // and set connection attributes.
#ifdef _DEBUG
            _CrtDbgReport(_CRT_WARN, NULL, 0, NULL, "Executing
SQLDriverConnect.\n");
#endif

            if (m_bAbort)

```

```

        return(tElapsed);

        // Connect to the server using the passed in
        // connection string
        rc = SQLDriverConnect(m_hdbc, NULL,
            (unsigned char *) (LPSTR)m_szExecDtls,
            SQL_NTS,
            NULL, 0, NULL, SQL_DRIVER_NOPROMPT);
        HandleODBCError(rc, SQL_HANDLE_DBC, m_hdbc,
            SMSQLDriverConnect);
    }

    ReConnectDeadConnection(&m_hdbc);

#ifdef _DEBUG
    _CrtDbgReport(_CRT_WARN, NULL, 0, NULL, "Executing
SQLAllocHandle for hdbc.\n");
#endif

    if (!m_bAbort && (rc = SQLAllocHandle(SQL_HANDLE_STMT,
        m_hdbc, &m_hHandle)) != SQL_SUCCESS)
        HandleODBCError(rc, SQL_HANDLE_DBC, m_hdbc,
            SMSQLAllocHandle);

    // Set connection attributes if any have been modified
    // from the default values
    if (m_lRowCount > 0)
    {
        char          szConnOptions[512];

        sprintf(szConnOptions, "SET ROWCOUNT %d ",
            m_lRowCount);

        SetConnectionOption(szConnOptions, &m_hdbc);
    }

    if (m_bQuotedIds)
        SetConnectionOption("SET QUOTED_IDENTIFIER ON ",
            &m_hdbc);

    if (!m_bAnsiNulls)
        SetConnectionOption("SET ANSI_NULL_DFLT_OFF ON ",
            &m_hdbc);

    if (!m_bAbort && m_lQueryTimeout > 0)
    {
#ifdef _DEBUG
        _CrtDbgReport(_CRT_WARN, NULL, 0, NULL, "Executing
SQLSetStmtAttr.\n");
#endif

        // Set the query timeout on the statement handle
        rc = SQLSetStmtAttr(m_hHandle,
            SQL_ATTR_QUERY_TIMEOUT, &m_lQueryTimeout,
            SQL_IS_UINTEGER);
        HandleODBCError(rc, SQL_HANDLE_STMT, m_hHandle,
            SMSQLSetStmtAttr);
    }
}

```

```

    }

    if (m_bNoExecute)
        SetConnectionOption("SET NOEXEC ON ", &m_hdbc);
    else if (m_bParseOnly)
        SetConnectionOption("SET PARSEONLY ON ", &m_hdbc);
    else if (m_bShowQP)
        // Important to ensure that this is the last
        // connection attributes being set -
        // otherwise showplans are generated for all
        // remaining SET statements
        SetConnectionOption("SET SHOWPLAN_TEXT ON ",
&m_hdbc);
    else
    {
        if (m_bNoCount)
            SetConnectionOption("SET NOCOUNT ON ",
&m_hdbc);

        if (m_bStatsIO)
            SetConnectionOption("SET STATISTICS IO ON
", &m_hdbc);

        // Important to ensure that this is the last
        // connection attributes being set -
        // otherwise timing statistics are generated for
        // all remaining SET statements
        if (m_bStatsTime)
            SetConnectionOption("SET STATISTICS TIME
ON ", &m_hdbc);
    }

    m_szCmd = (LPSTR)m_szCommand;
    m_ExecTime->Start();

    while ((szCmd = NextCmdInBatch((LPSTR)m_szCommand)) !=
NULL && !m_bAbort)
    {
#ifdef _DEBUG
        _CrtDbgReport(_CRT_WARN, NULL, 0, NULL, "Executing
SQLExecDirect.\n");
#endif

        // Execute the ODBC command
        rc = SQLExecDirect(m_hHandle, (unsigned char
*)szCmd, SQL_NTS);
        HandleODBCError(rc, SQL_HANDLE_STMT, m_hHandle,
SMSQLExecDirect);

        free(szCmd);

        // Call a procedure to log the results to the
        // output file
        ProcessResultsets();
    }
}

```

```

    m_ExecTime->Stop(&Elapsed);

    ResetConnectionProperties(&m_hdbc);
}
catch(CODBCError *pErr)
{
    m_StepStatus = gintFailed;
    delete pErr;
}
catch(CExecError *pErr)
{
    m_StepStatus = gintFailed;
    pErr->LogErrors(this);
    delete pErr;
}

ODBCCleanup(&m_hdbc, &m_hHandle);

if (m_StepStatus != gintFailed)
    m_StepStatus = gintComplete;

return((DWORD)Elapsed.int64);
}

void CExecute::InitializeConnection(HDBC *phdbc, BOOL *pbDoConnect)
{
    SQLRETURN rc;

    *pbDoConnect = TRUE;

    if (IsDynamicConnection())
    {
#ifdef _DEBUG
        _CrtDbgReport(_CRT_WARN, NULL, 0, NULL, "Executing
SQLAllocHandle for m_hdbc.\n");
#endif

        rc = SQLAllocHandle(SQL_HANDLE_DBC, henv, phdbc);
        HandleODBCError(rc, SQL_HANDLE_ENV, henv,
SMSQLAllocHandle);

        return;
    }

    EnterCriticalSection(&hConnections);
    // Returns the connection handle if the connection,
    // m_szConnection, exists
    for (m_iConnectionIndex = iConnectionCount - 1;
m_iConnectionIndex >= 0; m_iConnectionIndex--)
    {
        if (!strcmp((p_Connections + m_iConnectionIndex)-
>szConnectionName, (LPSTR)m_szConnection))
        {
            if (!(p_Connections + m_iConnectionIndex)->bInUse)
            {

```

```

        *phdbc = (p_Connections +
m_iConnectionIndex)->hdbc;
        (p_Connections + m_iConnectionIndex)-
>bInUse = TRUE;

        *pbDoConnect = FALSE;
        break;
    }
    else
    {
        LeaveCriticalSection(&hConnections);

        throw new
CExecError(CExecError::SM_ERR_CONN_IN_USE);
    }
}

if (m_iConnectionIndex < 0)
{
    // Connection was not found. Allocate connection handle
    and add it to list of
    // available connections.
#ifdef _DEBUG
    _CrtDbgReport(_CRT_WARN, NULL, 0, NULL, "Executing
SQLAllocHandle for m_hdbc.\n");
#endif

    rc = SQLAllocHandle(SQL_HANDLE_DBC, henv, phdbc);
    HandleODBCError(rc, SQL_HANDLE_ENV, henv,
SMSQLAllocHandle);

    m_iConnectionIndex = iConnectionCount++;

    p_Connections = (SM_Connection_Info
*)realloc(p_Connections, iConnectionCount * sizeof(SM_Connection_Info));

    strcpy((p_Connections + m_iConnectionIndex)-
>szConnectionName, (LPSTR)m_szConnection);
    (p_Connections + m_iConnectionIndex)->hdbc = *phdbc;
    (p_Connections + m_iConnectionIndex)->bInUse = TRUE;
}

LeaveCriticalSection(&hConnections);

return;
}

void CExecute::ReConnectDeadConnection(HDBC *phdbc)
{
    SQLRETURN          rc;
    SQLUIINTEGER       uConnDead;

    // Connect to the server using the passed in connection string
    rc = SQLGetConnectAttr(*phdbc, SQL_ATTR_CONNECTION_DEAD,
        &uConnDead, SQL_IS_UIINTEGER, NULL);
        HandleODBCError(rc, SQL_HANDLE_DBC, *phdbc, SMSQLDriverConnect);
        if (uConnDead == SQL_CD_TRUE)
        {
            // Cleanup the old connection and re-connect.
#ifdef _DEBUG
            _CrtDbgReport(_CRT_WARN, NULL, 0, NULL, "Executing
SQLDisconnect.\n");
#endif
            rc = SQLDisconnect(*phdbc);
#ifdef _DEBUG
            _CrtDbgReport(_CRT_WARN, NULL, 0, NULL, "Executing
SQLFreeHandle for hdbc.\n");
#endif
            SQLFreeHandle(SQL_HANDLE_DBC, *phdbc);
            *phdbc = SQL_NULL_HDBC;
#ifdef _DEBUG
            _CrtDbgReport(_CRT_WARN, NULL, 0, NULL, "Executing
SQLDriverConnect.\n");
#endif

            rc = SQLAllocHandle(SQL_HANDLE_DBC, henv, phdbc);
            HandleODBCError(rc, SQL_HANDLE_ENV, henv,
SMSQLAllocHandle);

            // Connect to the server using the passed in connection
            string
            rc = SQLDriverConnect(*phdbc, NULL,
                (unsigned char *) (LPSTR)m_szExecDtls, SQL_NTS,
                NULL, 0, NULL, SQL_DRIVER_NOPROMPT);
            HandleODBCError(rc, SQL_HANDLE_DBC, *phdbc,
SMSQLDriverConnect);
        }
        return;
    }

void CExecute::ResetConnectionUsage()
{
    if(m_iConnectionIndex >= 0 && m_iConnectionIndex <
iConnectionCount)
    {
        EnterCriticalSection(&hConnections);
        (p_Connections + m_iConnectionIndex)->bInUse = FALSE;
        LeaveCriticalSection(&hConnections);
    }

    return;
}

void CExecute::ResetConnectionProperties(HDBC *p_hdbc)
{
    SQLRETURN          rc;

```

```

// Reset connection attributes if any have been modified from the
default values

if (m_bNoExecute)
    SetConnectionOption("SET NOEXEC OFF ", p_hdbc);
else if (m_bParseOnly)
    SetConnectionOption("SET PARSEONLY OFF ", p_hdbc);
else if (m_bShowQP)
    // Reset connection attributes in reverse order
    SetConnectionOption("SET SHOWPLAN_TEXT OFF ", p_hdbc);
else
{
    // Reset connection attributes in reverse order
    if (m_bStatsTime)
        SetConnectionOption("SET STATISTICS TIME OFF ",
p_hdbc);

    if (m_bNoCount)
        SetConnectionOption("SET NOCOUNT OFF ", p_hdbc);

    if (m_bStatsIO)
        SetConnectionOption("SET STATISTICS IO OFF ",
p_hdbc);
}

if (m_lRowCount > 0)
{
    char                szConnOptions[512];

    sprintf(szConnOptions, "SET ROWCOUNT 0 ");
    SetConnectionOption(szConnOptions, p_hdbc);
}

if (m_bQuotedIds)
    SetConnectionOption("SET QUOTED_IDENTIFIER OFF ",
p_hdbc);

if (!m_bAnsiNulls)
    SetConnectionOption("SET ANSI_NULL_DFLT_OFF OFF ",
p_hdbc);

if (m_lQueryTmout > 0)
{
    SQLUINTEGER         lQueryTmout = 0;

#ifdef _DEBUG
        _CrtDbgReport(_CRT_WARN, NULL, 0, NULL, "Executing
SQLSetStmtAttr.\n");
#endif

    // Set the query timeout on the statement handle
    rc = SQLSetStmtAttr(m_hHandle, SQL_ATTR_QUERY_TIMEOUT,
&lQueryTmout,
        SQL_IS_UINTEGER);
    HandleODBCError(rc, SQL_HANDLE_STMT, m_hHandle,
SMSQLSetStmtAttr);
}

```

```

}

return;
}

LPSTR CExecute::NextCmdInBatch(LPSTR szBatch)
{
    LPSTR  szCmd, szSeparator, szStart;
    char   szNext;

    szStart = m_szCmd;

    while ( (szSeparator = strstr(szStart, CMD_SEPARATOR)) != NULL)
    {
        szNext = *(szSeparator + strlen(CMD_SEPARATOR));
        if ( szNext == '\n' || szNext == '\r' || szNext == '\0')
            break;
        else
            szStart = szSeparator + strlen(CMD_SEPARATOR);
    }

    if (!szSeparator)
    {
        // No more GO's
        if (strlen(m_szCmd) > 0)
        {
            szCmd = (LPSTR)malloc(strlen(m_szCmd) + 1);
            strcpy(szCmd, m_szCmd);
            m_szCmd += strlen(m_szCmd);
        }
        else
            szCmd = NULL;
    }
    else if (szSeparator - m_szCmd > 0)
    {
        // Strip the succeeding newline
        szCmd = (LPSTR)malloc(szSeparator - m_szCmd);
        strncpy(szCmd, m_szCmd, szSeparator - m_szCmd - 1);
        *(szCmd + (szSeparator - m_szCmd - 1)) = '\0';
        m_szCmd += szSeparator - m_szCmd + strlen(CMD_SEPARATOR);
        if ( szNext == '\n' || szNext == '\r')
            m_szCmd += 1;
    }
    else
        szCmd = NULL;

    return(szCmd);
}

void CExecute::SetConnectionOption(LPSTR szConn, HDC *pHdbc)
{
    // Executes the passed in connection options 'set' statement.
    Returns True if it succeeded
    char   szConnOptions[512];
    SQLRETURN rc;
}

```

```

        sprintf(szConnOptions, szConn);

#ifdef _DEBUG
        _CrtDbgReport(_CRT_WARN, NULL, 0, NULL, "Executing SQLExecDirect
for connection option.\n");
#endif

        if (m_bAbort)
            return;

        rc = SQLExecDirect(m_hHandle, (unsigned char *)szConnOptions,
SQL_NTS);
        HandleODBCError(rc, SQL_HANDLE_STMT, m_hHandle, SMSQLExecDirect);

        return;
}

STDMETHODIMP CExecute::AbortODBC()
{
    m_bAbort = TRUE;

    try
    {
        if (m_hHandle != SQL_NULL_HSTMT)
        {
#ifdef _DEBUG
            _CrtDbgReport(_CRT_WARN, NULL, 0, NULL, "Executing
SQLCancel.\n");
#endif

            SQLRETURN rc = SQLCancel(m_hHandle);
            HandleODBCError(rc, SQL_HANDLE_STMT, m_hHandle,
SMSQLCancel);
        }
        catch(CODBCError *pErr)
        {
            delete pErr;
        }

        return(S_OK);
    }

void CExecute::ProcessResultsets()
{
    SQLSMALLINT          *CTypeArray, *CScaleArray;
    SQLINTEGER           *ColLenArray, *DispLenArray, *OffsetArray;
    SQLSMALLINT          iColNameLen, SQLType, iColNull, i, NumCols
= 0;
    SQLINTEGER           iDispLen, iRowCount;
    SQLRETURN           rc;
    char                 szColName[MAX_DATA_LEN + 1];
    void                *DataPtr;
    SQLINTEGER           iLenOrInd = ALIGNBUF(sizeof(SQLINTEGER));
    SQLUINTEGER          iRowArraySize, iArrayElementSize;
    // SQLUINTEGER        NumRowsFetched;

```

```

// SQLUSMALLINT *RowStatusArray;

        if (!m_pOutputFile || m_bAbort)
            return;

        do
        {
#ifdef _DEBUG
            _CrtDbgReport(_CRT_WARN, NULL, 0, NULL, "Executing
SQLNumResultCols.\n");
#endif

            // Determine the number of result set columns.
            rc = SQLNumResultCols(m_hHandle, &NumCols);
            HandleODBCError(rc, SQL_HANDLE_STMT, m_hHandle,
SMSQLNumResultCols);

            if (NumCols > 0)
            {
                // Allocate arrays to hold the C type, scale,
                column and display length of the data
                CTypeArray = (SQLSMALLINT *) malloc(NumCols *
sizeof(SQLSMALLINT));
                CScaleArray = (SQLSMALLINT *) malloc(NumCols *
sizeof(SQLSMALLINT));
                ColLenArray = (SQLINTEGER *) malloc(NumCols *
sizeof(SQLINTEGER));
                DispLenArray = (SQLINTEGER *) malloc(NumCols *
sizeof(SQLINTEGER));
                OffsetArray = (SQLINTEGER *) malloc(NumCols *
sizeof(SQLINTEGER));
                OffsetArray[0] = 0;

                for (i = 0; i < NumCols && !m_bAbort; i++)
                {
#ifdef _DEBUG
                    _CrtDbgReport(_CRT_WARN, NULL, 0, NULL,
"Executing SQLDescribeCol.\n");
#endif

                    // Get the column description, include the
                    // Determine the column's byte length.
                    Calculate the offset in the buffer to the
                    // data as the offset to the previous
                    column, plus the byte length of the previous
                    // column, plus the byte length of the
                    previous column's length/indicator buffer.
                    // Note that the byte length of the column
                    and the length/indicator buffer are increased
                    // so that, assuming they start on an
                    alignment boundary, they will end on the byte

```



```

// before the next alignment boundary.
Although this might leave some holes in the
// buffer, it is a relatively inexpensive
way to guarantee alignment.
rc = SQLDescribeCol(m_hHandle,
((SQLUSMALLINT) i)+1,
(unsigned char *)szColName,
sizeof(szColName), &iColNameLen,
&SQLType, (unsigned long
*)&ColLenArray[i], &CScaleArray[i], &iColNull);
HandleODBCError(rc, SQL_HANDLE_STMT,
m_hHandle, SMSQLDescribeCol);
#ifdef _DEBUG
_CrtDbgReport(_CRT_WARN, NULL, 0, NULL,
"Executing SQLColAttribute.\n");
#endif

if (m_bAbort)
return;

rc = SQLColAttribute(m_hHandle,
((SQLUSMALLINT) i)+1, SQL_DESC_DISPLAY_SIZE, NULL, 0, NULL, &iDispLen);
HandleODBCError(rc, SQL_HANDLE_STMT,
m_hHandle, SMSQLColAttribute);

// GetDefaultCType contains a switch
statement that returns the default C type
// for each SQL type.
CTypeArray[i] = GetDefaultCType(SQLType);
if ( (CTypeArray[i] == SQL_C_CHAR ||
CTypeArray[i] == SQL_C_BINARY) && ColLenArray[i] > MAX_DATA_LEN)
{
ColLenArray[i] = MAX_DATA_LEN;
iDispLen = MAX_DATA_LEN;
}

DispLenArray[i] = max(iColNameLen,
DispLenArray[i] = max(DispLenArray[i],
sizeof(S_NULL));

// Print the column names in the header
PrintData(szColName, SQL_C_CHAR,
DispLenArray[i], 0, m_pOutputFile);

// Add a byte for the null-termination
character
ColLenArray[i] += 1;
ColLenArray[i] = ALIGNBUF(ColLenArray[i]);

// Calculate the offset in the buffer to
the data as the offset to the
previous column,
// plus the byte length of the previous
column, plus the byte length of the previous
// column's length/indicator buffer.

```

```

if (i)
OffsetArray[i] = OffsetArray[i-1] +
ColLenArray[i-1] + iLenOrInd;
}
m_pOutputFile->WriteLine(NULL);

iArrayElementSize = OffsetArray[NumCols-1] +
ColLenArray[NumCols-1] + iLenOrInd;
iRowArraySize = 1;
// Allocate the data buffer. The size of the
buffer is equal to the offset to the data
// buffer for the final column, plus the byte
length of the data buffer and length/indicator
// buffer for the last column.
DataPtr = malloc(iRowArraySize *
iArrayElementSize);

// Specify the size of the structure with the
SQL_ATTR_ROW_BIND_TYPE
// statement attribute. This also declares that
row-wise binding will
// be used. Declare the rowset size with the
SQL_ATTR_ROW_ARRAY_SIZE
// statement attribute. Set the
SQL_ATTR_ROW_STATUS_PTR statement
// attribute to point to the row status array. Set
the
// SQL_ATTR_ROWS_FETCHED_PTR statement attribute
to point to
// NumRowsFetched.
/*
RowStatusArray = (SQLUSMALLINT
*)malloc(iRowArraySize * sizeof(SQLUSMALLINT));

SQLSetStmtAttr(m_hHandle, SQL_ATTR_ROW_BIND_TYPE,
&iArrayElementSize, SQL_IS_INTEGER);
SQLSetStmtAttr(m_hHandle, SQL_ATTR_ROW_ARRAY_SIZE,
&iRowArraySize, SQL_IS_INTEGER);
SQLSetStmtAttr(m_hHandle, SQL_ATTR_ROW_STATUS_PTR,
RowStatusArray, SQL_IS_POINTER);
SQLSetStmtAttr(m_hHandle,
SQL_ATTR_ROWS_FETCHED_PTR, &NumRowsFetched, SQL_IS_POINTER);
*/

// For each column, bind the address in the buffer
at the start of the memory allocated
// for that column's data and the address at the
start of the memory allocated for that
// column's length/indicator buffer.
for (i = 0; i < NumCols; i++)
{
SQLBindCol(m_hHandle, i + 1, CTypeArray[i],
(SQLPOINTER)((SQLCHAR *)DataPtr + OffsetArray[i]),
ColLenArray[i], (SQLINTEGER
*)((SQLCHAR *)DataPtr + OffsetArray[i] + ColLenArray[i]));
}

```

```

        HandleODBCError(rc, SQL_HANDLE_STMT,
m_hHandle, SMSQLBindCol);

        // Underline each column name
        memset(szColName, '-', DispLenArray[i]);
        *(szColName + DispLenArray[i]) = '\0';
        PrintData(szColName, SQL_C_CHAR,
DispLenArray[i], 0, m_pOutputFile);
    }
    m_pOutputFile->WriteLine(NULL);

#ifdef _DEBUG
    _CrtDbgReport(_CRT_WARN, NULL, 0, NULL, "Executing
SQLFetch.\n");
#endif

    while (!m_bAbort && (rc = SQLFetch(m_hHandle)) !=
SQL_NO_DATA)
    {
        HandleODBCError(rc, SQL_HANDLE_STMT,
m_hHandle, SMSQLFetch);

        /*
        for (i = 0; i < NumRowsFetched; i++)
        {
            if (RowStatusArray[i] ==
SQL_ROW_SUCCESS || RowStatusArray[i] == SQL_ROW_SUCCESS_WITH_INFO)
            {
                /*
                for (i = 0; i < NumCols;
                {
                    // Retrieve and
                    print each row. PrintData accepts a pointer to the data, its C type,
                    // and its byte
                    length/indicator.
                    if ( *((SQLINTEGER
                    *)((SQLCHAR *)DataPtr + OffsetArray[i] + ColLenArray[i])) ==
SQL_NULL_DATA)
                        PrintData(S_NULL, SQL_C_CHAR, DispLenArray[i], 0, m_pOutputFile);
                    else
                        PrintData((LPVOID)((SQLCHAR *)DataPtr + OffsetArray[i]),
CTypeArray[i],
                        DispLenArray[i], CScaleArray[i], m_pOutputFile);
                }
                m_pOutputFile->
                WriteLine(NULL);
            }
        }
        */
    }
    m_pOutputFile->WriteLine(NULL);

        /*
        free(RowStatusArray);
        */

        free(DataPtr);

        free(CTypeArray);
        free(CScaleArray);
        free(ColLenArray);
        free(DispLenArray);
    }

    // Write io statistics, if applicable
    LogODBCErrors(rc, SQL_HANDLE_STMT, m_hHandle,
SMSQLFetch);

#ifdef _DEBUG
    _CrtDbgReport(_CRT_WARN, NULL, 0, NULL, "Executing
SQLRowCount.\n");
#endif

    if (m_bAbort)
        break;

    // action (insert, update, delete) query
    rc = SQLRowCount(m_hHandle, &iRowCount);
    HandleODBCError(rc, SQL_HANDLE_STMT, m_hHandle,
SMSQLRowCount);

    if (!m_bNoCount && iRowCount != -1)
    {
        sprintf(szColName, "(%d row(s) affected)",
iRowCount);
        _bstr_t temp(szColName);
        m_pOutputFile->WriteLine((BSTR)temp);
        m_pOutputFile->WriteLine(NULL);
    }

#ifdef _DEBUG
    _CrtDbgReport(_CRT_WARN, NULL, 0, NULL, "Executing
SQLFreeStmt.\n");
#endif

    if (m_bAbort)
        break;

    SQLFreeStmt(m_hHandle, SQL_UNBIND);

#ifdef _DEBUG
    _CrtDbgReport(_CRT_WARN, NULL, 0, NULL, "Executing
SQLMoreResults.\n");
#endif

    if (m_bAbort)
        break;

```

```

        // Process the next resultset. This function returns
'success with info' even
        // if there is no other resultset and there are
statistics messages to be printed.
        // Hence the check for -1 rows before printing.
        rc=SQLMoreResults(m_hHandle);
        if (rc != SQL_NO_DATA)
            HandleODBCError(rc, SQL_HANDLE_STMT, m_hHandle,
SMSQLMoreResults);
    } while (rc != SQL_NO_DATA);

    return;
}

```

```

void CExecute::PrintData(void *vData, SQLSMALLINT CType, SQLINTEGER
IndPtr, SQLSMALLINT iScale, ISMLog *pOutput)
{
    // PrintData accepts a pointer to the data, its C type,
// and its byte length/indicator. It contains a switch statement
that casts and prints
// the data according to its type.

    char *s;
    char fmt[MAXBUFLEN];
    int j = 0;
    SQLINTEGER iColLen = IndPtr + 1;

    assert(iColLen);
    s = (LPSTR)malloc(iColLen + 1);

    if (s)
    {
        if (vData)
        {
            switch(CType)
            {
                case SQL_C_CHAR:
                case SQL_C_WCHAR:
                case SQL_C_TYPE_DATE:
                case SQL_C_TYPE_TIME:
                case SQL_C_TYPE_TIMESTAMP:
                case SQL_C_INTERVAL_YEAR:
                case SQL_C_INTERVAL_MONTH:
                case SQL_C_INTERVAL_YEAR_TO_MONTH:
                case SQL_C_INTERVAL_DAY:
                case SQL_C_INTERVAL_HOUR:
                case SQL_C_INTERVAL_MINUTE:
                case SQL_C_INTERVAL_SECOND:
                case SQL_C_INTERVAL_DAY_TO_HOUR:
                case SQL_C_INTERVAL_DAY_TO_MINUTE:
                case SQL_C_INTERVAL_DAY_TO_SECOND:
                case SQL_C_INTERVAL_HOUR_TO_MINUTE:
                case SQL_C_INTERVAL_HOUR_TO_SECOND:
                case SQL_C_INTERVAL_MINUTE_TO_SECOND:

```

```

                case SQL_C_BINARY:
                    sprintf(fmt, "%%.%ds", iColLen);
                    j = sprintf(s, fmt, (char *)vData);
                    break;

                case SQL_C_SHORT:
                    j = sprintf(s, "%d", *(short *)vData);
                    break;

                case SQL_C_LONG:
                    j = sprintf(s, "%ld", *(long *)vData);
                    break;

                case SQL_C_UBIGINT:
                    j = sprintf(s, "%I64d", *(__int64
                    *)vData);
                    break;

                case SQL_C_FLOAT:
                    sprintf(fmt, "%%.0%df", iScale);
                    j = sprintf(s, "%f", *(float *)vData);
                    break;

                case SQL_C_DOUBLE:
                    sprintf(fmt, "%%.0%df", iScale);
                    j = sprintf(s, "%f", *(double *)vData);
                    break;

                case SQL_C_NUMERIC:
                    sprintf(fmt, "%%.0%df", iScale);
                    j = sprintf(s, fmt, *(double *)vData);
                    break;

                default:
                    j = sprintf(s, "%s", vData);
                    break;
            }
        }

        // Strip off terminating null character and pad the
string with blanks
        if (iColLen - j > 0)
            memset(s + j, ' ', iColLen - j);

        *(s + iColLen) = '\0';

        // Write the field to the output file
        _bstr_t temp(s);
        pOutput->WriteField((BSTR)temp);
        free(s);
    }

    return;
}

SQLSMALLINT CExecute::GetDefaultCTYPE(SQLINTEGER SQLType)

```

```

{
    // GetDefaultCType returns the C type for the passed in SQL
    datatype.

    switch(SQLType)
    {
    case SQL_CHAR:
        case SQL_VARCHAR:
        case SQL_LONGVARCHAR:
        case SQL_WCHAR:
        case SQL_WVARCHAR:
        case SQL_WLONGVARCHAR:
            return(SQL_C_CHAR);

    case SQL_TINYINT:
        return(SQL_C_CHAR);

    case SQL_SMALLINT:
        return(SQL_C_SHORT);

    case SQL_INTEGER:
        return(SQL_C_LONG);

    case SQL_BIGINT:
        return(SQL_C_UBIGINT);

    case SQL_REAL:
        return(SQL_C_FLOAT);

    case SQL_FLOAT:
    case SQL_DOUBLE:
    // case SQL_DECIMAL:
        return(SQL_C_DOUBLE);

        case SQL_DECIMAL:
            return(SQL_C_CHAR);

        case SQL_BIT:
            return(SQL_C_CHAR);

    case SQL_BINARY:
        case SQL_VARBINARY:
        case SQL_LONGVARBINARY:
            return(SQL_C_CHAR);
    // return(SQL_C_BINARY);

    case SQL_TYPE_DATE:
        return(SQL_C_CHAR);
    // return(SQL_C_TYPE_DATE);

    case SQL_TYPE_TIME:
        return(SQL_C_CHAR);
    // return(SQL_C_TYPE_TIME);

    case SQL_TYPE_TIMESTAMP:
        return(SQL_C_CHAR);

```

```

// return(SQL_C_TYPE_TIMESTAMP);

        case SQL_NUMERIC:
            return(SQL_C_FLOAT);

    case SQL_INTERVAL_YEAR:
        return(SQL_C_CHAR);
    // return(SQL_C_INTERVAL_YEAR);

    case SQL_INTERVAL_MONTH:
        return(SQL_C_CHAR);
    // return(SQL_C_INTERVAL_MONTH);

    case SQL_INTERVAL_YEAR_TO_MONTH:
        return(SQL_C_CHAR);
    // return(SQL_C_INTERVAL_YEAR_TO_MONTH);

    case SQL_INTERVAL_DAY:
        return(SQL_C_CHAR);
    // return(SQL_C_INTERVAL_DAY);

    case SQL_INTERVAL_HOUR:
        return(SQL_C_CHAR);
    // return(SQL_C_INTERVAL_HOUR);

    case SQL_INTERVAL_MINUTE:
        return(SQL_C_CHAR);
    // return(SQL_C_INTERVAL_MINUTE);

    case SQL_INTERVAL_SECOND:
        return(SQL_C_CHAR);
    // return(SQL_C_INTERVAL_SECOND);

    case SQL_INTERVAL_DAY_TO_HOUR:
        return(SQL_C_CHAR);
    // return(SQL_C_INTERVAL_DAY_TO_HOUR);

    case SQL_INTERVAL_DAY_TO_MINUTE:
        return(SQL_C_CHAR);
    // return(SQL_C_INTERVAL_DAY_TO_MINUTE);

    case SQL_INTERVAL_DAY_TO_SECOND:
        return(SQL_C_CHAR);
    // return(SQL_C_INTERVAL_DAY_TO_SECOND);

    case SQL_INTERVAL_HOUR_TO_MINUTE:
        return(SQL_C_CHAR);
    // return(SQL_C_INTERVAL_HOUR_TO_MINUTE);

    case SQL_INTERVAL_HOUR_TO_SECOND:
        return(SQL_C_CHAR);
    // return(SQL_C_INTERVAL_HOUR_TO_SECOND);

    case SQL_INTERVAL_MINUTE_TO_SECOND:
        return(SQL_C_CHAR);
    // return(SQL_C_INTERVAL_MINUTE_TO_SECOND);

```

```

        default:
            assert(TRUE);
            return(SQL_C_CHAR);
            break;
    }
}

/*
FUNCTION: LogODBCErrors(SQLRETURN rc, SWORD fHandleType, SQLHANDLE
handle)
COMMENTS: Formats ODBC errors or warnings and logs them. Also
initializes the completion status for the step to failure, if an
ODBC error has occurred.
*/

void CExecute::LogODBCErrors(SQLRETURN nResult, SWORD fHandleType,
SQLHANDLE handle, OdbcOperations FailedOp)
{
    // Messages returned by the server (e.g. Print statements) will
    be logged to the output file
    // ODBC warnings will be logged to the log file
    // All other ODBC errors will be logged to the error file.

    UCHAR          szErrState[SQL_SQLSTATE_SIZE+1];          //
SQL Error State string
    UCHAR          szErrMsg[SQL_MAX_MESSAGE_LENGTH+1];      // SQL
Error Text string
    char
    szBuffer[SQL_SQLSTATE_SIZE+SQL_MAX_MESSAGE_LENGTH+MAXBUFLEN+1] =
"";

    // formatted Error text Buffer
    SWORD          wErrMsgLen;
    // Error message length
    SQLINTEGER     dwErrCode;
    // Native Error code
    SQLRETURN      nErrResult;
    // Return Code from SQLGetDiagRec
    SWORD          sMsgNum = 1;
    // Error sequence number
    _bstr_t        temp;

    if (IsErrorReturn(nResult))
    {
        sprintf(szBuffer, "ODBC Operation: '%s' returned error
code: %d",
                g_szOdbcOps[FailedOp], nResult);
        temp = szBuffer;
        m_pErrorFile->WriteLine((BSTR) temp);
        m_StepStatus = gintFailed;
    }

    if (handle == SQL_NULL_HSTMT)
        return;
}

```

```

#ifdef _DEBUG
    _CrtDbgReport(_CRT_WARN, NULL, 0, NULL, "Executing
SQLGetDiagRec.\n");
#endif

    // call SQLGetDiagRec function with proper ODBC handles,
    repeatedly until
    // function returns SQL_NO_DATA.
    while (!m_bAbort && (nErrResult = SQLGetDiagRec(fHandleType,
handle, sMsgNum++,
            szErrState, &dwErrCode, szErrMsg,
SQL_MAX_MESSAGE_LENGTH-1, &wErrMsgLen)
            != SQL_NO_DATA)
    {
        if (!SQL_SUCCEEDED(nErrResult))
            break;

        if (m_pOutputFile && IsServerMessage(dwErrCode,
szErrMsg))
        {
            wsprintf(szBuffer, SM_SQLMSG_FORMAT,
(LPSTR)szErrMsg);
            temp = szBuffer;
            m_pOutputFile->WriteLine((BSTR) temp);
        }
        else if (IsODBCWarning(szErrState) && dwErrCode !=
SM_SQL_ERR_CHANGED_DB && dwErrCode != SM_SQL_ERR_CHANGED_LANG)
        {
            // Suppress warnings - 'Changed database context
to...' and 'Changed language setting to...'
            wsprintf(szBuffer, SM_SQLMSG_FORMAT,
ParseOdbcMsgPrefixes((LPCSTR)szErrMsg));
            temp = szBuffer;
            m_pOutputFile->WriteLine((BSTR) temp);
        }
        else if (m_pErrorFile && !IsODBCWarning(szErrState))
        {
            wsprintf(szBuffer, SM_SQLERR_FORMAT,
(LPSTR)szErrState, dwErrCode, (LPSTR)szErrMsg);
            temp = szBuffer;
            m_pErrorFile->WriteLine((BSTR) temp);
        }
    }
}

/*
FUNCTION: LogErrors(SQLRETURN rc, SWORD fHandleType, SQLHANDLE
handle)
COMMENTS: Writes the error message to the error log
*/

void CExecError::LogErrors(CExecute *p)
{
    _bstr_t temp(m_szExecErrorDesc[m_iErrCode]);
}

```

```

        if (p->m_pErrorFile)
            p->m_pErrorFile->WriteLine((BSTR)temp);

        return;
    }

/*
    FUNCTION: ODBCcleanup(HDBC *hdbc, HSTMT *hstmt)
    COMMENTS: Cleanup of all ODBC structures
*/

void CExecute::ODBCcleanup(HDBC *hdbc, HSTMT *hstmt)
{
    SQLRETURN        lReturn;

#ifdef _DEBUG
    _CrtDbgReport(_CRT_WARN, NULL, 0, NULL, "Executing
ODBCcleanup.\n");
#endif

    if (*hstmt != SQL_NULL_HSTMT)
    {
#ifdef _DEBUG
        _CrtDbgReport(_CRT_WARN, NULL, 0, NULL, "Executing
SQLCloseCursor.\n");
#endif
        SQLCloseCursor(hstmt);

#ifdef _DEBUG
        _CrtDbgReport(_CRT_WARN, NULL, 0, NULL, "Executing
SQLFreeHandle for hstmt.\n");
#endif
        SQLFreeHandle(SQL_HANDLE_STMT, hstmt);
        *hstmt = SQL_NULL_HSTMT;
    }

    // Cleanup connection if it is a dynamic connection
    if (IsDynamicConnection())
    {
        if (*hdbc != SQL_NULL_HDBC)
        {
#ifdef _DEBUG
            _CrtDbgReport(_CRT_WARN, NULL, 0, NULL, "Executing
SQLDisconnect.\n");
#endif
            lReturn = SQLDisconnect(*hdbc);

#ifdef _DEBUG
            _CrtDbgReport(_CRT_WARN, NULL, 0, NULL, "Executing
SQLFreeHandle for hdbc.\n");
#endif
            SQLFreeHandle(SQL_HANDLE_DBC, hdbc);
            *hdbc = SQL_NULL_HDBC;
        }
        else
            ResetConnectionUsage();
    }
}

```

```

        return;
    }

// Wrapper function that raises an error if a Windows Api fails
STDMETHODIMP CExecute::RaiseSystemError(void)
{
    char s[MAXBUFLEN];

    GetSystemError(s);
    return Error(s, 0, NULL, GUID_NULL);
}

// Wrapper function that logs the error raised by an Api function to the
passed in file
void CExecute::LogSystemError(ISMLog *pFile)
{
    if (pFile)
    {
        char s[MAXBUFLEN];
        GetSystemError(s);

        _bstr_t temp(s);
        pFile->WriteLine((BSTR)temp);
    }
}

// Populates the passed in string with the last Windows Api error that
occurred
void CExecute::GetSystemError(LPSTR s)
{
    long c;
    DWORD e;

    e = GetLastError();

    c = sprintf(s, "Error code: %ld. ", e);
    c = FormatMessage(FORMAT_MESSAGE_FROM_SYSTEM |
FORMAT_MESSAGE_IGNORE_INSERTS,
                    NULL, e, 0, s + c, MAXBUFLEN - c, NULL);

    return;
}

STDMETHODIMP CExecute::get_StepStatus(InstanceStatus *pVal)
{
    *pVal = m_StepStatus;
    return S_OK;
}

STDMETHODIMP CExecute::WriteError(BSTR szMsg)
{
    if (m_pErrorFile)
        return(m_pErrorFile->WriteLine(szMsg));

    return S_OK;
}

```

## Execute.h

```
// FILE:      Execute.h
//           Microsoft TPC-H Kit Ver. 1.00
//           Copyright Microsoft, 1999
//           All Rights Reserved
//
//
// PURPOSE:   Declaration of the CExecute
// Contact:   Reshma Tharamal (reshmat@microsoft.com)
//
// Execute.h : Declaration of the CExecute

#ifndef __EXECUTE_H__
#define __EXECUTE_H__

#include <atlwin.h>
#include <comdef.h>
#include <stdio.h>
#include "resource.h" // main symbols
#include "ExecuteDllCP.h"
#include "..\LogWriter\LogWriter.h"
#include "..\LogWriter\SMLog.h"
#include "..\common\SMTime\SMTime.h"
#include "..\common\SMTime\SMTimer.h"

// ODBC-specific includes
#define DBNTWIN32
#include <sqltypes.h>
#include <sql.h>
#include <sqlext.h>

////////////////////////////////////
////
// CExecute

#define WM_TASK_START (WM_USER + 101)
#define WM_TASK_FINISH (WM_USER + 102)

#define SM_SQLERR_FORMAT "SQL Error State:%s, Native Error Code: %ld\r\nODBC Error: %s"

// format for ODBC error messages
#define SM_SQLWARN_FORMAT SM_SQLERR_FORMAT // format for ODBC warnings
#define SM_SQLMSG_FORMAT "%s" // format for messages from the server

#define SM_SQL_STATE_WARNING "01000"
#define SM_MSG_SERVER "[Microsoft][ODBC SQL Server Driver][SQL Server]"

#define SM_SQL_ERR_CHANGED_DB 5701
#define SM_SQL_ERR_CHANGED_LANG 5703
```

```
#define SM_STEPMASTER_ERROR "StepMaster Error: "
#define CMD_SEPARATOR "\nGO"

#define INV_ARRAY_INDEX -1 // invalid index into an array

#define MAXBUFLEN 256 // display buffer size
#define MAXLOGCMDLEN 256 // maximum characters in command that will be

// printed to log
#define MAXLOGCMDDBUF 512 // maximum characters in command that will be

// printed to log
#define MAX_DATA_LEN 4000 // maximum buffer size for variable-length data types

// viz. character and binary fields
#define FILE_ACCESS_READ "r" // Open file for read access

#define S_NULL "NULL"

// Define a macro to increase the size of a buffer so it is a multiple of teh alignment size.
// Thus, if a buffer starts on an alignment boundary, it will end just before the next
// alignment boundary. Here, an alignment size of 4 is used because this is the size of the
// largest data type used in the application's buffer - the size of an SDWORD and of the largest
// default C data type are both 4. If a larger data type (such as __int64) is used, it will be
// necessary to align for that size.
#define ALIGNSIZE 4
#define ALIGNBUF(Length) ((Length) % ALIGNSIZE) ? \
((Length) + ALIGNSIZE - ((Length) % ALIGNSIZE)) : (Length)

#define MAX_BUFFER_SIZE 64000

typedef enum OdbcOperations
{
    SMSQLAllocHandle,
    SMSQLDriverConnect,
    SMSQLExecDirect,
    SMSQLSetStmtAttr,
    SMSQLCancel,
    SMSQLNumResultCols,
    SMSQLDescribeCol,
    SMSQLColAttribute,
    SMSQLFetch,
    SMSQLGetData,
    SMSQLRowCount,
    SMSQLMoreResults,
```

```

        SMSQLBindCol,
};

class CODBCError
{
public:
    CODBCError(SQLRETURN nResult, SWORD fHandleType, SQLHANDLE
handle, OdbcOperations FailedOp)
    {
        m_fHandleType = fHandleType;
        m_handle       = handle;
        m_FailedOp     = FailedOp;
        m_nResult      = nResult;
    };

private:
    SWORD          m_fHandleType;
    SQLHANDLE      m_handle;
    OdbcOperations m_FailedOp;
    SQLRETURN      m_nResult;

private:
inline BOOL IsServerMessage(SQLINTEGER lNativeError, UCHAR *szErr){
    return( (strstr((LPCTSTR)szErr, SM_MSG_SERVER) != NULL) ?
(lNativeError == 0) : FALSE); }
inline BOOL IsODBCWarning(UCHAR *szSqlState){
    return(strcmp((LPCSTR)szSqlState, SM_SQL_STATE_WARNING) == 0);}
inline LPCSTR ParseOdbcMsgPrefixes(LPCSTR szMsg){ char *pDest;
    return( (pDest = strstr(szMsg, SM_MSG_SERVER)) == NULL ? szMsg :
pDest + strlen(SM_MSG_SERVER));}
};

class ATL_NO_VTABLE CExecute :
    public CWindowImpl<CExecute>,
    public CComObjectRootEx<CComSingleThreadModel>,
    public CComCoClass<CExecute, &CLSID_Execute>,
    public IConnectionPointContainerImpl<CExecute>,
    public ISupportErrorInfo,
    public IDispatchImpl<IExecute, &IID_IExecute,
&LIBID_EXECUTEDLLLib>,
    public CProxy_IExecuteEvents< CExecute >
{
public:
    CExecute()
    {
        m_pErrorFile = NULL;
        //m_pLogFile = NULL;
        m_pOutputFile = NULL;

        // Initialize the elapsed time for the step
        m_tElapsedTime = 0;

        // Initialize the run status for the step
        m_StepStatus = gintPending;

        m_hHandle = SQL_NULL_HSTMT;

```

```

        m_bAbort = FALSE;

        m_iConnectionIndex = INV_ARRAY_INDEX;
    }

    ~CExecute()
    {
    }

    friend class CExecError;

public:
    DECLARE_WND_CLASS("Execute")

    BEGIN_MSG_MAP(CExecute)
        MESSAGE_HANDLER(WM_TASK_FINISH, OnTaskFinished)
        MESSAGE_HANDLER(WM_TASK_START, OnTaskStarted)
    END_MSG_MAP()

public:
    HRESULT OnTaskStarted(UINT uMsg, WPARAM wParam,
        LPARAM lParam, BOOL& bHandled)
    {
        CURRENCY      CStartTime = Get64BitTime(&m_tStartTime);

        Fire_Start(CStartTime);
        return 0;
    }

    HRESULT OnTaskFinished(UINT uMsg, WPARAM wParam,
        LPARAM lParam, BOOL& bHandled)
    {
        CURRENCY      CEndTime = Get64BitTime(&m_tEndTime);

        Fire_Complete(CEndTime, (long)m_tElapsedTime);
        return 0;
    }

    HRESULT FinalConstruct()
    {
        HRESULT      hr;
        RECT          rect;

        rect.left=0;
        rect.right=100;
        rect.top=0;
        rect.bottom=100;

        HWND hwnd = Create( NULL, rect, "ExecuteWindow",
WS_POPUP);

        if (!hwnd)
            return HRESULT_FROM_WIN32(GetLastError());

        hr = CoCreateInstance(CLSID_SMLog, NULL, CLSCTX_INPROC,
            IID_ISMLog, (void **)&m_pErrorFile);

```



```

    if FAILED(hr)
        return(hr);
    m_pErrorFile->put_Append(TRUE);

    //hr = CoCreateInstance(CLSID_SMLog, NULL, CLSCTX_INPROC,
    // IID_ISMLog, (void **)&m_pLogFile);
    //if FAILED(hr)
    //    return(hr);

    hr = CoCreateInstance(CLSID_SMLog, NULL, CLSCTX_INPROC,
        IID_ISMLog, (void **)&m_pLogFile);
    if FAILED(hr)
        return(hr);
    m_pOutputFile->put_Append(TRUE);

    hr = CoCreateInstance(CLSID_SMTimer, NULL, CLSCTX_INPROC,
        IID_ISMTimer, (void **)&m_ExecTime);
    if FAILED(hr)
        return(hr);

    return S_OK;
}

void FinalRelease()
{
    if (m_hWnd != NULL)
        DestroyWindow();

    // Close the log and error files
    if (m_pErrorFile)
        m_pErrorFile->Release();
    m_pErrorFile = NULL;

    //if (m_pLogFile)
    //    m_pLogFile->Release();
    //m_pLogFile = NULL;

    if (m_ExecTime)
        m_ExecTime->Release();
    m_ExecTime = NULL;
}

DECLARE_REGISTRY_RESOURCEID(IDR_EXECUTE)

DECLARE_PROTECT_FINAL_CONSTRUCT()

BEGIN_COM_MAP(CExecute)
    COM_INTERFACE_ENTRY(IExecute)
    COM_INTERFACE_ENTRY(ISupportErrorInfo)
    COM_INTERFACE_ENTRY(IDispatch)
    COM_INTERFACE_ENTRY(IConnectionPointContainer)
    COM_INTERFACE_ENTRY_IMPL(IConnectionPointContainer)
END_COM_MAP()

BEGIN_CONNECTION_POINT_MAP(CExecute)
    CONNECTION_POINT_ENTRY(DIID_IExecuteEvents)
END_CONNECTION_POINT_MAP()

```

```

// ISupportsErrorInfo
STDMETHOD(InterfaceSupportsErrorInfo)(REFIID riid);

// IExecute
public:
    STDMETHOD(put_ErrorFile)(/*[in]*/ BSTR newVal);
    STDMETHOD(put_OutputFile)(/*[in]*/ BSTR newVal);
    STDMETHOD(WriteError)(BSTR szMsg);
    STDMETHOD(Abort)();
    STDMETHOD(get_StepStatus)(/*[out, retval]*/ InstanceStatus
        *pVal);
    STDMETHOD(DoExecute)(/*[in]*/ BSTR szCommand, /*[in]*/ BSTR
        szExecutionDtls, /*[in]*/ ExecutionType ExecMethod,
        /*[in]*/ BOOL bNoCount, /*[in]*/ BOOL bNoExecute,
        /*[in]*/ BOOL bParseOnly,
        /*[in]*/ BOOL bQuotedIds, /*[in]*/ BOOL bAnsiNulls,
        /*[in]*/ BOOL bShowQP,
        /*[in]*/ BOOL bStatsTime, /*[in]*/ BOOL bStatsIO,
        /*[in]*/ long lRowCount,
        /*[in]*/ long lQueryTmout, /*[in]*/ BSTR szConnection);

    TC_TIME ExecuteShell();
    TC_TIME ExecuteODBC();
    STDMETHODIMP AbortShell();
    STDMETHODIMP AbortODBC();

    _bstr_t m_szCommand;
    _bstr_t m_szExecDtls;
    _bstr_t m_szConnection;
    DWORD m_lMode;
    //DATE m_CurTime;
    SYSTEMTIME m_tStartTime;
    SYSTEMTIME m_tEndTime;
    TC_TIME m_tElapsedTime;
    ISMLog *m_pErrorFile;
    //ILog *m_pLogFile;
    ISMLog *m_pOutputFile;
    ISMTimer *m_ExecTime;
    ExecutionType m_ExecMthd;
    InstanceStatus m_StepStatus;
    HANDLE m_hHandle; // Process handle

for shell commands and
//
Statement handle for ODBC commands
    LPSTR m_szCmd;

private:
    LPSTR NextCmdInBatch(LPSTR szBatch);
    void ProcessResultsets();
    SQLSMALLINT GetDefaultCType(SQLINTEGER SQLType);
    void PrintData(void *vData, SQLSMALLINT CType,
        SQLINTEGER IndPtr, SQLSMALLINT iScale, ISMLog *pOutput);
    void LogODBCErrors(SQLRETURN nResult, SWORD
        fHandleType, SQLHANDLE handle, OdbcOperations FailedOp);
    void ODBCcleanup(HDBC *hdbc, HSTMT *hstmt);

```

```

        STDMETHODCALLTYPE RaiseSystemError(void);
        void                LogSystemError(ISMLog *pFile);
        void                GetSystemError(LPSTR s);
        void                SetConnectionOption(LPSTR szConn, HDBC
*pHdbc);
        void                ResetConnectionProperties(HDBC *p_hdbc);

        void                InitializeConnection(HDBC *phdbc, BOOL
*pbDoConnect);
        void                ReConnectDeadConnection(HDBC *phdbc);

        void                ResetConnectionUsage();

        int                m_iConnectionIndex;

        BOOL                m_bNoCount, m_bNoExecute, m_bParseOnly,
m_bQuotedIds, m_bAnsiNulls, \
                m_bShowQP, m_bStatsTime,
m_bStatsIO;
        long                m_lRowCount;
        SQLUINTEGER         m_lQueryTmout;
        _bstr_t             m_ErrorFile, m_OutputFile;
        BOOL                m_bAbort;

private:
inline BOOL IsServerMessage(SQLINTEGER lNativeError, UCHAR *szErr){
    return( (strstr((LPCTSTR)szErr, SM_MSG_SERVER) != NULL) ?
(lNativeError == 0) : FALSE); }
inline BOOL IsODBCWarning(UCHAR *szSqlState){
    return(strcmp((LPCSTR)szSqlState, SM_SQL_STATE_WARNING) == 0);}
inline BOOL IsErrorReturn(SQLRETURN iRetCode){
    return( (!SQL_SUCCEEDED(iRetCode)) && (iRetCode !=
SQL_NO_DATA) );}
inline LPCSTR ParseOdbcMsgPrefixes(LPCSTR szMsg){ char *pDest;
    return( (pDest = strstr(szMsg, SM_MSG_SERVER)) == NULL ? szMsg :
pDest + strlen(SM_MSG_SERVER));}
inline BOOL IsDynamicConnection(){ return(!strcmp((LPSTR)m_szConnection,
""));}
inline void HandleODBCError(SQLRETURN rc, SWORD fHandleType, SQLHANDLE
handle, OdbcOperations OdbcOp)
{
    if (rc != SQL_SUCCESS)
    {
        LogODBCErrors(rc, fHandleType, handle, OdbcOp);
        if (IsErrorReturn(rc))
            throw new CODBCError(rc, fHandleType, handle,
OdbcOp);
    }
    return;
};

class CExecError
{
public:

```

```

typedef enum ExecErrorCodes
{
        SM_ERR_CONN_IN_USE,
};

CExecError(int iError)
{
        m_iErrCode    = iError;
};

void                LogErrors(CExecute *p);

private:
        int                m_iErrCode;
        static char        *m_szExecErrorDesc[];

void                ExecutionThread(LPVOID lpParameter);

#ifdef _TPCH_AUDIT
        void                WriteFileToTpchLog(LPSTR szFile, LPSTR
szFmt);
        void                WriteToTpchLog(char *szMsg);
#endif

#endif // __EXECUTE_H_

```

## ExecuteDll.cpp

```

// FILE:                ExecuteDll.cpp
//                    Microsoft TPC-H Kit Ver. 1.00
//                    Copyright Microsoft, 1999
//                    All Rights Reserved
//
//
// PURPOSE:            Implementation of DLL Exports.
// Contact:            Reshma Tharamal (reshmat@microsoft.com)
//
//
// Note: Proxy/Stub Information
//       To build a separate proxy/stub DLL,
//       run nmake -f ExecuteDllps.mk in the project directory.

#include "stdafx.h"
#include "resource.h"
#include <initguid.h>

#include "..\LogWriter\LogWriter.h"
#include "..\LogWriter\LogWriter_i.c"

#include "..\common\SMTime\SMTime.h"
#include "..\common\SMTime\SMTime_i.c"

#include "ExecuteDll.h"
#include "SMExecute.h"

```

```

#include "ExecuteDll_i.c"
#include "Execute.h"

CComModule _Module;

BEGIN_OBJECT_MAP(ObjectMap)
OBJECT_ENTRY(CLSID_Execute, CExecute)
END_OBJECT_MAP()

SQLHENV henv = NULL;
    // ODBC environment handle

static char szCaption[] = "StepMaster";
    // Message box caption

CRITICAL_SECTION hConnections;
    // Critical section to serialize access to available
connections
SM_Connection_Info *p_Connections = NULL;    //
Pointer to open connections
int iConnectionCount = 0;
    // Number of open connections

#ifdef _TPCH_AUDIT
FILE *pfLogFile = NULL;
    // Log file containing timestamps
CRITICAL_SECTION hLogFileWrite;
    // Critical section to serialize writes to log

static char szFileOpenModeAppend[] = "a+";    //
Log file open mode

static char szEnvVarLogFile[] = "TPCH_LOG_FILE";    //
Environment variable - initialized to

    // log file name if timing
information

    // is to be logged

#endif

void ShowODBCErrors(SWORD fHandleType, SQLHANDLE handle);
void CloseOpenConnections();

////////////////////////////////////
/////
// DLL Entry Point

extern "C"
BOOL WINAPI DllMain(HINSTANCE hInstance, DWORD dwReason, LPVOID
/*lpReserved*/)
{
    if (dwReason == DLL_PROCESS_ATTACH)
    {

```

```

_Module.Init(ObjectMap, hInstance, &LIBID_EXECUTEDLLLib);
DisableThreadLibraryCalls(hInstance);

#ifdef _TPCH_AUDIT
char szMsg[MAXBUFLLEN];
LPSTR szLogFileName = getenv(szEnvVarLogFile);

if (szLogFileName == NULL)
{
    sprintf(szMsg, "The environment variable '%s' does
not exist. "
"Step timing information will not be
written to a log.", szEnvVarLogFile);
    MessageBox(NULL, szMsg, szCaption, MB_OK);
}
else
{
    if ( (pfLogFile = fopen(szLogFileName,
szFileOpenModeAppend)) == NULL )
    {
        sprintf(szMsg, "The file '%s' does not
exist. "
"Step timing information will not
be written to log.", szLogFileName);
        MessageBox(NULL, szMsg, szCaption, MB_OK);
    }
    else
        InitializeCriticalSection(&hLogFileWrite);
}
#endif

InitializeCriticalSection(&hConnections);

p_Connections = NULL;
iConnectionCount = 0;

if (!SQL_SUCCEEDED(SQLSetEnvAttr(NULL,
SQL_ATTR_CONNECTION_POOLING, (SQLPOINTER)SQL_CP_ONE_PER_HENV , 0)))
    ShowODBCErrors(SQL_HANDLE_ENV, henv);

if (!SQL_SUCCEEDED(SQLAllocHandle(SQL_HANDLE_ENV,
SQL_NULL_HANDLE, &henv)))
{
    ShowODBCErrors(SQL_HANDLE_ENV, henv);
    return FALSE;
}

if (!SQL_SUCCEEDED(SQLSetEnvAttr(henv,
SQL_ATTR_ODBC_VERSION, (LPVOID)SQL_OV_ODBC3, 0)))
    ShowODBCErrors(SQL_HANDLE_ENV, henv);

SQLINTEGER CpMatch;
if (!SQL_SUCCEEDED(SQLGetEnvAttr(henv, SQL_ATTR_CP_MATCH,
&CpMatch, 0, NULL)))
    ShowODBCErrors(SQL_HANDLE_ENV, henv);

```

```

        if (!SQL_SUCCEEDED(SQLSetEnvAttr(henv, SQL_ATTR_CP_MATCH,
(SQLPOINTER)SQL_CP_STRICT_MATCH, SQL_IS_INTEGER)))
            ShowODBCErrors(SQL_HANDLE_ENV, henv);
    }
    else if (dwReason == DLL_PROCESS_DETACH)
    {
#ifdef _TPCH_AUDIT
        if (pfLogFile != NULL)
        {
            fclose(pfLogFile);

            DeleteCriticalSection(&hLogFileWrite);
        }
#endif

        CloseOpenConnections();

        if (henv != NULL)
            SQLFreeEnv(henv);

        DeleteCriticalSection(&hConnections);

        _Module.Term();
    }
    return TRUE;    // ok
}

void ShowODBCErrors(SWORD fHandleType, SQLHANDLE handle)
{
    UCHAR        szErrState[SQL_SQLSTATE_SIZE+1];    //
SQL Error State string
    UCHAR        szErrMsg[SQL_MAX_MESSAGE_LENGTH+1];    // SQL
Error Text string
    char
    szBuffer[SQL_SQLSTATE_SIZE+SQL_MAX_MESSAGE_LENGTH+MAXBUFLen+1] =
"";

        // formatted Error text Buffer
    SWORD        wErrMsgLen;
        // Error message length
    SQLINTEGER   dwErrCode;
        // Native Error code
    SQLRETURN    nErrResult;
        // Return Code from SQLGetDiagRec
    SWORD        sMsgNum = 1;
        // Error sequence number

        // call SQLGetDiagRec function with proper ODBC handles,
repeatedly until
        // function returns SQL_NO_DATA.
    while ((nErrResult = SQLGetDiagRec(fHandleType, handle, sMsgNum++,
szErrState, &dwErrCode, szErrMsg,
SQL_MAX_MESSAGE_LENGTH-1, &wErrMsgLen))
!= SQL_NO_DATA)

```

```

    {
        if (!SQL_SUCCEEDED(nErrResult))
            break;

        wsprintf(szBuffer, SM_SQLERR_FORMAT, (LPSTR)szErrState,
dwErrCode, (LPSTR)szErrMsg);

        MessageBox(NULL, szBuffer, szCaption, MB_OK);
    }
}

void CloseOpenConnections()
{
    // Closes all open connections

    if (p_Connections)
    {
        for (int iConnIndex = iConnectionCount - 1; iConnIndex >=
0; iConnIndex--)
        {
            if ((p_Connections + iConnIndex)->hdbc !=
SQL_NULL_HDBC)
            {
#ifdef _DEBUG
                _CrtDbgReport(_CRT_WARN, NULL, 0, NULL,
"Executing SQLDisconnect.\n");
#endif
                SQLDisconnect((p_Connections +
iConnIndex)->hdbc);
#ifdef _DEBUG
                _CrtDbgReport(_CRT_WARN, NULL, 0, NULL,
"Executing SQLFreeHandle for hdbc.\n");
#endif
                SQLFreeHandle(SQL_HANDLE_DBC,
(p_Connections + iConnIndex)->hdbc );
                (p_Connections + iConnIndex)->hdbc =
SQL_NULL_HDBC;
            }
        }

        free(p_Connections);
    }
    p_Connections = NULL;

    return;
}

////////////////////////////////////
////
// Used to determine whether the DLL can be unloaded by OLE
STDAPI DllCanUnloadNow(void)
{
    return (_Module.GetLockCount()==0) ? S_OK : S_FALSE;
}

```

```

////////////////////////////////////
////
// Returns a class factory to create an object of the requested type

STDAPI DllGetClassObject(REFCLSID rclsid, REFIID riid, LPVOID* ppv)
{
    return _Module.GetClassObject(rclsid, riid, ppv);
}

////////////////////////////////////
////
// DllRegisterServer - Adds entries to the system registry

STDAPI DllRegisterServer(void)
{
    // registers object, typelib and all interfaces in typelib
    return _Module.RegisterServer(TRUE);
}

////////////////////////////////////
////
// DllUnregisterServer - Removes entries from the system registry

STDAPI DllUnregisterServer(void)
{
    return _Module.UnregisterServer(TRUE);
}

```

## ExecuteDll.h

```

/* this ALWAYS GENERATED file contains the definitions for the
interfaces */

```

```

/* File created by MIDL compiler version 5.01.0164 */
/* at Mon Jun 09 19:33:03 2003
*/
/* Compiler settings for
C:\charles\Stepmaster\ExecuteDll\ExecuteDll.idl:
    Oicf (OptLev=i2), W1, Zp8, env=Win32, ms_ext, c_ext
    error checks: allocation ref bounds_check enum stub_data
*/
@@@MIDL_FILE_HEADING(  )

/* verify that the <rpcndr.h> version is high enough to compile this
file*/
#ifndef __REQUIRED_RPCNDR_H_VERSION__
#define __REQUIRED_RPCNDR_H_VERSION__ 440
#endif

#include "rpc.h"
#include "rpcndr.h"

#ifndef __ExecuteDll_h__

```

```

#define __ExecuteDll_h__

#ifdef __cplusplus
extern "C"{
#endif

/* Forward Declarations */

#ifndef __IExecuteEvents_FWD_DEFINED__
#define __IExecuteEvents_FWD_DEFINED__
typedef interface IExecuteEvents IExecuteEvents;
#endif /* __IExecuteEvents_FWD_DEFINED__ */

#ifndef __IExecute_FWD_DEFINED__
#define __IExecute_FWD_DEFINED__
typedef interface IExecute IExecute;
#endif /* __IExecute_FWD_DEFINED__ */

#ifndef __Execute_FWD_DEFINED__
#define __Execute_FWD_DEFINED__

#ifdef __cplusplus
typedef class Execute Execute;
#else
typedef struct Execute Execute;
#endif /* __cplusplus */

#endif /* __Execute_FWD_DEFINED__ */

/* header files for imported files */
#include "oaidl.h"
#include "ocidl.h"

void __RPC_FAR * __RPC_USER MIDL_user_allocate(size_t);
void __RPC_USER MIDL_user_free( void __RPC_FAR * );

/* interface __MIDL_itf_ExecuteDll_0000 */
/* [local] */

typedef /* [helpstring][uuid] */
enum ExecutionType
{
    execODBC          = 0x1,
    execShell         = 0x2,
} ExecutionType;

typedef /* [helpstring][uuid] */
enum InstanceStatus
{
    gintDisabled     = 0x1,
    gintPending      = 0x2,
    gintRunning      = 0x3,
    gintComplete     = 0x4,
    gintFailed       = 0x5,
    gintAborted      = 0x6
}

```

```

    } InstanceStatus;

extern RPC_IF_HANDLE __MIDL_itf_Executedll_0000_v0_0_c_ifspec;
extern RPC_IF_HANDLE __MIDL_itf_Executedll_0000_v0_0_s_ifspec;

#ifdef __EXECUTEDLLLib_LIBRARY_DEFINED__
#define __EXECUTEDLLLib_LIBRARY_DEFINED__

/* library EXECUTEDLLLib */
/* [helpstring][version][uuid] */

EXTERN_C const IID LIBID_EXECUTEDLLLib;

#ifdef __IExecuteEvents_DISPINTERFACE_DEFINED__
#define __IExecuteEvents_DISPINTERFACE_DEFINED__

/* dispinterface IExecuteEvents */
/* [helpstring][uuid] */

EXTERN_C const IID DIID_IExecuteEvents;

#if defined(__cplusplus) && !defined(CINTERFACE)

    MIDL_INTERFACE("551AC532-AB1C-11D2-BC0C-00A0C90D2CA5")
    _IExecuteEvents : public IDispatch
    {
    };

#else /* C style interface */

    typedef struct _IExecuteEventsVtbl
    {
        BEGIN_INTERFACE

        HRESULT ( STDMETHODCALLTYPE *_QueryInterface ) (
            _IExecuteEvents __RPC_FAR * This,
            /* [in] */ REFIID riid,
            /* [iid_is][out] */ void __RPC_FAR * __RPC_FAR *ppvObject);

        ULONG ( STDMETHODCALLTYPE *_AddRef ) (
            _IExecuteEvents __RPC_FAR * This);

        ULONG ( STDMETHODCALLTYPE *_Release ) (
            _IExecuteEvents __RPC_FAR * This);

        HRESULT ( STDMETHODCALLTYPE *_GetTypeInfoCount ) (
            _IExecuteEvents __RPC_FAR * This,
            /* [out] */ UINT __RPC_FAR *pctinfo);

        HRESULT ( STDMETHODCALLTYPE *_GetTypeInfo ) (
            /* [in] */ UINT iTInfo,
            /* [in] */ LCID lcid,
            /* [out] */ ITypeInfo __RPC_FAR * __RPC_FAR *ppTInfo);

        HRESULT ( STDMETHODCALLTYPE *_GetIDsOfNames ) (
            /* [in] */ REFIID riid,
            /* [size_is][in] */ LPOLESTR __RPC_FAR *rgszNames,
            /* [in] */ UINT cNames,
            /* [in] */ LCID lcid,
            /* [size_is][out] */ DISPID __RPC_FAR *rgDispId);

        /* [local] */ HRESULT ( STDMETHODCALLTYPE *_Invoke ) (
            _IExecuteEvents __RPC_FAR * This,
            /* [in] */ DISPID dispIdMember,
            /* [in] */ REFIID riid,
            /* [in] */ LCID lcid,
            /* [in] */ WORD wFlags,
            /* [out][in] */ DISPPARAMS __RPC_FAR *pDispParams,
            /* [out] */ VARIANT __RPC_FAR *pVarResult,
            /* [out] */ EXCEPINFO __RPC_FAR *pExcepInfo,
            /* [out] */ UINT __RPC_FAR *puArgErr);

        END_INTERFACE
    } _IExecuteEventsVtbl;

    interface _IExecuteEvents
    {
        CONST_VTBL struct _IExecuteEventsVtbl __RPC_FAR *lpVtbl;
    };

#endif COBJMACROS

#define _IExecuteEvents_QueryInterface(This,riid,ppvObject) \
    (This)->lpVtbl -> QueryInterface(This,riid,ppvObject)

#define _IExecuteEvents_AddRef(This) \
    (This)->lpVtbl -> AddRef(This)

#define _IExecuteEvents_Release(This) \
    (This)->lpVtbl -> Release(This)

#define _IExecuteEvents_GetTypeInfoCount(This,pctinfo) \
    (This)->lpVtbl -> GetTypeInfoCount(This,pctinfo)

#define _IExecuteEvents_GetTypeInfo(This,iTInfo,lcid,ppTInfo) \
    (This)->lpVtbl -> GetTypeInfo(This,iTInfo,lcid,ppTInfo)

#define _IExecuteEvents_GetIDsOfNames(This,riid,rgszNames,cNames,lcid,rgDispId) \
    (This)->lpVtbl -> GetIDsOfNames(This,riid,rgszNames,cNames,lcid,rgDispId)

```

```

(This)->lpVtbl ->
GetIDsOfNames(This, riid, rgpszNames, cNames, lcid, rgDispId)

#define
_IExecuteEvents_Invoke(This, dispIdMember, riid, lcid, wFlags, pDispParams, pV
arResult, pExcepInfo, puArgErr) \
(This)->lpVtbl ->
Invoke(This, dispIdMember, riid, lcid, wFlags, pDispParams, pVarResult, pExcepI
nfo, puArgErr)
#endif /* COBJMACROS */

#endif /* C style interface */

#endif /* __IExecuteEvents_DISPINTERFACE_DEFINED__ */

#ifndef __IExecute_INTERFACE_DEFINED__
#define __IExecute_INTERFACE_DEFINED__

/* interface IExecute */
/* [unique][helpstring][dual][uuid][object] */

EXTERN_C const IID IID_IExecute;

#if defined(__cplusplus) && !defined(CINTERFACE)

MIDL_INTERFACE("551AC531-AB1C-11D2-BC0C-00A0C90D2CA5")
IExecute : public IDispatch
{
public:
    virtual /* [helpstring][id] */ HRESULT STDMETHODCALLTYPE
DoExecute(
    /* [in] */ BSTR szCommand,
    /* [in] */ BSTR szExecutionDtls,
    /* [in] */ ExecutionType ExecMethod,
    /* [in] */ BOOL bNoCount,
    /* [in] */ BOOL bNoExecute,
    /* [in] */ BOOL bParseOnly,
    /* [in] */ BOOL bQuotedIds,
    /* [in] */ BOOL bAnsiNulls,
    /* [in] */ BOOL bShowQP,
    /* [in] */ BOOL bStatsTime,
    /* [in] */ BOOL bStatsIO,
    /* [in] */ long lRowCount,
    /* [in] */ long lQueryTmout,
    /* [in] */ BSTR szConnection) = 0;

    virtual /* [helpstring][id][propget] */ HRESULT
STDMETHODCALLTYPE get_StepStatus(
    /* [retval][out] */ InstanceStatus __RPC_FAR *pVal) = 0;

```

```

    virtual /* [helpstring][id] */ HRESULT STDMETHODCALLTYPE
Abort( void) = 0;

    virtual /* [helpstring][id] */ HRESULT STDMETHODCALLTYPE
WriteError(
    BSTR szMsg) = 0;

    virtual /* [helpstring][id][propput] */ HRESULT
STDMETHODCALLTYPE put_OutputFile(
    /* [in] */ BSTR newVal) = 0;

    virtual /* [helpstring][id][propput] */ HRESULT
STDMETHODCALLTYPE put_ErrorFile(
    /* [in] */ BSTR newVal) = 0;

};

#else /* C style interface */

typedef struct IExecuteVtbl
{
    BEGIN_INTERFACE

    HRESULT ( STDMETHODCALLTYPE __RPC_FAR *QueryInterface )(
        IExecute __RPC_FAR * This,
        /* [in] */ REFIID riid,
        /* [iid_is][out] */ void __RPC_FAR * __RPC_FAR *ppvObject);

    ULONG ( STDMETHODCALLTYPE __RPC_FAR *AddRef )(
        IExecute __RPC_FAR * This);

    ULONG ( STDMETHODCALLTYPE __RPC_FAR *Release )(
        IExecute __RPC_FAR * This);

    HRESULT ( STDMETHODCALLTYPE __RPC_FAR *GetTypeInfoCount )(
        IExecute __RPC_FAR * This,
        /* [out] */ UINT __RPC_FAR *pctinfo);

    HRESULT ( STDMETHODCALLTYPE __RPC_FAR *GetTypeInfo )(
        IExecute __RPC_FAR * This,
        /* [in] */ UINT iTInfo,
        /* [in] */ LCID lcid,
        /* [out] */ ITypeInfo __RPC_FAR * __RPC_FAR *ppTInfo);

    HRESULT ( STDMETHODCALLTYPE __RPC_FAR *GetIDsOfNames )(
        IExecute __RPC_FAR * This,
        /* [in] */ REFIID riid,
        /* [size_is][in] */ LPOLESTR __RPC_FAR *rgpszNames,
        /* [in] */ UINT cNames,
        /* [in] */ LCID lcid,
        /* [size_is][out] */ DISPID __RPC_FAR *rgDispId);

    /* [local] */ HRESULT ( STDMETHODCALLTYPE __RPC_FAR *Invoke )(
        IExecute __RPC_FAR * This,
        /* [in] */ DISPID dispIdMember,
        /* [in] */ REFIID riid,

```

```

    /* [in] */ LCID lcid,
    /* [in] */ WORD wFlags,
    /* [out][in] */ DISPPARAMS __RPC_FAR *pDispParams,
    /* [out] */ VARIANT __RPC_FAR *pVarResult,
    /* [out] */ EXCEPINFO __RPC_FAR *pExcepInfo,
    /* [out] */ UINT __RPC_FAR *puArgErr);

    /* [helpstring][id] */ HRESULT ( STDMETHODCALLTYPE __RPC_FAR
*DoExecute )(
    IExecute __RPC_FAR * This,
    /* [in] */ BSTR szCommand,
    /* [in] */ BSTR szExecutionDtls,
    /* [in] */ ExecutionType ExecMethod,
    /* [in] */ BOOL bNoCount,
    /* [in] */ BOOL bNoExecute,
    /* [in] */ BOOL bParseOnly,
    /* [in] */ BOOL bQuotedIds,
    /* [in] */ BOOL bAnsiNulls,
    /* [in] */ BOOL bShowQP,
    /* [in] */ BOOL bStatsTime,
    /* [in] */ BOOL bStatsIO,
    /* [in] */ long lRowCount,
    /* [in] */ long lQueryTmout,
    /* [in] */ BSTR szConnection);

    /* [helpstring][id][propget] */ HRESULT ( STDMETHODCALLTYPE
__RPC_FAR *get_StepStatus )(
    IExecute __RPC_FAR * This,
    /* [retval][out] */ InstanceStatus __RPC_FAR *pVal);

    /* [helpstring][id] */ HRESULT ( STDMETHODCALLTYPE __RPC_FAR
*Abort )(
    IExecute __RPC_FAR * This);

    /* [helpstring][id] */ HRESULT ( STDMETHODCALLTYPE __RPC_FAR
*WriteError )(
    IExecute __RPC_FAR * This,
    BSTR szMsg);

    /* [helpstring][id][propput] */ HRESULT ( STDMETHODCALLTYPE
__RPC_FAR *put_OutputFile )(
    IExecute __RPC_FAR * This,
    /* [in] */ BSTR newVal);

    /* [helpstring][id][propput] */ HRESULT ( STDMETHODCALLTYPE
__RPC_FAR *put_ErrorFile )(
    IExecute __RPC_FAR * This,
    /* [in] */ BSTR newVal);

    END_INTERFACE
} IExecuteVtbl;

interface IExecute
{
    CONST_VTBL struct IExecuteVtbl __RPC_FAR *lpVtbl;
};

```

```
#ifdef COBJMACROS
```

```
#define IExecute_QueryInterface(This,riid,ppvObject) \
(This)->lpVtbl -> QueryInterface(This,riid,ppvObject)
```

```
#define IExecute_AddRef(This) \
(This)->lpVtbl -> AddRef(This)
```

```
#define IExecute_Release(This) \
(This)->lpVtbl -> Release(This)
```

```
#define IExecute_GetTypeInfoCount(This,pctinfo) \
(This)->lpVtbl -> GetTypeInfoCount(This,pctinfo)
```

```
#define IExecute_GetTypeInfo(This,iTInfo,lcid,ppTInfo) \
(This)->lpVtbl -> GetTypeInfo(This,iTInfo,lcid,ppTInfo)
```

```
#define IExecute_GetIDsOfNames(This,riid,rgszNames,cNames,lcid,rgDispId) \
(This)->lpVtbl ->
GetIDsOfNames(This,riid,rgszNames,cNames,lcid,rgDispId)
```

```
#define
IExecute_Invoke(This,dispIdMember,riid,lcid,wFlags,pDispParams,pVarResult,pExcepInfo,puArgErr) \
(This)->lpVtbl ->
Invoke(This,dispIdMember,riid,lcid,wFlags,pDispParams,pVarResult,pExcepInfo,puArgErr)
```

```
#define
IExecute_DoExecute(This,szCommand,szExecutionDtls,ExecMethod,bNoCount,bNoExecute,bParseOnly,bQuotedIds,bAnsiNulls,bShowQP,bStatsTime,bStatsIO,lRowCount,lQueryTmout,szConnection) \
(This)->lpVtbl ->
DoExecute(This,szCommand,szExecutionDtls,ExecMethod,bNoCount,bNoExecute,bParseOnly,bQuotedIds,bAnsiNulls,bShowQP,bStatsTime,bStatsIO,lRowCount,lQueryTmout,szConnection)
```

```
#define IExecute_get_StepStatus(This,pVal) \
(This)->lpVtbl -> get_StepStatus(This,pVal)
```

```
#define IExecute_Abort(This) \
(This)->lpVtbl -> Abort(This)
```

```
#define IExecute_WriteError(This,szMsg) \
(This)->lpVtbl -> WriteError(This,szMsg)
```

```
#define IExecute_put_OutputFile(This,newVal) \
(This)->lpVtbl -> put_OutputFile(This,newVal)
```



```

#define IExecute_put_ErrorFile(This,newVal) \
    (This)->lpVtbl -> put_ErrorFile(This,newVal)
    PRPC_MESSAGE _pRpcMessage,
    DWORD *_pdwStubPhase);

#endif /* COBJMACROS */

#endif /* C style interface */

/* [helpstring][id] */ HRESULT STDMETHODCALLTYPE
IExecute_DoExecute_Proxy(
    IExecute __RPC_FAR * This,
    /* [in] */ BSTR szCommand,
    /* [in] */ BSTR szExecutionDtls,
    /* [in] */ ExecutionType ExecMethod,
    /* [in] */ BOOL bNoCount,
    /* [in] */ BOOL bNoExecute,
    /* [in] */ BOOL bParseOnly,
    /* [in] */ BOOL bQuotedIds,
    /* [in] */ BOOL bAnsiNulls,
    /* [in] */ BOOL bShowQP,
    /* [in] */ BOOL bStatsTime,
    /* [in] */ BOOL bStatsIO,
    /* [in] */ long lRowCount,
    /* [in] */ long lQueryTmout,
    /* [in] */ BSTR szConnection);

void __RPC_STUB IExecute_DoExecute_Stub(
    IRpcStubBuffer *This,
    IRpcChannelBuffer *_pRpcChannelBuffer,
    PRPC_MESSAGE _pRpcMessage,
    DWORD *_pdwStubPhase);

/* [helpstring][id][propget] */ HRESULT STDMETHODCALLTYPE
IExecute_get_StepStatus_Proxy(
    IExecute __RPC_FAR * This,
    /* [retval][out] */ InstanceStatus __RPC_FAR *pVal);

void __RPC_STUB IExecute_get_StepStatus_Stub(
    IRpcStubBuffer *This,
    IRpcChannelBuffer *_pRpcChannelBuffer,
    PRPC_MESSAGE _pRpcMessage,
    DWORD *_pdwStubPhase);

/* [helpstring][id] */ HRESULT STDMETHODCALLTYPE IExecute_Abort_Proxy(
    IExecute __RPC_FAR * This);

void __RPC_STUB IExecute_Abort_Stub(
    IRpcStubBuffer *This,
    IRpcChannelBuffer *_pRpcChannelBuffer,

    PRPC_MESSAGE _pRpcMessage,
    DWORD *_pdwStubPhase);

/* [helpstring][id] */ HRESULT STDMETHODCALLTYPE
IExecute_WriteError_Proxy(
    IExecute __RPC_FAR * This,
    BSTR szMsg);

void __RPC_STUB IExecute_WriteError_Stub(
    IRpcStubBuffer *This,
    IRpcChannelBuffer *_pRpcChannelBuffer,
    PRPC_MESSAGE _pRpcMessage,
    DWORD *_pdwStubPhase);

/* [helpstring][id][propput] */ HRESULT STDMETHODCALLTYPE
IExecute_put_OutputFile_Proxy(
    IExecute __RPC_FAR * This,
    /* [in] */ BSTR newVal);

void __RPC_STUB IExecute_put_OutputFile_Stub(
    IRpcStubBuffer *This,
    IRpcChannelBuffer *_pRpcChannelBuffer,
    PRPC_MESSAGE _pRpcMessage,
    DWORD *_pdwStubPhase);

/* [helpstring][id][propput] */ HRESULT STDMETHODCALLTYPE
IExecute_put_ErrorFile_Proxy(
    IExecute __RPC_FAR * This,
    /* [in] */ BSTR newVal);

void __RPC_STUB IExecute_put_ErrorFile_Stub(
    IRpcStubBuffer *This,
    IRpcChannelBuffer *_pRpcChannelBuffer,
    PRPC_MESSAGE _pRpcMessage,
    DWORD *_pdwStubPhase);

#endif /* __IExecute_INTERFACE_DEFINED__ */

EXTERN_C const CLSID CLSID_Execute;

#ifdef __cplusplus

class DECLSPEC_UUID("2EFC198E-AA8D-11D2-BC0C-00A0C90D2CA5")
Execute;
#endif
#endif /* __EXECUTEDLLLib_LIBRARY_DEFINED__ */

```

```
/* Additional Prototypes for ALL interfaces */
```

```
/* end of Additional Prototypes */
```

```
#ifdef __cplusplus
```

```
}
```

```
#endif
```

```
#endif
```

## ExecuteDllCP.h

```
// FILE:      ExecuteDllCP.h
//           Microsoft TPC-H Kit Ver. 1.00
//           Copyright Microsoft, 1999
//           All Rights Reserved
//
//
```

```
// PURPOSE:   Connection point implementation
// Contact:   Reshma Tharamal (reshmat@microsoft.com)
```

```
#ifndef _EXECUTEDLLCP_H_
```

```
#define _EXECUTEDLLCP_H_
```

```
template <class T>
class CProxy_IExecuteEvents : public IConnectionPointImpl<T,
&DIID_IExecuteEvents, CComDynamicUnkArray>
{
    //Warning this class may be recreated by the wizard.
public:
    VOID Fire_Start(CY StartTime)
    {
        T* pT = static_cast<T*>(this);
        int nConnectionIndex;
        CComVariant* pvars = new CComVariant[1];
        int nConnections = m_vec.GetSize();

        for (nConnectionIndex = 0; nConnectionIndex <
nConnections; nConnectionIndex++)
        {
            pT->Lock();
            CComPtr<IUnknown> sp =
m_vec.GetAt(nConnectionIndex);
            pT->Unlock();
            IDispatch* pDispatch =
reinterpret_cast<IDispatch*>(sp.p);
            if (pDispatch != NULL)
            {
                pvars[0] = StartTime;
                DISPPARAMS disp = { pvars, NULL, 1, 0 };

```

```
                pDispatch->Invoke(0x1, IID_NULL,
LOCALE_USER_DEFAULT, DISPATCH_METHOD, &disp, NULL, NULL, NULL);
            }
        }
        delete[] pvars;
    }
    VOID Fire_Complete(CY EndTime, LONG Elapsed)
    {
        T* pT = static_cast<T*>(this);
        int nConnectionIndex;
        CComVariant* pvars = new CComVariant[2];
        int nConnections = m_vec.GetSize();

        for (nConnectionIndex = 0; nConnectionIndex <
nConnections; nConnectionIndex++)
        {
            pT->Lock();
            CComPtr<IUnknown> sp =
m_vec.GetAt(nConnectionIndex);
            pT->Unlock();
            IDispatch* pDispatch =
reinterpret_cast<IDispatch*>(sp.p);
            if (pDispatch != NULL)
            {
                pvars[1] = EndTime;
                pvars[0] = Elapsed;
                DISPPARAMS disp = { pvars, NULL, 2, 0 };
                pDispatch->Invoke(0x2, IID_NULL,
LOCALE_USER_DEFAULT, DISPATCH_METHOD, &disp, NULL, NULL, NULL);
            }
        }
        delete[] pvars;
    }
};
#endif
```

## resource.h

```
// FILE:      resource.h
//           Microsoft TPC-H Kit Ver. 1.00
//           Copyright Microsoft, 1999
//           All Rights Reserved
//
//
// PURPOSE:   Resource file
// Contact:   Reshma Tharamal (reshmat@microsoft.com)
//
//{{NO_DEPENDENCIES}}
// Microsoft Developer Studio generated include file.
// Used by ExecuteDll.rc
//
#define IDS_PROJNAME                100
#define IDR_EXECUTE                 101
#define IDR_LOG                     102
```

```

#define IDR_EXECUTESHELL                103
#define SM_SYSTEM_ERROR                 0x0201

// Next default values for new objects
//
#ifdef APSTUDIO_INVOKED
#ifndef APSTUDIO_READONLY_SYMBOLS
#define _APS_NEXT_RESOURCE_VALUE        201
#define _APS_NEXT_COMMAND_VALUE        32768
#define _APS_NEXT_CONTROL_VALUE        201
#define _APS_NEXT_SYMED_VALUE          104
#endif
#endif

```

## SMExecute.h

```

// FILE:      SMLExecute.h
//            Microsoft TPC-H Kit Ver. 1.00
//            Copyright Microsoft, 1999
//            All Rights Reserved
//
// PURPOSE:   Common include file for Execute.cpp and ExecuteDll.cpp
// Contact:   Reshma Tharamal (reshmat@microsoft.com)
//
#pragma once

// ODBC-specific includes
#define DBNTWIN32
#include <sqltypes.h>
#include <sql.h>
#include <sqlext.h>

#define CONNECTION_NAME_LEN 256          // connection name length

typedef struct _SM_Connection_Info
{
    char      szConnectionName[CONNECTION_NAME_LEN];
    HDBC      hdbc;
    BOOL      bInUse;
} SM_Connection_Info;

```

## StdAfx.cpp

```

// FILE:      stdafx.cpp
//            Microsoft TPC-H Kit Ver. 1.00
//            Copyright Microsoft, 1999
//            All Rights Reserved
//
// PURPOSE:   source file that includes just the standard includes
// Contact:   Reshma Tharamal (reshmat@microsoft.com)
//
// stdafx.cpp : source file that includes just the standard includes

```

```

// stdafx.pch will be the pre-compiled header
// stdafx.obj will contain the pre-compiled type information

```

```

#include "stdafx.h"

#ifdef _ATL_STATIC_REGISTRY
#include <statreg.h>
#include <statreg.cpp>
#endif

#include <atlimpl.cpp>

```

## StdAfx.h

```

// FILE:      stdafx.h
//            Microsoft TPC-H Kit Ver. 1.00
//            Copyright Microsoft, 1999
//            All Rights Reserved
//
// PURPOSE:   include file for standard system include files,
//            or project specific include files that are used frequently,
//            but are changed infrequently
// Contact:   Reshma Tharamal (reshmat@microsoft.com)
//
#ifdef !defined(AFX_STDAFX_H__551AC528_AB1C_11D2_BC0C_00A0C90D2CA5__INCLUDE
D_)
#define AFX_STDAFX_H__551AC528_AB1C_11D2_BC0C_00A0C90D2CA5__INCLUDED_

#ifdef _MSC_VER > 1000
#pragma once
#endif // _MSC_VER > 1000

#define STRICT
#ifdef _WIN32_WINNT
#define _WIN32_WINNT 0x0400
#endif
#define _ATL_APARTMENT_THREADED

#include <atlbase.h>
//You may derive a class from CComModule and use it if you want to
override
//something, but do not change the name of _Module
extern CComModule _Module;
#include <atlcom.h>

//{{AFX_INSERT_LOCATION}}
// Microsoft Visual C++ will insert additional declarations immediately
before the previous line.

#endif
// !defined(AFX_STDAFX_H__551AC528_AB1C_11D2_BC0C_00A0C90D2CA5__INCLUDED
)

```

## F.1.2 LogWriter

### LogWriter.cpp

```
// FILE:      LogWriter.cpp
//           Microsoft TPC-H Kit Ver. 1.00
//           Copyright Microsoft, 1999
//           All Rights Reserved
//
// PURPOSE:   Implementation of DLL Exports.
// Contact:   Reshma Tharamal (reshmat@microsoft.com)
//
// LogWriter.cpp : Implementation of DLL Exports.

// Note: Proxy/Stub Information
//       To build a separate proxy/stub DLL,
//       run nmake -f LogWriterps.mk in the project directory.

#include "stdafx.h"
#include "resource.h"
#include <initguid.h>
#include "LogWriter.h"

#include "LogWriter_i.c"
#include "SMLog.h"

CComModule _Module;

BEGIN_OBJECT_MAP(ObjectMap)
OBJECT_ENTRY(CLSID_SMLog, CSMLog)
END_OBJECT_MAP()

////////////////////////////////////
/////
// DLL Entry Point

extern "C"
BOOL WINAPI DllMain(HINSTANCE hInstance, DWORD dwReason, LPVOID
/*lpReserved*/)
{
    if (dwReason == DLL_PROCESS_ATTACH)
    {
        _Module.Init(ObjectMap, hInstance, &LIBID_LOGWRITERLib);
        DisableThreadLibraryCalls(hInstance);
    }
    else if (dwReason == DLL_PROCESS_DETACH)
        _Module.Term();
    return TRUE;    // ok
}

////////////////////////////////////
/////
```

```
// Used to determine whether the DLL can be unloaded by OLE
STDAPI DllCanUnloadNow(void)
{
    return (_Module.GetLockCount()==0) ? S_OK : S_FALSE;
}

////////////////////////////////////
/////
// Returns a class factory to create an object of the requested type
STDAPI DllGetClassObject(REFCLSID rclsid, REFIID riid, LPVOID* ppv)
{
    return _Module.GetClassObject(rclsid, riid, ppv);
}

////////////////////////////////////
/////
// DllRegisterServer - Adds entries to the system registry
STDAPI DllRegisterServer(void)
{
    // registers object, typelib and all interfaces in typelib
    return _Module.RegisterServer(TRUE);
}

////////////////////////////////////
/////
// DllUnregisterServer - Removes entries from the system registry
STDAPI DllUnregisterServer(void)
{
    return _Module.UnregisterServer(TRUE);
}
```

### LogWriter.h

```
/* this ALWAYS GENERATED file contains the definitions for the
interfaces */

/* File created by MIDL compiler version 5.01.0164 */
/* at Thu Sep 19 17:49:50 2002
*/
/* Compiler settings for C:\charles\Stepmaster\LogWriter\LogWriter.idl:
Oicf (OptLev=i2), W1, Zp8, env=Win32, ms_ext, c_ext
error checks: allocation ref bounds_check enum stub_data
*/
//@@MIDL_FILE_HEADING( )

/* verify that the <rpcndr.h> version is high enough to compile this
file*/
#ifndef __REQUIRED_RPCNDR_H_VERSION__
#define __REQUIRED_RPCNDR_H_VERSION__ 440
```

```

#endif

#include "rpc.h"
#include "rpcndr.h"

#ifdef __RPCNDR_H_VERSION__
#error this stub requires an updated version of <rpcndr.h>
#endif // __RPCNDR_H_VERSION__

#ifdef COM_NO_WINDOWS_H
#include "windows.h"
#include "ole2.h"
#endif /*COM_NO_WINDOWS_H*/

#ifdef __LogWriter_h__
#define __LogWriter_h__

#ifdef __cplusplus
extern "C"{
#endif

/* Forward Declarations */

#ifdef __ISMLog_FWD_DEFINED__
#define __ISMLog_FWD_DEFINED__
typedef interface ISMLog ISMLog;
#endif /* __ISMLog_FWD_DEFINED__ */

#ifdef __ISMLogEvents_FWD_DEFINED__
#define __ISMLogEvents_FWD_DEFINED__
typedef interface __ISMLogEvents __ISMLogEvents;
#endif /* __ISMLogEvents_FWD_DEFINED__ */

#ifdef __SMLog_FWD_DEFINED__
#define __SMLog_FWD_DEFINED__

#ifdef __cplusplus
typedef class SMLog SMLog;
#else
typedef struct SMLog SMLog;
#endif /* __cplusplus */
#endif /* __SMLog_FWD_DEFINED__ */

/* header files for imported files */
#include "oaidl.h"
#include "ocidl.h"

void __RPC_FAR * __RPC_USER MIDL_user_allocate(size_t);
void __RPC_USER MIDL_user_free( void __RPC_FAR * );

#ifdef __ISMLog_INTERFACE_DEFINED__
#define __ISMLog_INTERFACE_DEFINED__

/* interface ISMLog */
/* [unique][helpstring][dual][uuid][object] */

EXTERN_C const IID IID_ISMLog;

#ifdef __cplusplus && !defined(CINTERFACE)

    MIDL_INTERFACE("5AC75DAD-1936-11D3-BC2D-00A0C90D2CA5")
    ISMLog : public IDispatch
    {
    public:
        virtual /* [helpstring][id][propput] */ HRESULT
        STDMETHODCALLTYPE put_FileHeader(
            /* [in] */ BSTR newVal) = 0;

        virtual /* [helpstring][id] */ HRESULT STDMETHODCALLTYPE
        WriteLine(
            BSTR szMsg) = 0;

        virtual /* [helpstring][id] */ HRESULT STDMETHODCALLTYPE
        WriteField(
            BSTR szMsg) = 0;

        virtual /* [helpstring][id][propput] */ HRESULT
        STDMETHODCALLTYPE put_FileName(
            /* [in] */ BSTR newVal) = 0;

        virtual /* [helpstring][id][propput] */ HRESULT
        STDMETHODCALLTYPE put_Append(
            /* [in] */ BOOL newVal) = 0;

    };
#else /* C style interface */

    typedef struct ISMLogVtbl
    {
        BEGIN_INTERFACE

        HRESULT ( STDMETHODCALLTYPE __RPC_FAR *QueryInterface )(
            ISMLog __RPC_FAR * This,
            /* [in] */ REFIID riid,
            /* [iid_is][out] */ void __RPC_FAR * __RPC_FAR *ppvObject);

        ULONG ( STDMETHODCALLTYPE __RPC_FAR *AddRef )(
            ISMLog __RPC_FAR * This);

        ULONG ( STDMETHODCALLTYPE __RPC_FAR *Release )(
            ISMLog __RPC_FAR * This);

        HRESULT ( STDMETHODCALLTYPE __RPC_FAR *GetTypeInfoCount )(
            ISMLog __RPC_FAR * This,
            /* [out] */ UINT __RPC_FAR *pctinfo);
        END_INTERFACE
    } ISMLogVtbl;

    interface ISMLog
    {
        BEGIN_INTERFACE
        HRESULT ( STDMETHODCALLTYPE __RPC_FAR *QueryInterface )(
            REFIID riid, void __RPC_FAR * __RPC_FAR *ppvObject);
        ULONG ( STDMETHODCALLTYPE __RPC_FAR *AddRef )(
            void);
        ULONG ( STDMETHODCALLTYPE __RPC_FAR *Release )(
            void);
        HRESULT ( STDMETHODCALLTYPE __RPC_FAR *GetTypeInfoCount )(
            void, void);
        END_INTERFACE
    }
#endif
#endif

```

```

HRESULT ( STDMETHODCALLTYPE __RPC_FAR *GetTypeInfo ) (
    ISMLog __RPC_FAR * This,
    /* [in] */ UINT iTInfo,
    /* [in] */ LCID lcid,
    /* [out] */ ITypeInfo __RPC_FAR * __RPC_FAR *ppTInfo);

HRESULT ( STDMETHODCALLTYPE __RPC_FAR *GetIDsOfNames ) (
    ISMLog __RPC_FAR * This,
    /* [in] */ REFIID riid,
    /* [size_is][in] */ LPOLESTR __RPC_FAR *rgszNames,
    /* [in] */ UINT cNames,
    /* [in] */ LCID lcid,
    /* [size_is][out] */ DISPID __RPC_FAR *rgDispId);

/* [local] */ HRESULT ( STDMETHODCALLTYPE __RPC_FAR *Invoke ) (
    ISMLog __RPC_FAR * This,
    /* [in] */ DISPID dispIdMember,
    /* [in] */ REFIID riid,
    /* [in] */ LCID lcid,
    /* [in] */ WORD wFlags,
    /* [out][in] */ DISPPARAMS __RPC_FAR *pDispParams,
    /* [out] */ VARIANT __RPC_FAR *pVarResult,
    /* [out] */ EXCEPINFO __RPC_FAR *pExcepInfo,
    /* [out] */ UINT __RPC_FAR *puArgErr);

/* [helpstring][id][propput] */ HRESULT ( STDMETHODCALLTYPE
__RPC_FAR *put_FileHeader ) (
    ISMLog __RPC_FAR * This,
    /* [in] */ BSTR newVal);

/* [helpstring][id] */ HRESULT ( STDMETHODCALLTYPE __RPC_FAR
*WriteLine ) (
    ISMLog __RPC_FAR * This,
    BSTR szMsg);

/* [helpstring][id] */ HRESULT ( STDMETHODCALLTYPE __RPC_FAR
*WriteField ) (
    ISMLog __RPC_FAR * This,
    BSTR szMsg);

/* [helpstring][id][propput] */ HRESULT ( STDMETHODCALLTYPE
__RPC_FAR *put_FileName ) (
    ISMLog __RPC_FAR * This,
    /* [in] */ BSTR newVal);

/* [helpstring][id][propput] */ HRESULT ( STDMETHODCALLTYPE
__RPC_FAR *put_Append ) (
    ISMLog __RPC_FAR * This,
    /* [in] */ BOOL newVal);

    END_INTERFACE
} ISMLogVtbl;

interface ISMLog
{
    CONST_VTBL struct ISMLogVtbl __RPC_FAR *lpVtbl;
};
};

#ifdef COBJMACROS

#define ISMLog_QueryInterface(This,riid,ppvObject) \
    (This)->lpVtbl -> QueryInterface(This,riid,ppvObject)
#define ISMLog_AddRef(This) \
    (This)->lpVtbl -> AddRef(This)
#define ISMLog_Release(This) \
    (This)->lpVtbl -> Release(This)
#define ISMLog_GetTypeInfoCount(This,pctinfo) \
    (This)->lpVtbl -> GetTypeInfoCount(This,pctinfo)
#define ISMLog_GetTypeInfo(This,iTInfo,lcid,ppTInfo) \
    (This)->lpVtbl -> GetTypeInfo(This,iTInfo,lcid,ppTInfo)
#define ISMLog_GetIDsOfNames(This,riid,rgszNames,cNames,lcid,rgDispId) \
    (This)->lpVtbl -> \
    GetIDsOfNames(This,riid,rgszNames,cNames,lcid,rgDispId)
#define \
ISMLog_Invoke(This,dispIdMember,riid,lcid,wFlags,pDispParams,pVarResult, \
pExcepInfo,puArgErr) \
    (This)->lpVtbl -> \
    Invoke(This,dispIdMember,riid,lcid,wFlags,pDispParams,pVarResult,pExcepI \
nfo,puArgErr)
#define ISMLog_put_FileHeader(This,newVal) \
    (This)->lpVtbl -> put_FileHeader(This,newVal)
#define ISMLog_WriteLine(This,szMsg) \
    (This)->lpVtbl -> WriteLine(This,szMsg)
#define ISMLog_WriteField(This,szMsg) \
    (This)->lpVtbl -> WriteField(This,szMsg)
#define ISMLog_put_FileName(This,newVal) \
    (This)->lpVtbl -> put_FileName(This,newVal)
#define ISMLog_put_Append(This,newVal) \
    (This)->lpVtbl -> put_Append(This,newVal)
#endif /* COBJMACROS */

#endif /* C style interface */

```

```

/* [in] */ BOOL newVal);

/* [helpstring][id][propput] */ HRESULT STDMETHODCALLTYPE
ISMLog_put_FileHeader_Proxy(
    ISMLog __RPC_FAR * This,
    /* [in] */ BSTR newVal);

void __RPC_STUB ISMLog_put_FileHeader_Stub(
    IRpcStubBuffer *This,
    IRpcChannelBuffer *pRpcChannelBuffer,
    PRPC_MESSAGE _pRpcMessage,
    DWORD *_pdwStubPhase);

/* [helpstring][id] */ HRESULT STDMETHODCALLTYPE ISMLog_WriteLine_Proxy(
    ISMLog __RPC_FAR * This,
    BSTR szMsg);

void __RPC_STUB ISMLog_WriteLine_Stub(
    IRpcStubBuffer *This,
    IRpcChannelBuffer *pRpcChannelBuffer,
    PRPC_MESSAGE _pRpcMessage,
    DWORD *_pdwStubPhase);

/* [helpstring][id] */ HRESULT STDMETHODCALLTYPE
ISMLog_WriteField_Proxy(
    ISMLog __RPC_FAR * This,
    BSTR szMsg);

void __RPC_STUB ISMLog_WriteField_Stub(
    IRpcStubBuffer *This,
    IRpcChannelBuffer *pRpcChannelBuffer,
    PRPC_MESSAGE _pRpcMessage,
    DWORD *_pdwStubPhase);

/* [helpstring][id][propput] */ HRESULT STDMETHODCALLTYPE
ISMLog_put_FileName_Proxy(
    ISMLog __RPC_FAR * This,
    /* [in] */ BSTR newVal);

void __RPC_STUB ISMLog_put_FileName_Stub(
    IRpcStubBuffer *This,
    IRpcChannelBuffer *pRpcChannelBuffer,
    PRPC_MESSAGE _pRpcMessage,
    DWORD *_pdwStubPhase);

/* [helpstring][id][propput] */ HRESULT STDMETHODCALLTYPE
ISMLog_put_Append_Proxy(
    ISMLog __RPC_FAR * This,
    /* [in] */ BOOL newVal);

void __RPC_STUB ISMLog_put_Append_Stub(
    IRpcStubBuffer *This,
    IRpcChannelBuffer *pRpcChannelBuffer,
    PRPC_MESSAGE _pRpcMessage,
    DWORD *_pdwStubPhase);

#endif /* __ISMLog_INTERFACE_DEFINED__ */

#ifndef __LOGWRITERLib_LIBRARY_DEFINED__
#define __LOGWRITERLib_LIBRARY_DEFINED__

/* library LOGWRITERLib */
/* [helpstring][version][uuid] */

EXTERN_C const IID LIBID_LOGWRITERLib;

#ifndef __ISMLogEvents_DISPINTERFACE_DEFINED__
#define __ISMLogEvents_DISPINTERFACE_DEFINED__

/* dispinterface _ISMLogEvents */
/* [helpstring][uuid] */

EXTERN_C const IID DIID__ISMLogEvents;

#if defined(__cplusplus) && !defined(CINTERFACE)

    MIDL_INTERFACE("5AC75DB1-1936-11D3-BC2D-00A0C90D2CA5")
    _ISMLogEvents : public IDispatch
    {
    };

#else /* C style interface */

    typedef struct _ISMLogEventsVtbl
    {
        BEGIN_INTERFACE

        HRESULT ( STDMETHODCALLTYPE __RPC_FAR *QueryInterface )(
            _ISMLogEvents __RPC_FAR * This,
            /* [in] */ REFIID riid,
            /* [iid_is][out] */ void __RPC_FAR * __RPC_FAR *ppvObject);

        ULONG ( STDMETHODCALLTYPE __RPC_FAR *AddRef )(
            _ISMLogEvents __RPC_FAR * This);

        ULONG ( STDMETHODCALLTYPE __RPC_FAR *Release )(
            _ISMLogEvents __RPC_FAR * This);


```

```

HRESULT ( STDMETHODCALLTYPE __RPC_FAR *GetTypeInfoCount ) (
    _ISMLogEvents __RPC_FAR * This,
    /* [out] */ UINT __RPC_FAR *pctinfo);

HRESULT ( STDMETHODCALLTYPE __RPC_FAR *GetTypeInfo ) (
    _ISMLogEvents __RPC_FAR * This,
    /* [in] */ UINT iTInfo,
    /* [in] */ LCID lcid,
    /* [out] */ ITypeInfo __RPC_FAR * __RPC_FAR *ppTInfo);

HRESULT ( STDMETHODCALLTYPE __RPC_FAR *GetIDsOfNames ) (
    _ISMLogEvents __RPC_FAR * This,
    /* [in] */ REFIID riid,
    /* [size_is][in] */ LPOLESTR __RPC_FAR *rgszNames,
    /* [in] */ UINT cNames,
    /* [in] */ LCID lcid,
    /* [size_is][out] */ DISPID __RPC_FAR *rgDispId);

/* [local] */ HRESULT ( STDMETHODCALLTYPE __RPC_FAR *Invoke ) (
    _ISMLogEvents __RPC_FAR * This,
    /* [in] */ DISPID dispIdMember,
    /* [in] */ REFIID riid,
    /* [in] */ LCID lcid,
    /* [in] */ WORD wFlags,
    /* [out][in] */ DISPPARAMS __RPC_FAR *pDispParams,
    /* [out] */ VARIANT __RPC_FAR *pVarResult,
    /* [out] */ EXCEPINFO __RPC_FAR *pExcepInfo,
    /* [out] */ UINT __RPC_FAR *puArgErr);

    END_INTERFACE
} _ISMLogEventsVtbl;

interface _ISMLogEvents
{
    CONST_VTBL struct _ISMLogEventsVtbl __RPC_FAR *lpVtbl;
};

#ifdef COBJMACROS

#define _ISMLogEvents_QueryInterface(This,riid,ppvObject) \
    (This)->lpVtbl -> QueryInterface(This,riid,ppvObject)

#define _ISMLogEvents_AddRef(This) \
    (This)->lpVtbl -> AddRef(This)

#define _ISMLogEvents_Release(This) \
    (This)->lpVtbl -> Release(This)

#define _ISMLogEvents_GetTypeInfoCount(This,pctinfo) \
    (This)->lpVtbl -> GetTypeInfoCount(This,pctinfo)

```

```

#define _ISMLogEvents_GetTypeInfo(This,iTInfo,lcid,ppTInfo) \
    (This)->lpVtbl -> GetTypeInfo(This,iTInfo,lcid,ppTInfo)

#define
_ISMLogEvents_GetIDsOfNames(This,riid,rgszNames,cNames,lcid,rgDispId)
\
    (This)->lpVtbl ->
GetIDsOfNames(This,riid,rgszNames,cNames,lcid,rgDispId)

#define
_ISMLogEvents_Invoke(This,dispIdMember,riid,lcid,wFlags,pDispParams,pVar
Result,pExcepInfo,puArgErr) \
    (This)->lpVtbl ->
Invoke(This,dispIdMember,riid,lcid,wFlags,pDispParams,pVarResult,pExcepI
nfo,puArgErr)

#endif /* COBJMACROS */

#endif /* C style interface */

#endif /* ___ISMLogEvents_DISPINTERFACE_DEFINED__ */

EXTERN_C const CLSID CLSID_SMLog;

#ifdef __cplusplus

class DECLSPEC_UUID("5AC75DB0-1936-11D3-BC2D-00A0C90D2CA5")
SMLog;
#endif

#endif /* __LOGWRITERLib_LIBRARY_DEFINED__ */

/* Additional Prototypes for ALL interfaces */

unsigned long             __RPC_USER  BSTR_UserSize(      unsigned long
__RPC_FAR *, unsigned long
, BSTR __RPC_FAR * );
unsigned char __RPC_FAR * __RPC_USER  BSTR_UserMarshal(  unsigned long
__RPC_FAR *, unsigned char __RPC_FAR *, BSTR __RPC_FAR * );
unsigned char __RPC_FAR * __RPC_USER  BSTR_UserUnmarshal(unsigned long
__RPC_FAR *, unsigned char __RPC_FAR *, BSTR __RPC_FAR * );
void                      __RPC_USER  BSTR_UserFree(     unsigned long
__RPC_FAR *, BSTR __RPC_FAR * );

/* end of Additional Prototypes */

#ifdef __cplusplus
}
#endif

#endif

// FILE:          LogWriterCP.h

```

## LogWriterCP.h



```

//          Microsoft TPC-H Kit Ver. 1.00
//          Copyright Microsoft, 1999
//          All Rights Reserved
//
//
// PURPOSE:   Connection point implementation
// Contact:   Reshma Tharamal (reshmat@microsoft.com)
//
#ifndef _LOGWRITERCP_H_
#define _LOGWRITERCP_H_

template <class T>
class CProxy_ISMLogEvents : public IConnectionPointImpl<T,
&DIID_ISMLogEvents, CComDynamicUnkArray>
{
    //Warning this class may be recreated by the wizard.
public:
};
#endif

```

## resource.h

```

// FILE:      resource.h
//          Microsoft TPC-H Kit Ver. 1.00
//          Copyright Microsoft, 1999
//          All Rights Reserved
//
//
// PURPOSE:   Resource file
// Contact:   Reshma Tharamal (reshmat@microsoft.com)
//
//{{NO_DEPENDENCIES}}
// Microsoft Developer Studio generated include file.
// Used by LogWriter.rc
//
#define IDS_PROJNAME            100
#define IDR_SMLOG               101

// Next default values for new objects
//
#ifdef APSTUDIO_INVOKED
#ifndef APSTUDIO_READONLY_SYMBOLS
#define _APS_NEXT_RESOURCE_VALUE        201
#define _APS_NEXT_COMMAND_VALUE        32768
#define _APS_NEXT_CONTROL_VALUE        201
#define _APS_NEXT_SYMED_VALUE         102
#endif
#endif

```

## SMLog.cpp

```

// FILE:      SMLog.cpp
//          Microsoft TPC-H Kit Ver. 1.00
//          Copyright Microsoft, 1999
//          All Rights Reserved
//

```

```

//
// PURPOSE:   Implementation of CSMLog
// Contact:   Reshma Tharamal (reshmat@microsoft.com)
//
// SMLog.cpp : Implementation of CSMLog
#include "stdafx.h"
#include <stdio.h>
#include "LogWriter.h"
#include "SMLog.h"

////////////////////////////////////
////
// CSMLog

STDMETHODIMP CSMLog::InterfaceSupportsErrorInfo(REFIID riid)
{
    static const IID* arr[] =
    {
        &IID_ISMLog
    };
    for (int i=0; i < sizeof(arr) / sizeof(arr[0]); i++)
    {
        if (InlineIsEqualGUID(*arr[i],riid))
            return S_OK;
    }
    return S_FALSE;
}

STDMETHODIMP CSMLog::WriteToFile(BSTR szMsg)
{
    // Writes the passed in string to the file
    _bstr_t szTempMsg(szMsg);

    return(Write((PBYTE)(LPSTR)szTempMsg, SysStringLen(szMsg)));
}

HRESULT CSMLog::Init()
{
    char    szDrive[256];
    char    szDir[256];
    char    szLogDir[256];
    HANDLE  hLogThread;
    DWORD   dwThreadID;
    _bstr_t szFile(m_szFile);
    DWORD   lDisposition;

    //create transaction log directory
    _splitpath((LPCTSTR)szFile, szDrive, szDir, NULL, NULL);
    _makepath(szLogDir, szDrive, szDir, NULL, NULL);
    CreateDirectory(szLogDir, NULL);

    iBufferSize = WRITE_BUFFER_SIZE;
    iBytesFreeInBuffer = iBufferSize;

    // use VirtualAlloc to get page aligned buffers //
    for (int i=0;i<MAX_NUM_BUFFERS;i++)

```

```

    {
        // use VirtualAlloc to get page aligned buffers //
        pBuffer[i] = (BYTE *)VirtualAlloc(NULL, iBufferSize,
MEM_COMMIT, PAGE_READWRITE );
        if (pBuffer[i] == NULL)
            return RaiseSystemError();
    }

    iActiveBuffer = 0;
    pCurrent = pBuffer[iActiveBuffer];

    lDisposition = m_bAppend ? OPEN_ALWAYS : CREATE_ALWAYS;
    m_hTxnFile = CreateFile((LPCTSTR)szFile, GENERIC_WRITE,
FILE_SHARE_READ,
    NULL, lDisposition, FILE_ATTRIBUTE_NORMAL, NULL);
    if ( m_hTxnFile == INVALID_HANDLE_VALUE )
        return (RaiseSystemError());

    if (m_bAppend)
        if ( SetFilePointer(m_hTxnFile, 0, NULL, FILE_END) ==
ERR_SET_FILE_POINTER )
            return (RaiseSystemError());

    hIoComplete = CreateEvent(NULL, TRUE, TRUE, NULL);
    if ( hIoComplete == NULL)
        return RaiseSystemError();

    hLogFileIo = CreateEvent(NULL, FALSE, FALSE, NULL);
    if ( hLogFileIo == NULL)
        return RaiseSystemError();

    hLogThread = CreateThread( NULL, 0,
(LPTHREAD_START_ROUTINE)LogFileIO, this, 0, &dwThreadID );
    if (hLogThread == NULL)
        return RaiseSystemError();

    if (m_szHeader != NULL)
        WriteLine(m_szHeader);

    return S_OK;
}

void CSMLog::LogFileIO(void *ptr)
{
    unsigned long BytesWritten;
    CSMLog *p=(CSMLog *)ptr;

    while( TRUE )
    {
        WaitForSingleObject(p->hLogFileIo, INFINITE);
        if ( p->m_hTxnFile == INVALID_HANDLE_VALUE )
            break;

        // do synchronous (blocking) write to log file
        if ( !WriteFile(p->m_hTxnFile, p->pBuffer[p->iIoBuffer],
p->iWriteSize, &BytesWritten, NULL) )

```

```

    {
        // set error code in this thread, but don't throw
an exception

        // because no one will catch it.
        p->dwError = GetLastError();
    }
    SetEvent(p->hIoComplete);
}

SetEvent(p->hIoComplete);
}

HRESULT CSMLog::Write(BYTE *ptr, DWORD iSize)
{
    int StartPos, Remainder;
    int dwErrorLocal = 0;

    if (!m_bInitialized)
    {
        HRESULT hr = Init();
        m_bInitialized = TRUE;

        if (FAILED(hr))
            return hr;
    }

    if ( m_hTxnFile == INVALID_HANDLE_VALUE )
        return S_OK;

    if ( iBytesFreeInBuffer >= iSize )
    {
        memcpy(pCurrent, ptr, iSize);
        pCurrent += iSize;
        iBytesFreeInBuffer -= iSize;
    }
    else
    {
        // We don't expect to ever have to wait here, but just in
case...
        WaitForSingleObject(hIoComplete, INFINITE);

        // check for an error from the log writer thread
        if (dwError != 0)
        {
            SetLastError(dwError);
            return RaiseSystemError();
        }

        assert( iSize <= iBufferSize );
        memcpy(pCurrent, ptr, iBytesFreeInBuffer);
        StartPos = iBytesFreeInBuffer;
        Remainder = iSize - iBytesFreeInBuffer;

        // trigger an IO on the current buffer and roll to the
next buffer

```

```

        iIoBuffer = iActiveBuffer;
        iWriteSize = iBufferSize;
        ResetEvent(hIoComplete);
        SetEvent( hLogFileIo ); // wake up IO writer

        iActiveBuffer = (iActiveBuffer+1) % MAX_NUM_BUFFERS;
        pCurrent = pBuffer[iActiveBuffer];

        memcpy(pCurrent, ((BYTE *)ptr+StartPos), Remainder);
        pCurrent += Remainder;
        iBytesFreeInBuffer = iBufferSize - Remainder;
    }

    return S_OK;
}

void CSMLog::CloseLogFile(void)
{
    if ( m_hTxnFile != INVALID_HANDLE_VALUE )
    {
        if ( iBytesFreeInBuffer < iBufferSize )
        {
            WaitForSingleObject(hIoComplete, INFINITE);
            ResetEvent(hIoComplete);

            // check for an error from the log writer thread
            if (dwError != 0)
            {
                SetLastError( dwError );
                goto exit_SpinLock;
            }

            //zero fill remainder of buffer
            ZeroMemory(pCurrent, iBytesFreeInBuffer);

            iIoBuffer = iActiveBuffer;
            iWriteSize = iBufferSize - iBytesFreeInBuffer;
            SetEvent(hLogFileIo); // wake up IO writer
        }

        WaitForSingleObject(hIoComplete, INFINITE);
        // check for an error from the log writer thread
        if (dwError != 0)
            goto exit_SpinLock;

        pCurrent = pBuffer[iActiveBuffer];
        ZeroMemory(pCurrent, iBufferSize);
        iIoBuffer = iActiveBuffer;

        CloseHandle(m_hTxnFile);
        m_hTxnFile = INVALID_HANDLE_VALUE; //handle to
open transaction log file

        // wake up IO writer one more time for it to terminate
        ResetEvent(hIoComplete);

```

```

        SetEvent(hLogFileIo); // wake up IO writer
        WaitForSingleObject(hIoComplete, INFINITE);
    }

exit_SpinLock:
    if (dwError != 0)
    {
        if (m_hTxnFile != INVALID_HANDLE_VALUE)
        {
            CloseHandle(m_hTxnFile);
            m_hTxnFile = INVALID_HANDLE_VALUE;
        }

        SetLastError( dwError );
        // TODO: Don't know yet what to do with an error on the
file close,
        // since this function is called by the desctructor
(which does not return a value)
        //throw new CSystemErr( CSystemErr::eWriteFile,
"CTxnLog::CloseTransactionLogFile" );
    }

}

// Wrapper function that raises an error if a Windows Api fails
STDMETHODIMP CSMLog::RaiseSystemError(void)
{
    char s[ERR_BUFFER_SIZE];
    long c;
    DWORD e;

    e = GetLastError();

    c = sprintf(s, "Error code: %ld. ", e);
    c = FormatMessage(FORMAT_MESSAGE_FROM_SYSTEM |
FORMAT_MESSAGE_IGNORE_INSERTS,
NULL, e, 0, s + c, sizeof(s) - c, NULL);

    return Error(s, 0, NULL, GUID_NULL);
}

//DEL STDMETHODIMP CSMLog::get_FileName(BSTR *pVal)
//DEL {
//DEL *pVal = m_szFile;
//DEL return S_OK;
//DEL }

STDMETHODIMP CSMLog::put_FileName(BSTR newVal)
{
    m_szFile = SysAllocString(newVal);

    return S_OK;
}

//DEL STDMETHODIMP CSMLog::get_FileHeader(BSTR *pVal)

```

```

//DEL {
//DEL  *pVal = m_szHeader;
//DEL  return S_OK;
//DEL }

STDMETHODIMP CSMLog::put_FileHeader(BSTR newVal)
{
    m_szHeader = SysAllocString(newVal);
    return S_OK;
}

STDMETHODIMP CSMLog::WriteLine(BSTR szMsg)
{
    _bstr_t szTmp(szMsg);

    szTmp += "\\r";
    szTmp += "\\n";
    return(WriteToFile(szTmp));
}

STDMETHODIMP CSMLog::WriteField(BSTR szMsg)
{
    return(WriteToFile(szMsg));
}

//DEL STDMETHODIMP CSMLog::get_Append(BOOL *pVal)
//DEL {
//DEL  *pVal = m_bAppend;
//DEL  return S_OK;
//DEL }

STDMETHODIMP CSMLog::put_Append(BOOL newVal)
{
    m_bAppend = newVal;
    return S_OK;
}

```

## SMLog.h

```

// FILE:      SMExecute.h
//            Microsoft TPC-H Kit Ver. 1.00
//            Copyright Microsoft, 1999
//            All Rights Reserved
//
//
// PURPOSE:   Declaration of the CSMLog
// Contact:   Reshma Tharamal (reshmat@microsoft.com)
//
// SMLog.h : Declaration of the CSMLog

#ifndef __SMLOG_H_
#define __SMLOG_H_

#include "resource.h"    // main symbols
#include "assert.h"
#include "comdef.h"

```

```

#include "LogWriterCP.h"

#define WRITE_BUFFER_SIZE      8*1024
#define MAX_NUM_BUFFERS      2
#define ERR_BUFFER_SIZE      512
#define ERR_SET_FILE_POINTER  0xFFFFFFFF

////////////////////////////////////
////
// CSMLog
class ATL_NO_VTABLE CSMLog :
public CComObjectRootEx<CComSingleThreadModel>,
public CComCoClass<CSMLog, &CLSID_SMLog>,
public ISupportErrorInfo,
public IConnectionPointContainerImpl<CSMLog>,
public IDispatchImpl<ISMLog, &IID_ISMLog, &LIBID_LOGWRITERLib>,
public CProxy_ISMLogEvents< CSMLog >
{
public:
    CSMLog()
    {
        m_bAppend = FALSE;
        m_bInitialized = FALSE;

        m_hTxnFile = INVALID_HANDLE_VALUE;
        hIoComplete = NULL;
        hLogFileIo = NULL;

        for (int i=0;i<MAX_NUM_BUFFERS;i++)
            pBuffer[i] = NULL;
        pCurrent = NULL;

        m_szFile = NULL;
        m_szHeader = NULL;
        dwError = 0;
    }

    ~CSMLog()
    {
        if (m_hTxnFile != INVALID_HANDLE_VALUE)
            CloseLogFile();

        for (int i=0;i<MAX_NUM_BUFFERS;i++)
        {
            if (pBuffer[i] != NULL)
                VirtualFree(pBuffer[i], 0, MEM_RELEASE);
        }

        if (m_szFile)
            SysFreeString(m_szFile);
        m_szFile = NULL;

        if (m_szHeader)
            SysFreeString(m_szHeader);
        m_szHeader = NULL;
    }
}

```

```

        if (hIoComplete != INVALID_HANDLE_VALUE)
            CloseHandle(hIoComplete);

        if (hLogFileIo != INVALID_HANDLE_VALUE)
            CloseHandle(hLogFileIo);
    }

DECLARE_REGISTRY_RESOURCEID(IDR_SMLOG)

DECLARE_PROTECT_FINAL_CONSTRUCT()

BEGIN_COM_MAP(CSMLog)
    COM_INTERFACE_ENTRY(ISMLog)
    COM_INTERFACE_ENTRY(IDispatch)
    COM_INTERFACE_ENTRY(ISupportErrorInfo)
    COM_INTERFACE_ENTRY(IConnectionPointContainer)
    COM_INTERFACE_ENTRY_IMPL(IConnectionPointContainer)
END_COM_MAP()

BEGIN_CONNECTION_POINT_MAP(CSMLog)
    CONNECTION_POINT_ENTRY(DIID__ISMLogEvents)
END_CONNECTION_POINT_MAP()

// ISupportsErrorInfo
    STDMETHOD(InterfaceSupportsErrorInfo)(REFIID riid);

// ISMLog
public:
    STDMETHOD(Init)();
    STDMETHOD(put_Append) (/*[in]*/ BOOL newVal);
    STDMETHOD(WriteField) (/*[in]*/ BSTR szMsg);
    STDMETHOD(WriteLine) (/*[in]*/ BSTR szMsg);
    STDMETHOD(put_FileHeader) (/*[in]*/ BSTR newVal);
    STDMETHOD(put_FileName) (/*[in]*/ BSTR newVal);

// typedef enum err
private:

    BOOL        m_bAppend;
    BOOL        m_bInitialized;

    HANDLE      m_hTxnFile;           //handle to
log file
    HANDLE      hIoComplete;         //event to signify
that there are no pending IOs
    HANDLE      hLogFileIo;         //event to
signal the IO thread to write the inactive buffer

    BYTE        *pBuffer[MAX_NUM_BUFFERS];
    BYTE        *pCurrent;           //ptr to
current buffer
    int         iActiveBuffer;       //indicates
which buffer is active: 0 or 1
    int         iIoBuffer;
    //buffer for any pending IO operation

```

```

        DWORD        dwError;

        DWORD        iBufferSize;           //buffer allocated
size
        DWORD        iBytesFreeInBuffer;   //total bytes
available for use in buffer
        DWORD        iWriteSize;           //bytes to
write to file

        BSTR        m_szFile;             //name of
the file to write to
        BSTR        m_szHeader;          //header to
be printed to the file (optional)

private:
    static void      LogFileIO(void *p);
    HRESULT          Write(BYTE *ptr, DWORD iSize);
    STDMETHODIMP     WriteToFile(BSTR szMsg);
    void             CloseLogFile(void);
    STDMETHODIMP     RaiseSystemError(void);
};

#endif // __SMLOG_H_

```

## StdAfx.cpp

```

// FILE:      stdafx.cpp
//           Microsoft TPC-H Kit Ver. 1.00
//           Copyright Microsoft, 1999
//           All Rights Reserved
//
// PURPOSE:   source file that includes just the standard includes
// Contact:   Reshma Tharamal (reshmat@microsoft.com)
//
// stdafx.cpp : source file that includes just the standard includes
// stdafx.pch will be the pre-compiled header
// stdafx.obj will contain the pre-compiled type information

```

```

#include "stdafx.h"

#ifdef _ATL_STATIC_REGISTRY
#include <statreg.h>
#include <statreg.cpp>
#endif

#include <atlimpl.cpp>

```

## StdAfx.h

```

// FILE:      stdafx.h
//           Microsoft TPC-H Kit Ver. 1.00
//           Copyright Microsoft, 1999
//           All Rights Reserved
//

```

```

//
// PURPOSE:   include file for standard system include files,
//            or project specific include files that are used frequently,
//            but are changed infrequently
// Contact:   Reshma Tharamal (reshmat@microsoft.com)
//
#if !defined(AFX_STDAFX_H__5AC75DA4_1936_11D3_BC2D_00A0C90D2CA5__INCLUDE
D_)
#define AFX_STDAFX_H__5AC75DA4_1936_11D3_BC2D_00A0C90D2CA5__INCLUDED_

#if _MSC_VER > 1000
#pragma once
#endif // _MSC_VER > 1000

#define STRICT
#ifdef _WIN32_WINNT
#define _WIN32_WINNT 0x0400
#endif
#define _ATL_APARTMENT_THREADED

#include <atlbase.h>
//You may derive a class from CComModule and use it if you want to
override
//something, but do not change the name of _Module
extern CComModule _Module;
#include <atlcom.h>

//{{AFX_INSERT_LOCATION}}
// Microsoft Visual C++ will insert additional declarations immediately
before the previous line.

#endif
// !defined(AFX_STDAFX_H__5AC75DA4_1936_11D3_BC2D_00A0C90D2CA5__INCLUDED
)

```

### F.1.3 SMTIME

#### resource.h

```

// FILE:      resource.h
//            Microsoft TPC-H Kit Ver. 1.00
//            Copyright Microsoft, 1999
//            All Rights Reserved
//
//
// PURPOSE:   Resource file
// Contact:   Reshma Tharamal (reshmat@microsoft.com)
//
//{{NO_DEPENDENCIES}}
// Microsoft Developer Studio generated include file.
// Used by SMTIME.rc
//
#define IDS_PROJNAME            100
#define IDR_SMTIMER            102

```

```

// Next default values for new objects
//
#ifdef APSTUDIO_INVOKED
#ifdef APSTUDIO_READONLY_SYMBOLS
#define _APS_NEXT_RESOURCE_VALUE        201
#define _APS_NEXT_COMMAND_VALUE        32768
#define _APS_NEXT_CONTROL_VALUE        201
#define _APS_NEXT_SYMED_VALUE          103
#endif
#endif

```

#### SMTIME.cpp

```

// FILE:      SMTIME.cpp
//            Microsoft TPC-H Kit Ver. 1.00
//            Copyright Microsoft, 1999
//            All Rights Reserved
//
//
// PURPOSE:   Implementation of DLL Exports.
// Contact:   Reshma Tharamal (reshmat@microsoft.com)
//
// SMTIME.cpp : Implementation of DLL Exports.

// Note: Proxy/Stub Information
//       To build a separate proxy/stub DLL,
//       run nmake -f SMTIMEps.mk in the project directory.

#include "stdafx.h"
#include "resource.h"
#include <initguid.h>
#include "SMTIME.h"

#include "SMTIME_i.c"
#include "SMTIMEr.h"

```

```

CComModule _Module;

BEGIN_OBJECT_MAP(ObjectMap)
OBJECT_ENTRY(CLSID_SMTIMER, CSMTIMER)
END_OBJECT_MAP()

////////////////////////////////////
////
// DLL Entry Point

extern "C"
BOOL WINAPI DllMain(HINSTANCE hInstance, DWORD dwReason, LPVOID
/*lpReserved*/)
{
    if (dwReason == DLL_PROCESS_ATTACH)
    {
        _Module.Init(ObjectMap, hInstance, &LIBID_SMTIMELib);
    }
}

```

```

        DisableThreadLibraryCalls(hInstance);
    }
    else if (dwReason == DLL_PROCESS_DETACH)
        _Module.Term();
    return TRUE;    // ok
}

////////////////////////////////////
////
// Used to determine whether the DLL can be unloaded by OLE

STDAPI DllCanUnloadNow(void)
{
    return (_Module.GetLockCount()==0) ? S_OK : S_FALSE;
}

////////////////////////////////////
////
// Returns a class factory to create an object of the requested type

STDAPI DllGetClassObject(REFCLSID rclsid, REFIID riid, LPVOID* ppv)
{
    return _Module.GetClassObject(rclsid, riid, ppv);
}

////////////////////////////////////
////
// DllRegisterServer - Adds entries to the system registry

STDAPI DllRegisterServer(void)
{
    // registers object, typelib and all interfaces in typelib
    return _Module.RegisterServer(TRUE);
}

////////////////////////////////////
////
// DllUnregisterServer - Removes entries from the system registry

STDAPI DllUnregisterServer(void)
{
    return _Module.UnregisterServer(TRUE);
}

```

## SMTIME.H

```

/* this ALWAYS GENERATED file contains the definitions for the
interfaces */

```

```

/* File created by MIDL compiler version 5.01.0164 */
/* at Thu Sep 19 17:49:55 2002
*/
/* Compiler settings for C:\charles\Stepmaster\COMMON\SMTIME\SMTIME.IDL:
Oicf (OptLev=12), W1, Zp8, env=Win32, ms_ext, c_ext

```

```

        error checks: allocation ref bounds_check enum stub_data
*/
//@@MIDL_FILE_HEADING(  )

/* verify that the <rpcndr.h> version is high enough to compile this
file*/
#ifndef __REQUIRED_RPCNDR_H_VERSION__
#define __REQUIRED_RPCNDR_H_VERSION__ 440
#endif

#include "rpc.h"
#include "rpcndr.h"

#ifndef __RPCNDR_H_VERSION__
#error this stub requires an updated version of <rpcndr.h>
#endif // __RPCNDR_H_VERSION__

#ifndef COM_NO_WINDOWS_H
#include "windows.h"
#include "ole2.h"
#endif /*COM_NO_WINDOWS_H*/

#ifndef __SMTIME_H__
#define __SMTIME_H__

#ifdef __cplusplus
extern "C"{
#endif

/* Forward Declarations */

#ifndef __ISMTimer_FWD_DEFINED__
#define __ISMTimer_FWD_DEFINED__
typedef interface ISMTimer ISMTimer;
#endif /* __ISMTimer_FWD_DEFINED__ */

#ifndef __SMTimer_FWD_DEFINED__
#define __SMTimer_FWD_DEFINED__

#ifdef __cplusplus
typedef class SMTimer SMTimer;
#else
typedef struct SMTimer SMTimer;
#endif /* __cplusplus */

#endif /* __SMTimer_FWD_DEFINED__ */

/* header files for imported files */
#include "oaidl.h"
#include "ocidl.h"

void __RPC_FAR * __RPC_USER MIDL_user_allocate(size_t);
void __RPC_USER MIDL_user_free( void __RPC_FAR * );

```

```

#ifdef __ISMTimer_INTERFACE_DEFINED__
#define __ISMTimer_INTERFACE_DEFINED__

/* interface ISMTimer */
/* [unique][helpstring][dual][uuid][object] */

EXTERN_C const IID IID_ISMTimer;

#if defined(__cplusplus) && !defined(CINTERFACE)

    MIDL_INTERFACE("1A6D0AE4-8528-453B-B8E3-8DAD1F0561B7")
    ISMTimer : public IDispatch
    {
    public:
        virtual /* [helpstring][id] */ HRESULT STDMETHODCALLTYPE
Start( void) = 0;

        virtual /* [helpstring][id] */ HRESULT STDMETHODCALLTYPE Stop(
            CURRENCY __RPC_FAR *pElapsedTime) = 0;

        virtual /* [helpstring][id][propget] */ HRESULT
STDMETHODCALLTYPE get_Running(
            /* [retval][out] */ BOOL __RPC_FAR *pVal) = 0;
    };

#else /* C style interface */

typedef struct ISMTimerVtbl
{
    BEGIN_INTERFACE

    HRESULT ( STDMETHODCALLTYPE __RPC_FAR *QueryInterface ) (
        ISMTimer __RPC_FAR * This,
        /* [in] */ REFIID riid,
        /* [iid_is][out] */ void __RPC_FAR * __RPC_FAR *ppvObject);

    ULONG ( STDMETHODCALLTYPE __RPC_FAR *AddRef ) (
        ISMTimer __RPC_FAR * This);

    ULONG ( STDMETHODCALLTYPE __RPC_FAR *Release ) (
        ISMTimer __RPC_FAR * This);

    HRESULT ( STDMETHODCALLTYPE __RPC_FAR *GetTypeInfoCount ) (
        ISMTimer __RPC_FAR * This,
        /* [out] */ UINT __RPC_FAR *pctinfo);

    HRESULT ( STDMETHODCALLTYPE __RPC_FAR *GetTypeInfo ) (
        ISMTimer __RPC_FAR * This,
        /* [in] */ UINT iTInfo,
        /* [in] */ LCID lcid,
        /* [out] */ ITypeInfo __RPC_FAR * __RPC_FAR *ppTInfo);

    HRESULT ( STDMETHODCALLTYPE __RPC_FAR *GetIDsOfNames ) (
        ISMTimer __RPC_FAR * This,
        /* [in] */ REFIID riid,
        /* [size_is][in] */ LPOLESTR __RPC_FAR *rgszNames,
        /* [in] */ UINT cNames,
        /* [in] */ LCID lcid,
        /* [size_is][out] */ DISPID __RPC_FAR *rgDispId);

    /* [local] */ HRESULT ( STDMETHODCALLTYPE __RPC_FAR *Invoke ) (
        ISMTimer __RPC_FAR * This,
        /* [in] */ DISPID dispIdMember,
        /* [in] */ REFIID riid,
        /* [in] */ LCID lcid,
        /* [in] */ WORD wFlags,
        /* [out][in] */ DISPPARAMS __RPC_FAR *pDispParams,
        /* [out] */ VARIANT __RPC_FAR *pVarResult,
        /* [out] */ EXCEPINFO __RPC_FAR *pExcepInfo,
        /* [out] */ UINT __RPC_FAR *puArgErr);

        /* [helpstring][id] */ HRESULT ( STDMETHODCALLTYPE
*Start ) (
            ISMTimer __RPC_FAR * This);

        /* [helpstring][id] */ HRESULT ( STDMETHODCALLTYPE
*Stop ) (
            ISMTimer __RPC_FAR * This,
            CURRENCY __RPC_FAR *pElapsedTime);

        /* [helpstring][id][propget] */ HRESULT ( STDMETHODCALLTYPE
__RPC_FAR *get_Running ) (
            ISMTimer __RPC_FAR * This,
            /* [retval][out] */ BOOL __RPC_FAR *pVal);

    END_INTERFACE
} ISMTimerVtbl;

interface ISMTimer
{
    CONST_VTBL struct ISMTimerVtbl __RPC_FAR *lpVtbl;
};

#endif COBJMACROS

#define ISMTimer_QueryInterface(This,riid,ppvObject) \
    (This)->lpVtbl -> QueryInterface(This,riid,ppvObject)

#define ISMTimer_AddRef(This) \
    (This)->lpVtbl -> AddRef(This)

#define ISMTimer_Release(This) \
    (This)->lpVtbl -> Release(This)

#define ISMTimer_GetTypeInfoCount(This,pctinfo) \

```



```

        (This)->lpVtbl -> GetTypeInfoCount (This,pctinfo)

#define ISMTimer_GetTypeInfo (This,iTInfo,lcid,ppTInfo) \
        (This)->lpVtbl -> GetTypeInfo (This,iTInfo,lcid,ppTInfo)

#define ISMTimer_GetIDsOfNames (This,riid,rgszNames,cNames,lcid,rgDispId) \
        (This)->lpVtbl -> \
GetIDsOfNames (This,riid,rgszNames,cNames,lcid,rgDispId)

#define \
ISMTimer_Invoke (This,dispIdMember,riid,lcid,wFlags,pDispParams,pVarResult, \
pExcepInfo,puArgErr) \
        (This)->lpVtbl -> \
Invoke (This,dispIdMember,riid,lcid,wFlags,pDispParams,pVarResult,pExcepInfo, \
puArgErr)

#define ISMTimer_Start (This) \
        (This)->lpVtbl -> Start (This)

#define ISMTimer_Stop (This,pElapsedTime) \
        (This)->lpVtbl -> Stop (This,pElapsedTime)

#define ISMTimer_get_Running (This,pVal) \
        (This)->lpVtbl -> get_Running (This,pVal)

#endif /* COBJMACROS */

#endif /* C style interface */

/* [helpstring][id] */ HRESULT STDMETHODCALLTYPE ISMTimer_Start_Proxy(
    ISMTimer __RPC_FAR * This);

void __RPC_STUB ISMTimer_Start_Stub(
    IRpcStubBuffer *This,
    IRpcChannelBuffer *pRpcChannelBuffer,
    PRPC_MESSAGE pRpcMessage,
    DWORD *_pdwStubPhase);

/* [helpstring][id] */ HRESULT STDMETHODCALLTYPE ISMTimer_Stop_Proxy(
    ISMTimer __RPC_FAR * This,
    CURRENCY __RPC_FAR *pElapsedTime);

void __RPC_STUB ISMTimer_Stop_Stub(
    IRpcStubBuffer *This,
    IRpcChannelBuffer *pRpcChannelBuffer,
    PRPC_MESSAGE pRpcMessage,
    DWORD *_pdwStubPhase);

```

```

/* [helpstring][id][propget] */ HRESULT STDMETHODCALLTYPE
ISMTimer_get_Running_Proxy(
    ISMTimer __RPC_FAR * This,
    /* [retval][out] */ BOOL __RPC_FAR *pVal);

void __RPC_STUB ISMTimer_get_Running_Stub(
    IRpcStubBuffer *This,
    IRpcChannelBuffer *pRpcChannelBuffer,
    PRPC_MESSAGE pRpcMessage,
    DWORD *_pdwStubPhase);

#endif /* __ISMTimer_INTERFACE_DEFINED__ */

#ifndef __SMTIMELib_LIBRARY_DEFINED__
#define __SMTIMELib_LIBRARY_DEFINED__

/* library SMTIMELib */
/* [helpstring][version][uuid] */

EXTERN_C const IID LIBID_SMTIMELib;

#ifndef __StepMasterTimeFunctions_MODULE_DEFINED__
#define __StepMasterTimeFunctions_MODULE_DEFINED__

/* module StepMasterTimeFunctions */
/* [dllname][version][helpstring] */

/* [entry][helpstring] */ CURRENCY __stdcall Get64BitTime(
    /* [in] */ LPSYSTEMTIME lpInitTime);

/* [entry][helpstring] */ void __stdcall JulianToTime(
    /* [in] */ CURRENCY julianTS,
    /* [out][in] */ int __RPC_FAR *yr,
    /* [out][in] */ int __RPC_FAR *mm,
    /* [out][in] */ int __RPC_FAR *dd,
    /* [out][in] */ int __RPC_FAR *hh,
    /* [out][in] */ int __RPC_FAR *mi,
    /* [out][in] */ int __RPC_FAR *ss,
    /* [out][in] */ int __RPC_FAR *ms);

#endif /* __StepMasterTimeFunctions_MODULE_DEFINED__ */

EXTERN_C const CLSID CLSID_SMTimer;

#ifdef __cplusplus
class DECLSPEC_UUID("27BAB71B-89E1-4A78-8854-FDFFBDC8037E")

```

```

SMTimer;
#endif
#endif /* __SMTIMELib_LIBRARY_DEFINED__ */

/* Additional Prototypes for ALL interfaces */

/* end of Additional Prototypes */

#ifdef __cplusplus
}
#endif

#endif

```

## SMTimer.cpp

```

// FILE:      SMTimer.cpp
//           Microsoft TPC-H Kit Ver. 1.00
//           Copyright Microsoft, 1999
//           All Rights Reserved
//
//
// PURPOSE:   Implementation of CSMTimer
// Contact:   Reshma Tharamal (reshmat@microsoft.com)
//
// SMTimer.cpp : Implementation of CSMTimer
#include "stdafx.h"
#include "SMTTime.h"
#include "SMTimer.h"

////////////////////////////////////
////
// CSMTimer

////////////////////////////////////
// Construction/Destruction
////////////////////////////////////

CSMTimer::~CSMTimer()
{
}

STDMETHODIMP CSMTimer::Start()
{
    // Starts the timer
    assert(!m_bInProgress);
    m_bInProgress = TRUE;

    m_lStartTime = MyTickCount();

    return S_OK;
}

STDMETHODIMP CSMTimer::Stop(CURRENCY *pElapsedTime)
{

```

```

TC_TIME      lEndTime = MyTickCount();

// Stops the timer and returns the elapsed time
assert(m_bInProgress);
m_bInProgress = FALSE;

pElapsedTime->int64 = lEndTime - m_lStartTime;

return S_OK;
}

TC_TIME CSMTimer::MyTickCount(void)
{
    TC_TIME currentTC;
    LARGE_INTEGER l;
    __int64 count;

    //The purpose of this function is to prevent the 49 day wrapping
effect of the
    //system API GetTickCount(). This function essentially provides a
monotonically
    //increasing timer value which is milliseconds from class
instantiation.

    if ( m_bCountUnavailable )
    {
        count = (__int64)GetTickCount();
        currentTC = (TC_TIME)(count-m_baseTC);
    }
    else
    {
        QueryPerformanceCounter(&l);
        count = (__int64)l.HighPart << 32 | (__int64)l.LowPart;
        currentTC = (TC_TIME)((count-m_baseTC) * 1000) /

m_Timerfreq);
    }

    return currentTC;
}

STDMETHODIMP CSMTimer::get_Running(BOOL *pVal)
{
    *pVal = m_bInProgress;

    return S_OK;
}

CURRENCY __stdcall Get64BitTime(LPSYSTEMTIME lpInitTime)
{
    __int64 ms_day, ms_hour, ms_minute, ms_seconds, ms_milliseconds,
ms_total;
    int          day;
    SYSTEMTIME   tim;
    CURRENCY     tmReturn;

    if ( lpInitTime )

```

```

        memcpy(&tim, lpInitTime, sizeof(SYSTEMTIME));
    else
        GetLocalTime(&tim);
    day = JulianDay((int)tim.wYear, (int)tim.wMonth, (int)tim.wDay);
    ms_day          = (__int64)day * (__int64)(24 * 1000 * 60
* 60);
    ms_hour         = (__int64)tim.wHour  * (__int64)(1000 *
3600);
    ms_minute      = (__int64)tim.wMinute * (1000 * 60);
    ms_seconds     = (__int64)(tim.wSecond * 1000);
    ms_milliseconds = (__int64)tim.wMilliseconds;

    ms_total = ms_day + ms_hour + ms_minute + ms_seconds +
ms_milliseconds;
    tmReturn.int64 = ms_total;

    return tmReturn;
}

// JulianDay computes the number of days since Jan 1, 1900.
// This function is valid for dates from 1-Jan-1900 to 1-Jan-2100.
// 1-Jan-1900 = 0
int JulianDay( int yr, int mm, int dd )
{
    // MonthArray contains cumulative days for months in a non leap-
year
    int MonthArray[12] = { 0, 31, 59, 90, 120, 151, 181, 212, 243,
273, 304, 334};
    int j1, j2;

    // compute day of year (j1)
    j1 = MonthArray[mm-1] + dd - 1;
    // adjust day of year if this is a leap year and it is after
February
    if ((yr % 4)==0 && (yr != 1900) && (mm > 2))
        j1++;
    // compute number of days from 1/1/1900 to beginning of present
year
    j2 = (yr-1900)*365 + (yr-1901)/4;
    return j1+j2;
}

// Breaks up the Julian Time into it's sub-components
void __stdcall SMTTime_JulianToTime( CURRENCY CurJulian, int* yr, int* mm,
int* dd, int *hh, int *mi, int *ss, int *ms )
{
    int julianDay, msLeft;
    JULIAN_TIME      julianTS = CurJulian.int64;

    *ms = julianTS % 1000;

    julianTS /= 1000;

    julianDay = (int)(julianTS / ( 60 * 60 * 24 ));

```

```

    JulianToCalendar(julianDay, yr, mm, dd );

    msLeft = (int)(julianTS - (julianDay * (__int64)( 60 * 60 *
24 )));

    *hh = msLeft / (60 * 60);
    msLeft = msLeft - *hh * 3600;
    *mi = msLeft / (60);
    *ss = msLeft % 60;
}

// JulianToCalendar converts a day index (from the JulianDay function)
to
// its corresponding calendar value (mm/dd/yr). The valid range for
days
// is { 0 .. 73049 } for dates from 1-Jan-1900 to 1-Jan-2100.
void JulianToCalendar( int day, int* yr, int* mm, int* dd )
{
    int y, m, d;
    // month array contains days of months for months in a non leap-
year
    int month[12] = { 31, 28, 31, 30, 31, 30, 31, 31, 30, 31, 30,
31 };

    // compute year from days
    if (day < 365)
        y = 1900;
    else
        y = 1901 + ((day-365)/1461)*4 + (4*((day-
365)%1461)+3)/1461;

    // adjust February if this year is a leap year
    if ((y % 4)==0 && (y != 1900))
        month[1] = 29;
    else
        month[1] = 28;

    d = day - JulianDay( y, 1, 1 ) + 1;
    m = 1;

    while (d > month[m-1])
    {
        d = d - month[m-1];
        m++;
    }

    *yr = y;
    *mm = m;
    *dd = d;
}

```

## SMTimer.h

```

// FILE:      SMTimer.h
//           Microsoft TPC-H Kit Ver. 1.00

```

```

//          Copyright Microsoft, 1999
//          All Rights Reserved
//
//
// PURPOSE:   Declaration of the CSMTimer
// Contact:   Reshma Tharamal (reshmat@microsoft.com)
//
// SMTimer.h : Declaration of the CSMTimer

#ifndef __SMTIMER_H_
#define __SMTIMER_H_

#include "resource.h" // main symbols

#include "assert.h"

#define MAX_JULIAN_TIME          0x7FFFFFFFFFFFFFFF
#define JULIAN_TIME              __int64
#define TC_TIME                  DWORD

#ifdef SMTIMER
#define DLL_LINK                 __declspec( dllexport )
#else
#define DLL_LINK                 __declspec( dllimport )
#endif

#ifdef __cplusplus
extern "C"
{
#endif
//DLL_LINK      CURRENCY          __stdcall SMTIME_Get64BitTime(LPSYSTEMTIME
lpInitTime);
int              JulianDay( int yr, int mm, int dd );
void             JulianToCalendar( int day, int* yr, int* mm, int* dd );
#ifdef __cplusplus
}
#endif

////////////////////////////////////
////
// CSMTimer
class ATL_NO_VTABLE CSMTimer :
public CComObjectRootEx<CComSingleThreadModel>,
public CComCoClass<CSMTimer, &CLSID_SMTimer>,
public IDispatchImpl<ISMTimer, &IID_ISMTimer, &LIBID_SMTIMELib>
{
public:
    CSMTimer()
    {
        LARGE_INTEGER l;

        if ( !QueryPerformanceFrequency(&l) )
        {
            m_baseTC = (__int64)GetTickCount();
            m_bCountUnavailable = TRUE;

```

```

}
else
{
    m_bCountUnavailable = FALSE;

    m_Timerfreq = (__int64)l.HighPart << 32 |
(__int64)l.LowPart;

    QueryPerformanceCounter(&l);
    m_baseTC = (__int64)l.HighPart << 32 |
(__int64)l.LowPart;
}
m_bInProgress = FALSE;
}

DECLARE_REGISTRY_RESOURCEID(IDR_SMTIMER)

DECLARE_PROTECT_FINAL_CONSTRUCT()

BEGIN_COM_MAP(CSMTimer)
    COM_INTERFACE_ENTRY(ISMTimer)
    COM_INTERFACE_ENTRY(IDispatch)
//    COM_INTERFACE_ENTRY2(IDispatch, ISMTimer)
END_COM_MAP()

// ISMTimer
public:
    STDMETHOD(get_Running) (/*[out, retval]*/ BOOL *pVal);
    STDMETHOD(Stop) (CURRENCY *pElapsedTime);
    STDMETHOD(Start) ();
    virtual ~CSMTimer();

private:
    __int64          m_baseTC;
    __int64          m_Timerfreq;
    BOOL             m_bCountUnavailable;
    TC_TIME          m_lStartTime;
    BOOL             m_bInProgress;

    TC_TIME          MyTickCount(void);
};

#endif // __SMTIMER_H_

```

## StdAfx.cpp

```

// stdafx.cpp : source file that includes just the standard includes
// stdafx.pch will be the pre-compiled header
// stdafx.obj will contain the pre-compiled type information

#include "stdafx.h"

#ifdef _ATL_STATIC_REGISTRY
#include <statreg.h>
#include <statreg.cpp>
#endif

```

```
#include <atlimpl.cpp>
```

## StdAfx.h

```
// FILE:          stdafx.h
//               Microsoft TPC-H Kit Ver. 1.00
//               Copyright Microsoft, 1999
//               All Rights Reserved
//
//
// PURPOSE:      include file for standard system include files,
//               or project specific include files that are used frequently,
//               but are changed infrequently
// Contact:      Reshma Tharamal (reshmat@microsoft.com)
//
//
//if !defined(AFX_STDAFX_H__4CDF88F4_EE9C_4F29_8212_61557F251BDD__INCLUDE
D_)
#define AFX_STDAFX_H__4CDF88F4_EE9C_4F29_8212_61557F251BDD__INCLUDED_

#if _MSC_VER > 1000
#pragma once
#endif // _MSC_VER > 1000

#define STRICT
#ifndef _WIN32_WINNT
#define _WIN32_WINNT 0x0400
#endif
#define _ATL_APARTMENT_THREADED

#include <atlbase.h>
//You may derive a class from CComModule and use it if you want to
override
//something, but do not change the name of _Module
extern CComModule _Module;
#include <atlcom.h>

//{{AFX_INSERT_LOCATION}}
// Microsoft Visual C++ will insert additional declarations immediately
before the previous line.

#endif
// !defined(AFX_STDAFX_H__4CDF88F4_EE9C_4F29_8212_61557F251BDD__INCLUDED
)
```

## F.1.4 StepMaster

### cArrConstraints.cls

```
VERSION 1.0 CLASS
BEGIN
    MultiUse = -1    'True
END
Attribute VB_Name = "cArrConstraints"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
```

```
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:          cArrConstraints.cls
'               Microsoft TPC-H Kit Ver. 1.00
'               Copyright Microsoft, 1999
'               All Rights Reserved
'
'
' PURPOSE:      Implements an array of cConstraint objects.
'               Type-safe wrapper around cNodeCollections.
'               Also contains additional functions that determine all the
'               constraints for a step, all constraints in a workspace,
'               validation functions, etc.
' Contact:      Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

Private mcarrConstraints As cNodeCollections

' Used to indicate the source module name when errors
' are raised by this class
Private mstrSource As String
Private Const mstrModuleName As String = "cArrConstraints."
Public Sub SaveWspConstraints(ByVal lngWorkspace As Long)
    ' Calls a procedure to commit all changes to the constraints
    ' in the passed in workspace.

    Call mcarrConstraints.Save(lngWorkspace)

End Sub
Public Property Set ConstraintDB(vdata As Database)

    Set mcarrConstraints.NodeDB = vdata

End Property
Public Property Get ConstraintDB() As Database

    Set ConstraintDB = mcarrConstraints.NodeDB

End Property

Public Sub Modify(cConstToUpdate As cConstraint)

    ' Modify the constraint record
    Call mcarrConstraints.Modify(cConstToUpdate)

End Sub
Public Sub CreateNewConstraintVersion(ByVal lngStepId As Long, _
    ByVal strNewVersion As String, _
    ByVal strOldVersion As String, _
    ByVal intStepType As Integer)

    ' Does all the processing needed to create new versions of
    ' all the constraints for a given step
    ' It inserts new constraint records in the database with
    ' the new version numbers on them
```

```

' It also updates the version number on all constraints
' for the step in the array to the new version passed in
' Since it handles both global and manager/worker steps,
' it checks for the step_id or global_step_id fields,
' depending on the type of step

Dim lngIndex As Long
Dim cUpdateConstraint As cConstraint

On Error GoTo CreateNewConstraintVersionErr
mstrSource = mstrModuleName & "CreateNewConstraintVersion"

' Update the version/global version on Constraint with the
' passed in step/global step id
For lngIndex = 0 To mcarrConstraints.Count - 1
    Set cUpdateConstraint = mcarrConstraints(lngIndex)
    If intStepType = gintGlobalStep Then
        If cUpdateConstraint.GlobalStepId = lngStepId And _
            cUpdateConstraint.IndOperation <> DeleteOp Then
            cUpdateConstraint.GlobalVersionNo = strNewVersion

            ' Set the operation to indicate an insert
            cUpdateConstraint.IndOperation = InsertOp
        End If
    Else
        If cUpdateConstraint.StepId = lngStepId And _
            cUpdateConstraint.IndOperation <> DeleteOp Then
            cUpdateConstraint.VersionNo = strNewVersion

            ' Set the operation to indicate an insert
            cUpdateConstraint.IndOperation = InsertOp
        End If
    End If
Next lngIndex

Exit Sub

CreateNewConstraintVersionErr:
LogErrors Errors
gstrSource = mstrModuleName & "CreateNewConstraintVersion"
On Error GoTo 0
Err.Raise vbObjectError + errCreateNewConstraintVersionFailed, _
    mstrSource, _
    LoadResString(errCreateNewConstraintVersionFailed)

End Sub
Private Sub Class_Initialize()

    Set mcarrConstraints = New cNodeCollections
    BugMessage "cArrConstraints: Initialize event - setting Constraint
count to 0"

End Sub

Private Sub Class_Terminate()

    Set mcarrConstraints = Nothing
    BugMessage "cArrConstraints: Terminate event triggered"

End Sub

Public Sub Add(ByVal cConstraintToAdd As cConstraint)

    Set cConstraintToAdd.NodeDB = mcarrConstraints.NodeDB

    ' Retrieve a unique constraint identifier
    cConstraintToAdd.ConstraintId = cConstraintToAdd.NextIdentifier

    ' Call a procedure to load the constraint record in the array
    Call mcarrConstraints.Add(cConstraintToAdd)

End Sub

Public Sub Delete(ByVal cOldConstraint As cConstraint)

    Dim lngDeleteElement As Long
    Dim cConsToDelete As cConstraint

    lngDeleteElement = QueryConstraintIndex(cOldConstraint.ConstraintId)
    Set cConsToDelete = mcarrConstraints(lngDeleteElement)

    Call mcarrConstraints.Delete(cConsToDelete.Position)

    Set cConsToDelete = Nothing

End Sub

Private Function QueryConstraintIndex(lngConstraintId As Long) _
    As Long

    Dim lngIndex As Integer

    ' Find the element in the array to be deleted
    For lngIndex = 0 To mcarrConstraints.Count - 1

        ' Note: The constraint id is not a primary key field in
        ' the database - there can be multiple records with the
        ' same constraint_id but for different versions of a step
        ' However, since we'll always load the constraint information
        ' for the latest version of a step, we'll have just one
        ' constraint record with a given constraint_id
        If mcarrConstraints(lngIndex).ConstraintId = lngConstraintId

            Then
                QueryConstraintIndex = lngIndex
                Exit Function
            End If

        Next lngIndex

        ' Raise error that Constraint has not been found
        ShowError errConstraintNotFound
        On Error GoTo 0
        Err.Raise vbObjectError + errConstraintNotFound, mstrSource, _
            LoadResString(errConstraintNotFound)
    
```

```

End Function

Public Function QueryConstraint(ByVal lngConstraintId As Long) _
    As cConstraint

    ' Returns a cConstraint object with the property values
    ' corresponding to the Constraint Identifier, lngConstraintId

    Dim lngQueryElement As Long

    lngQueryElement = QueryConstraintIndex(lngConstraintId)

    ' Set the return value to the queried Constraint
    Set QueryConstraint = mcarrConstraints(lngQueryElement)

End Function

Public Sub LoadConstraints(ByVal lngWorkspaceId As Long, rstStepsInWsp
As Recordset)

    ' Loads the constraints array with all the constraints
    ' for the workspace
    Dim recConstraints As Recordset
    Dim qryCons As DAO.QueryDef
    Dim strSql As String
    Dim dtStart As Date

    On Error GoTo LoadConstraintsErr
    mstrSource = mstrModuleName & "LoadConstraints"

    If rstStepsInWsp.RecordCount = 0 Then
        Exit Sub
    End If

    ' First check if the database object has been set
    If mcarrConstraints.NodeDB Is Nothing Then
        On Error GoTo 0
        Err.Raise vbObjectError + errSetDBBeforeLoad, _
            mstrSource, _
            LoadResString(errSetDBBeforeLoad)
    End If

    dtStart = Now

    ' Select based on the global step id since there might
    ' be constraints for a global step that run are executed
    ' for the workspace
    ' This method has the advantage that if the steps are queried right,
    everything else follows
    strSql = "Select a.constraint_id, a.step_id, a.version_no, " & _
        " a.constraint_type, a.global_step_id, a.global_version_no, " & _
        " a.sequence_no, b.workspace_id " & _
        " from step_constraints a, att_steps b " & _
        " where a.global_step_id = b.step_id " & _

```

```

" and a.global_version_no = b.version_no " & _
" and a.global_step_id = [g_s_id] " & _
" and a.global_version_no = [g_ver_no] " & _
" and b.archived_flag = [archived] "

    ' Find the highest X-component of the version number
    strSql = strSql & " AND ( a.step_id = 0 or ( cint( mid( a.version_no,
1, instr( a.version_no, " & gstrDQ & gstrVerSeparator & gstrDQ & " ) -
1 ) ) = " & _
        " ( select max( cint( mid( version_no, 1, instr( version_no, " &
gstrDQ & gstrVerSeparator & gstrDQ & " ) - 1 ) ) ) " & _
        " from att_steps AS d " & _
        " WHERE a.step_id = d.step_id " & _
        " and d.archived_flag = [archived] ) "

    ' Find the highest Y-component of the version number for the highest
X-component
    strSql = strSql & " AND cint( mid( a.version_no, instr( a.version_no,
" & gstrDQ & gstrVerSeparator & gstrDQ & " ) + 1 ) ) = " & _
        " ( select max( cint( mid( version_no, instr( version_no, " &
gstrDQ & gstrVerSeparator & gstrDQ & " ) + 1 ) ) ) " & _
        " from att_steps AS y " & _
        " Where a.step_id = y.step_id " & _
        " AND cint( mid( version_no, 1, instr( version_no, " & gstrDQ &
gstrVerSeparator & gstrDQ & " ) - 1 ) ) = " & _
        " ( select max( cint( mid( version_no, 1, instr( version_no, " &
gstrDQ & gstrVerSeparator & gstrDQ & " ) - 1 ) ) ) " & _
        " from att_steps AS c " & _
        " WHERE y.step_id = c.step_id " & _
        " and c.archived_flag = [archived] ) ) ) "

    ' Order the constraints by sequence within a given step
    strSql = strSql & " order by a.sequence_no "

    Set qryCons = mcarrConstraints.NodeDB.CreateQueryDef(gstrEmptyString,
strSql)
    qryCons.Parameters("archived").Value = False

    rstStepsInWsp.MoveFirst

    While Not rstStepsInWsp.EOF

        If Not (rstStepsInWsp!global_flag) Then
            qryCons.Close
            BugMessage "Query constraints Read + load took: " &
                CStr(DateDiff("s", dtStart, Now))
            Exit Sub
        End If

        qryCons.Parameters("g_s_id").Value = rstStepsInWsp!step_id
        qryCons.Parameters("g_ver_no").Value = rstStepsInWsp!version_no

        Set recConstraints = qryCons.OpenRecordset(dbOpenSnapshot)

        Call LoadRecordsetInConstraintArray(recConstraints)
        recConstraints.Close
    
```

```

        rstStepsInWsp.MoveNext
    Wend

    qyCons.Close
    BugMessage "Query constraints Read + load took: " &
    CStr(DateDiff("s", dtStart, Now))

    Exit Sub

LoadConstraintsErr:
    LogErrors Errors
    gstrSource = mstrModuleName & "LoadConstraints"
    On Error GoTo 0
    Err.Raise vbObjectError + errLoadDataFailed, _
        mstrSource, _
        LoadResString(errLoadDataFailed)

End Sub

Public Sub UnloadStepConstraints(ByVal lngStepId As Long)

    ' Unloads all the constraints for the workspace from
    ' the constraints array

    Dim lngIndex As Long

    ' Find all constraints in the array with a matching step id
    ' It is important to step in reverse order through the array,
    ' since we delete constraint records!
    For lngIndex = mcarrConstraints.Count - 1 To 0 Step -1
        If mcarrConstraints(lngIndex).GlobalStepId = lngStepId Then

            ' Unload the constraint from the array
            Call mcarrConstraints.Unload(lngIndex)

        End If
    Next lngIndex

End Sub

Public Sub UnloadConstraint(cOldConstraint As cConstraint)
    ' Unloads the constraint from the constraints array

    Dim lngDeleteElement As Long

    lngDeleteElement = QueryConstraintIndex(cOldConstraint.ConstraintId)

    Call mcarrConstraints.Unload(lngDeleteElement)

End Sub

Private Sub LoadRecordsetInConstraintArray(ByVal recConstraints As
Recordset)
    ' Loads all the constraint records in the passed in
    ' recordset into the array

    Dim cNewConstraint As cConstraint

    On Error GoTo LoadRecordsetInConsArrayErr
    mstrSource = mstrModuleName & "LoadRecordsetInConstraintArray"

    If recConstraints.RecordCount = 0 Then
        Exit Sub
    End If

    recConstraints.MoveFirst
    While Not recConstraints.EOF
        Set cNewConstraint = New cConstraint

        ' Initialize Constraint values
        cNewConstraint.ConstraintId =
        CLng(ErrorOnNullField(recConstraints, "Constraint_id"))
        cNewConstraint.StepId = CLng(ErrorOnNullField(recConstraints,
"step_id"))
        cNewConstraint.VersionNo = CStr(ErrorOnNullField(recConstraints,
"version_no"))

        cNewConstraint.GlobalStepId =
        CLng(ErrorOnNullField(recConstraints, "global_step_id"))
        cNewConstraint.GlobalVersionNo =
        CStr(ErrorOnNullField(recConstraints, "global_version_no"))
        cNewConstraint.SequenceNo = CInt(ErrorOnNullField(recConstraints,
"sequence_no"))

        cNewConstraint.WorkspaceId =
        CLng(ErrorOnNullField(recConstraints, FLD_ID_WORKSPACE))
        cNewConstraint.ConstraintType =
        CInt(ErrorOnNullField(recConstraints, "constraint_type"))

        ' Add this record to the array of Constraints
        mcarrConstraints.Load cNewConstraint

        Set cNewConstraint = Nothing
        recConstraints.MoveNext
    Wend

    Exit Sub

LoadRecordsetInConsArrayErr:
    LogErrors Errors
    gstrSource = mstrModuleName & "LoadRecordsetInConstraintArray"
    On Error GoTo 0
    Err.Raise vbObjectError + errLoadRsInArrayFailed, _
        mstrSource, _
        LoadResString(errLoadRsInArrayFailed)

End Sub

Public Function ConstraintsForStep( _
    ByVal lngStepId As Long, _
    ByVal strVersionNo As String, _
    Optional ByVal intConstraintType As ConstraintType = 0, _
    Optional ByVal blnSort As Boolean = True, _
    Optional ByVal blnGlobal As Boolean = False, _

```



```

Optional ByVal blnGlobalConstraintsOnly As Boolean = False) _
As Variant

' Returns a variant containing an array of cConstraint objects,
' containing all the constraints that have been defined for the
' given step. If the Global flag is set to true, the
' search will be made for all the constraints that have
' a matching global_step_id

Dim lngIndex As Long
Dim cStepConstraint() As cConstraint
Dim lngConstraintCount As Long
Dim cTempConstraint As cConstraint

On Error GoTo ConstraintsForStepErr
mstrSource = mstrModuleName & "ConstraintsForStep"

lngConstraintCount = 0

' Find each element in the constraints array
For lngIndex = 0 To mcarrConstraints.Count - 1
    ' If a constraint type has been specified then check
    ' if the constraint type for the record matches the
    ' passed in type
    Set cTempConstraint = mcarrConstraints(lngIndex)
    If Not blnGlobal Then
        If cTempConstraint.StepId = lngStepId And _
            cTempConstraint.VersionNo = strVersionNo And _
            cTempConstraint.IndOperation <> DeleteOp And _
            (intConstraintType = 0 Or _
            cTempConstraint.ConstraintType = intConstraintType)
            Then
                ' We have a matching constraint for the given step
                AddArrayElement cStepConstraint, _
                    cTempConstraint, lngConstraintCount
            End If
        Else
            If cTempConstraint.GlobalStepId = lngStepId And _
                cTempConstraint.GlobalVersionNo = strVersionNo And _
                cTempConstraint.IndOperation <> DeleteOp Then
                If blnGlobalConstraintsOnly = False Or _
                    (blnGlobalConstraintsOnly And _
                    cTempConstraint.StepId = 0 And _
                    cTempConstraint.VersionNo = gstrMinVersion) Then
                    ' We have a matching constraint for the global step
                    AddArrayElement cStepConstraint, _
                        cTempConstraint, lngConstraintCount
                End If
            End If
        End If
    End If

Next lngIndex

' Set the return value of the function to the array of
' constraints that has been built above

```

```

If lngConstraintCount = 0 Then
    ConstraintsForStep = Empty
Else
    ConstraintsForStep = cStepConstraint()
End If

' Sort the constraints
If blnSort Then
    Call QuickSort(ConstraintsForStep)
End If

Exit Function

ConstraintsForStepErr:
LogErrors Errors
On Error GoTo 0
Err.Raise vbObjectError + errConstraintsForStepFailed, _
    mstrSource, _
    LoadResString(errConstraintsForStepFailed)

End Function

Private Sub AddArrayElement(ByRef arrNodes() As cConstraint, _
    ByVal objToAdd As cConstraint, _
    ByRef lngCount As Long)
    ' Adds the passed in object to the array

    ' Increase the array dimension and add the object to it
    ReDim Preserve arrNodes(lngCount)
    Set arrNodes(lngCount) = objToAdd
    lngCount = lngCount + 1
End Sub

Public Function ConstraintsForWsp( _
    ByVal lngWorkspaceId As Long, _
    Optional ByVal intConstraintType As Integer = 0, _
    Optional ByVal blnSort As Boolean = True, _
    Optional ByVal blnGlobalConstraintsOnly As Boolean = False) _
As Variant

' Returns a variant containing an array of cConstraint objects,
' containing all the constraints that have been defined for the
' given workspace.

Dim lngIndex As Long
Dim cWspConstraint() As cConstraint
Dim lngConstraintCount As Long
Dim cTempConstraint As cConstraint

On Error GoTo ConstraintsForWspErr
mstrSource = mstrModuleName & "ConstraintsForWsp"

lngConstraintCount = 0

' Find each element in the constraints array
For lngIndex = 0 To mcarrConstraints.Count - 1

```

```

' If a constraint type has been specified then check
' if the constraint type for the record matches the
' passed in type
Set cTempConstraint = mcarrConstraints(lngIndex)
If cTempConstraint.WorkspaceId = lngWorkspaceId And _
    cTempConstraint.IndOperation <> DeleteOp And _
    (intConstraintType = 0 Or _
    cTempConstraint.ConstraintType = intConstraintType) Then

    If blnGlobalConstraintsOnly = False Or _
        (blnGlobalConstraintsOnly And _
        cTempConstraint.StepId = 0 And _
        cTempConstraint.VersionNo = gstrMinVersion) Then

        ' We have a matching constraint for the workspace
        AddArrayElement cWspConstraint, _
            cTempConstraint, lngConstraintCount

    End If
End If
Next lngIndex

' Set the return value of the function to the array of
' constraints that has been built above
If lngConstraintCount = 0 Then
    ConstraintsForWsp = Empty
Else
    ConstraintsForWsp = cWspConstraint()
End If

' Sort the constraints
If blnSort Then
    Call QuickSort(ConstraintsForWsp)
End If

Exit Function

ConstraintsForWspErr:
LogErrors Errors
On Error GoTo 0
Err.Raise vbObjectError + errConstraintsForWspFailed, _
    mstrSource, _
    LoadResString(errConstraintsForWspFailed)

End Function
Public Function PreConstraintsForStep( _
    ByVal lngStepId As Long, _
    ByVal strVersionNo As String, _
    Optional ByVal blnSort As Boolean) As Variant

' Returns a variant containing an array of cConstraint objects,
' containing all the pre-execution constraints that have
' been defined for the given step_id and version

' Call a function that will return a variant containing
' all the constraints of the passed in type
PreConstraintsForStep = ConstraintsForStep(lngStepId, _

```

```

    strVersionNo, gintPreStep, blnSort)

End Function
Public Function PostConstraintsForStep( _
    ByVal lngStepId As Long, _
    ByVal strVersionNo As String, _
    Optional ByVal blnSort As Boolean) As Variant

' Returns a variant containing an array of cConstraint objects,
' containing all the Post-execution constraints that have
' been defined for the given step_id and version

' Call a function that will return a variant containing
' all the constraints of the passed in type
PostConstraintsForStep = ConstraintsForStep(lngStepId, _
    strVersionNo, gintPostStep, blnSort)

End Function
Public Function PostConstraintsForWsp( _
    ByVal lngWorkspaceId As Long, _
    Optional ByVal blnSort As Boolean) As Variant

' Returns a variant containing an array of cConstraint objects,
' containing all the Post-execution globals that have
' been defined for the workspace

' Call a function that will return a variant containing
' all the constraints of the passed in type
PostConstraintsForWsp = ConstraintsForWsp(lngWorkspaceId, _
    gintPostStep, blnSort, True)

End Function
Public Function PreConstraintsForWsp( _
    ByVal lngWorkspaceId As Long, _
    Optional ByVal blnSort As Boolean) As Variant

' Returns a variant containing an array of cConstraint objects,
' containing all the Pre-execution globals that have
' been defined for the workspace

' Call a function that will return a variant containing
' all the constraints of the passed in type
PreConstraintsForWsp = ConstraintsForWsp(lngWorkspaceId, _
    gintPreStep, blnSort, True)

End Function
Public Property Get ConstraintCount() As Long

    ConstraintCount = mcarrConstraints.Count

End Property

cArrParameters.cls
VERSION 1.0 CLASS
BEGIN

```

```

MultiUse = -1 'True
END
Attribute VB_Name = "cArrParameters"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:      cArrParameters.cls
'            Microsoft TPC-H Kit Ver. 1.00
'            Copyright Microsoft, 1999
'            All Rights Reserved
'
' PURPOSE:   Implements an array of cParameter objects.
'            Type-safe wrapper around cNodeCollections.
'            Also contains additional functions to determine parameter
'            values, validation functions, etc.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
Option Explicit

Private mcarrParameters As cNodeCollections

' Used to indicate the source module name when errors
' are raised by this class
Private mstrSource As String
Private Const mstrModuleName As String = "cArrParameters."

Public Sub InitBuiltInsForRun(lWspId As Long, lRunId As Long)

    Dim cParamRec As cParameter

    ' Initialize the values of the run_id and output_dir built-in
    parameters and save them
    ' to the database
    Set cParamRec = GetParameterValue(lWspId, PARAM_RUN_ID)
    cParamRec.ParameterValue = CStr(lRunId)
    Call Modify(cParamRec)

    Set cParamRec = GetParameterValue(lWspId, PARAM_OUTPUT_DIR)
    cParamRec.ParameterValue = GetDefaultDir(lWspId, Me)
    cParamRec.ParameterValue = cParamRec.ParameterValue &
gstrFileSeparator & CStr(lRunId)
    Call Modify(cParamRec)

    Call SaveParametersInWsp(lWspId)

End Sub

Public Property Set ParamDatabase(vdata As Database)

    Set mcarrParameters.NodeDB = vdata

End Property
Public Sub Modify(cModifiedParam As cParameter)

    ' First check if the parameter record is valid
    Call CheckDupParamName(cModifiedParam)

    Call mcarrParameters.Modify(cModifiedParam)

End Sub
Public Sub Load(ByRef cParamToAdd As cParameter)

    Call mcarrParameters.Load(cParamToAdd)

End Sub
Public Sub Add(ByRef cParamToAdd As cParameter)

    Set cParamToAdd.NodeDB = mcarrParameters.NodeDB

    ' First check if the parameter record is valid
    Call Validate(cParamToAdd)

    ' Retrieve a unique parameter identifier
    cParamToAdd.ParameterId = cParamToAdd.NextIdentifier

    Call mcarrParameters.Add(cParamToAdd)

End Sub
Public Sub Unload(lngParamToDelete As Long)

    Dim lngDeleteElement As Long

    lngDeleteElement = QueryIndex(lngParamToDelete)

    Call mcarrParameters.Unload(lngDeleteElement)

End Sub
Public Sub SaveParametersInWsp(ByVal lngWorkspace As Long)
' Calls a procedure to commit all changes to the parameters
' for the passed in workspace.

' Call a procedure to save all parameter records for the
' workspace
Call mcarrParameters.Save(lngWorkspace)

End Sub
Public Function GetParameterValue(ByVal lngWorkspace As Long, _
    ByVal strParamName As String) As cParameter
' Returns the value for the passed in workspace parameter

    Dim cParamRec As cParameter
    Dim lngIndex As Long

    On Error GoTo GetParameterValueErr

    ' Find all parameters in the array with a matching workspace id
    For lngIndex = 0 To mcarrParameters.Count - 1

```

```

Set cParamRec = mcarrParameters(lngIndex)
If cParamRec.WorkspaceId = lngWorkspace And _
    cParamRec.ParameterName = strParamName Then

    Set GetParameterValue = cParamRec
    Exit For
End If
Next lngIndex

If lngIndex > mcarrParameters.Count - 1 Then
    ' The parameter has not been defined for the workspace
    ' Raise an error
    On Error GoTo 0
    Err.Raise vbObjectError + errParamNameInvalid, _
        mstrModuleName & "GetParameterValue", _
        LoadResString(errParamNameInvalid)
End If

Exit Function

GetParameterValueErr:
    ' Log the error code raised by Visual Basic
    Call LogErrors(Errors)
    gstrSource = mstrModuleName & "GetParameterValue"
    On Error GoTo 0
    Err.Raise vbObjectError + errGetParamValueFailed, _
        gstrSource, _
        LoadResString(errGetParamValueFailed)
End Function

Public Sub Delete(lngParamToDelete As Long)
    ' Delete the passed in parameter

    Dim lngDeleteElement As Long

    lngDeleteElement = QueryIndex(lngParamToDelete)
    Call mcarrParameters.Delete(lngDeleteElement)
End Sub

Private Function QueryIndex(lngParameterId As Long) As Long

    Dim lngIndex As Long

    ' Find the matching parameter record in the array
    For lngIndex = 0 To mcarrParameters.Count - 1
        If mcarrParameters(lngIndex).ParameterId = lngParameterId And _
            mcarrParameters(lngIndex).IndOperation <> DeleteOp Then
            QueryIndex = lngIndex
            Exit Function
        End If
    Next lngIndex

    ' Raise error that parameter has not been found
    On Error GoTo 0
    Err.Raise vbObjectError + errParamNotFound,
    "cArrParameters.QueryIndex", _

```

```

LoadResString(errParamNotFound)
End Function

Public Function QueryParameter(lngParameterId As Long) _
    As cParameter

    Dim lngQueryElement As Long

    lngQueryElement = QueryIndex(lngParameterId)

    ' Return the queried parameter object
    Set QueryParameter = mcarrParameters(lngQueryElement)
End Function

Public Property Get ParameterCount() As Long

    ParameterCount = mcarrParameters.Count
End Property

Public Property Get Item(lngIndex As Long) As cParameter
Attribute Item.VB_UserMemId = 0

    Set Item = mcarrParameters(lngIndex)
End Property

Public Sub Validate(ByVal cParamToValidate As cParameter)
    ' This procedure is necessary since the class cannot validate
    ' all the parameter properties on it's own. This is 'coz we
    ' might have created new parameters in the workspace, but not
    ' saved them to the database yet - hence the duplicate check
    ' has to be repeated in the array

    Dim lngIndex As Long
    Dim cTempParam As cParameter

    On Error GoTo ValidateErr

    ' Check if the parameter name already exists in the workspace
    For lngIndex = 0 To mcarrParameters.Count - 1
        Set cTempParam = mcarrParameters(lngIndex)
        If cTempParam.WorkspaceId = cParamToValidate.WorkspaceId And _
            cTempParam.ParameterName =
            cParamToValidate.ParameterName And _
            cTempParam.IndOperation <> DeleteOp Then
            On Error GoTo 0
            Err.Raise vbObjectError + errDuplicateParameterName, _
                mstrSource, LoadResString(errDuplicateParameterName)
        End If
    Next lngIndex

    Exit Sub

ValidateErr:
    LogErrors Errors

```

```

mstrSource = mstrModuleName & "Validate"
On Error GoTo 0
Err.Raise vbObjectError + errValidateFailed, _
    mstrSource, LoadResString(errValidateFailed)
End Sub
Public Sub CheckDupParamName(ByVal cParamToValidate As cParameter)

    Dim lngIndex As Long
    Dim cTempParam As cParameter

    ' Check if the parameter name already exists in the workspace
    For lngIndex = 0 To mcarrParameters.Count - 1
        Set cTempParam = mcarrParameters(lngIndex)
        If cTempParam.WorkspaceId = cParamToValidate.WorkspaceId And _
            cTempParam.ParameterName =
cParamToValidate.ParameterName And _
            cTempParam.ParameterId <> cParamToValidate.ParameterId
And _
            cTempParam.IndOperation <> DeleteOp Then
                ShowError errDuplicateParameterName
                On Error GoTo 0
                Err.Raise vbObjectError + errDuplicateParameterName, _
                    mstrSource, LoadResString(errDuplicateParameterName)
            End If
        Next lngIndex
    End Sub

Private Sub Class_Initialize()

    'bugmessage "cArrParameters: Initialize event - setting parameter
count to 0"
    Set mcarrParameters = New cNodeCollections

End Sub

Private Sub Class_Terminate()

    Set mcarrParameters = Nothing

End Sub

```

## cArrSteps.cls

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cArrSteps"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:      cArrSteps.cls

```

```

'      Microsoft TPC-H Kit Ver. 1.00
'      Copyright Microsoft, 1999
'      All Rights Reserved
'
'
' PURPOSE:  Implements an array of cStep objects.
'           Type-safe wrapper around cNodeCollections.
'           Also contains additional functions to update parent
version
'           on substeps, validation functions, etc.
' Contact:  Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

Private mcarrSteps As cNodeCollections

' Used to indicate the source module name when errors
' are raised by this class
Private mstrSource As String
Private Const mstrModuleName As String = "cArrSteps."

Public Sub Unload(lngStepToDelete As Long)

    Dim lngDeleteElement As Long
    Dim cUnloadStep As cStep

    lngDeleteElement = QueryStepIndex(lngStepToDelete)
    Set cUnloadStep = QueryStep(lngStepToDelete)

    ' First unload all iterators for the step
    Call cUnloadStep.UnloadIterators

    ' Unload the step from the collection
    Call mcarrSteps.Unload(lngDeleteElement)

End Sub

Public Sub Modify(cModifiedStep As cStep)

    Dim iAppend As Integer
    Dim sLabel As String

    On Error GoTo ModifyErr

    iAppend = 0
    sLabel = cModifiedStep.StepLabel

    Validate cModifiedStep

    Call mcarrSteps.Modify(cModifiedStep)

Exit Sub

ModifyErr:
' If the error raised by the add function is due to a duplication
' of the step label, then try to generate a unique label
If Err.Number - vbObjectError = errStepLabelUnique Then

```

```

        iAppend = iAppend + 1
        cModifiedStep.StepLabel = sLabel & CStr(iAppend)
        ' Try to insert the step record again
        Resume
    End If

    ' Log the error code raised by Visual Basic
    Call LogErrors(Errors)
    On Error GoTo 0
    Err.Raise vbObjectError + errModifyStepFailed, _
        gstrSource, _
        LoadResString(errModifyStepFailed)
End Sub

Public Sub UpdateParentVersion(ByVal lngStepId As Long, _
    ByVal strNewVersion As String, _
    ByVal strOldVersion As String, _
    ByVal intStepType As Integer)

    ' Does all the processing needed to update the parent version
    ' number on all the sub-steps for a given step
    ' It updates the parent version no in the database for all
    ' sub-steps of the passed in step id
    ' It also updates the parent version number on all sub-steps
    ' in the array to the new version passed in

    Dim lngIndex As Long
    Dim cUpdateStep As cStep

    On Error GoTo UpdateParentVersionErr

    If intStepType <> gintManagerStep Then
        ' Only a manager can have sub-steps - if the passed
        ' in step is not a manager, exit
        Exit Sub
    End If

    ' For all steps in the array
    For lngIndex = 0 To mcarrSteps.Count - 1

        Set cUpdateStep = mcarrSteps(lngIndex)

        ' If the current step is a sub-step of the passed in step
        If cUpdateStep.ParentStepId = lngStepId And _
            cUpdateStep.ParentVersionNo = strOldVersion And _
            Not cUpdateStep.ArchivedFlag Then

            ' Update the parent version number for the sub-step
            ' in the array
            cUpdateStep.ParentVersionNo = strNewVersion

            ' Update the parent version number for the sub-step
            ' in the array
            Call Modify(cUpdateStep)

        End If
    End If

```

```

        Next lngIndex
    Exit Sub

UpdateParentVersionErr:
    LogErrors Errors
    mstrSource = mstrModuleName & "UpdateParentVersion"
    On Error GoTo 0
    Err.Raise vbObjectError + errUpdateParentVersionFailed, _
        mstrSource, _
        LoadResString(errUpdateParentVersionFailed)
End Sub

Private Sub Validate(cCheckStep As cStep)

    ' Step validations that depend on other steps in the collection

    Dim lngIndex As Long

    ' Ensure that the step label is unique in the workspace
    For lngIndex = 0 To mcarrSteps.Count - 1

        ' If the current step is a sub-step of the passed in step
        If mcarrSteps(lngIndex).WorkspaceId = cCheckStep.WorkspaceId And

            -
                mcarrSteps(lngIndex).StepLabel = cCheckStep.StepLabel
        And _
                mcarrSteps(lngIndex).StepId <> cCheckStep.StepId And _
                mcarrSteps(lngIndex).IndOperation <> DeleteOp Then

            On Error GoTo 0
            Err.Raise vbObjectError + errStepLabelUnique, _
                mstrModuleName & "Validate", _
                LoadResString(errStepLabelUnique)

        End If
    Next lngIndex
End Sub

Public Sub ValidateStep(cCheckStep As cStep)

    On Error GoTo ValidateStepErr

    'Public wrapper for Validate function (2 many Validates)
    Call Validate(cCheckStep)

    Exit Sub

ValidateStepErr:
    ShowError errStepLabelUnique
    On Error GoTo 0
    Err.Raise vbObjectError + errValidateFailed, _
        gstrSource, _
        LoadResString(errValidateFailed)
End Sub

Private Sub Class_Initialize()

```

```

    BugMessage "cArrSteps: Initialize event - setting step count to 0"
    Set mcarrSteps = New cNodeCollections

End Sub

Private Sub Class_Terminate()

    BugMessage "cArrSteps: Terminate event triggered"
    Set mcarrSteps = Nothing

End Sub

Public Sub Add(ByVal cStepToAdd As cStep)

    Dim iAppend As Integer
    Dim sLabel As String

    On Error GoTo AddErr

    iAppend = 0
    sLabel = cStepToAdd.StepLabel

    Set cStepToAdd.NodeDB = mcarrSteps.NodeDB

    ' Retrieve a unique step identifier
    cStepToAdd.StepId = cStepToAdd.NextStepId

    Validate cStepToAdd

    ' Call a procedure to add the step record
    Call mcarrSteps.Add(cStepToAdd)

    ' Call a procedure to add all iterators for the step
    cStepToAdd.AddAllIterators

    Exit Sub

AddErr:
    ' If the error raised by the add function is due to a duplication
    ' of the step label, then try to generate a unique label
    If Err.Number - vbObjectError = errStepLabelUnique Then
        iAppend = iAppend + 1
        cStepToAdd.StepLabel = sLabel & CStr(iAppend)
        ' Try to insert the step record again
        Resume
    End If

    ' Log the error code raised by Visual Basic
    Call LogErrors(Errors)
    On Error GoTo 0
    Err.Raise vbObjectError + errInsertStepFailed, _
        gstrSource, _
        LoadResString(errInsertStepFailed)

End Sub

```

```

Public Sub Load(cStepToLoad As cStep)

    Call mcarrSteps.Load(cStepToLoad)

End Sub

Public Sub SaveStepsInWsp(ByVal lngWorkspace As Long)
    ' Calls a procedure to commit all changes to the steps
    ' in the passed in workspace.

    Dim lngIndex As Integer

    ' Find all steps in the array with a matching workspace id
    ' It is important to step in reverse order through the array,
    ' since we delete step records sometimes!
    For lngIndex = mcarrSteps.Count - 1 To 0 Step -1
        If mcarrSteps(lngIndex).WorkspaceId = lngWorkspace Then

            ' Call a procedure to commit all changes to the
            ' Step record, if any
            Call CommitStep(mcarrSteps(lngIndex), lngIndex)

        End If
    Next lngIndex

End Sub

Private Sub CommitStep(ByVal cCommitStep As cStep, _
    ByVal intIndex As Integer)
    ' This procedure checks if any changes have been made to the
    ' passed in Step. If so, it calls the step methods to commit
    ' the changes.

    ' First commit all changes to the iterator records for
    ' the step
    cCommitStep.SaveIterators

    Call mcarrSteps.Commit(cCommitStep, intIndex)

End Sub

Public Sub Delete(lngStepToDelete As Long)

    Dim lngDeleteElement As Long

    lngDeleteElement = QueryStepIndex(lngStepToDelete)
    Call mcarrSteps.Delete(lngDeleteElement)

End Sub

Public Function QueryStepIndex(lngStepId As Long) As Long

    Dim lngIndex As Long

    ' Find the element in the array that corresponds to the
    ' passed in step id - note that while there will be multiple
    ' versions of a step in the database, only one version will
    ' be currently loaded in the array - meaning that the stepid
    ' is enough to uniquely identify a step
    For lngIndex = 0 To mcarrSteps.Count - 1

```

```

        If mcarrSteps(lngIndex).StepId = lngStepId Then
            QueryStepIndex = lngIndex
            Exit Function
        End If
    Next lngIndex

    ' Raise error that step has not been found
    On Error GoTo 0
    Err.Raise vbObjectError + errStepNotFound, mstrSource, _
        LoadResString(errStepNotFound)

End Function

Public Function QueryStep(ByVal lngStepId As Long) As cStep

    ' Populates the passed in cStep object with the property
    ' values corresponding to the Step Identifier, lngStepId

    Dim lngQueryElement As Integer

    lngQueryElement = QueryStepIndex(lngStepId)

    ' Initialize the passed in step object to the queried step
    Set QueryStep = mcarrSteps(lngQueryElement)

End Function

Public Property Get Item(ByVal Position As Long) As cStep
Attribute Item.VB_UserMemId = 0

    ' Returns the element at the passed in position in the array
    If Position >= 0 And Position < mcarrSteps.Count Then
        Set Item = mcarrSteps(Position)
    Else
        On Error GoTo 0
        Err.Raise vbObjectError + errItemDoesNotExist, mstrSource, _
            LoadResString(errItemDoesNotExist)
    End If

End Property

Public Property Set Item(ByVal Position As Long, _
    ByVal cStepRec As cStep)

    ' Returns the element at the passed in position in the array
    If Position >= 0 And Position < mcarrSteps.Count Then
        Set mcarrSteps(Position) = cStepRec
    Else
        On Error GoTo 0
        Err.Raise vbObjectError + errItemDoesNotExist, mstrSource, _
            LoadResString(errItemDoesNotExist)
    End If

End Property

Public Property Set StepDB(vdata As Database)

    Set mcarrSteps.NodeDB = vdata

```

```

End Property
Public Function SubSteps(ByVal lngStepId As Long, _
    ByVal strVersionNo As String) As Variant

    ' Returns a variant containing an array of all the substeps
    ' for the passed in step

    Dim intIndex As Integer
    Dim cSubSteps() As cStep
    Dim lngStepCount As Long
    Dim cQueryStep As cStep

    On Error GoTo SubStepsErr

    lngStepCount = 0

    Set cQueryStep = QueryStep(lngStepId)

    ' Only a manager can have sub-steps
    If cQueryStep.StepType = gintManagerStep Then

        ' For each element in the Steps array
        For intIndex = 0 To mcarrSteps.Count - 1
            ' Check if the parent step id and parent version number
            ' match the passed in step
            If mcarrSteps(intIndex).ParentStepId = lngStepId And _
                mcarrSteps(intIndex).ParentVersionNo = strVersionNo

                And _
                    mcarrSteps(intIndex).IndOperation <> DeleteOp Then

                ' Increase the array dimension and add the step
                ' to it
                ReDim Preserve cSubSteps(lngStepCount)
                Set cSubSteps(lngStepCount) = mcarrSteps(intIndex)
                lngStepCount = lngStepCount + 1

            End If
        Next intIndex

    End If

    ' Set the return value of the function to the array of
    ' Steps that has been built above
    If lngStepCount = 0 Then
        SubSteps = Empty
    Else
        SubSteps = cSubSteps()
    End If

    Exit Function

SubStepsErr:
    LogErrors Errors
    mstrSource = mstrModuleName & "SubSteps"
    On Error GoTo 0
    Err.Raise vbObjectError + errSubStepsFailed, _

```



```

        mstrSource, _
        LoadResString(errSubStepsFailed)

End Function

Public Property Get StepCount() As Integer

    StepCount = mcarrSteps.Count

End Property

```

## **cAsyncShell.cls**

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cAsyncShell"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
'-----
' Copyright © 1997 Microsoft Corporation. All rights reserved.
'
' You have a royalty-free right to use, modify, reproduce and distribute
the
' Sample Application Files (and/or any modified version) in any way you
find
' useful, provided that you agree that Microsoft has no warranty,
obligations or
' liability for any Sample Application Files.
'-----
Option Explicit

' Used to indicate the source module name when errors
' are raised by this class
Private mstrSource As String
Private Const mstrModuleName As String = "cAsyncShell."

Public Event Terminated()

Private WithEvents moTimer As cTimerSM
Attribute moTimer.VB_VarHelpID = -1
Private proc As PROCESS_INFORMATION
Private mfShelling As Boolean

'-----
'Initialization and cleanup:

Private Sub Class_Initialize()

```

```

        Set moTimer = New cTimerSM
End Sub

Private Sub Class_Terminate()
    If mfShelling Then CloseHandle proc.hProcess
End Sub

'-----
'Shelling:

Public Sub Shell(CommandLine As String, Optional PollingInterval As Long
= 1000)
    Dim Start As STARTUPINFO

    If mfShelling Then
        On Error GoTo 0
        Err.Raise vbObjectError + errInstanceInUse, _
            mstrSource, _
            LoadResString(errInstanceInUse)
    End If
    mfShelling = True

    ' Initialize the STARTUPINFO structure:
    Start.cb = Len(Start)
    Start.dwFlags = STARTF_USESHOWWINDOW
    Start.wShowWindow = SW_SHOWMINNOACTIVE

    ' Start the shelled application:
    CreateProcessA 0&, CommandLine, 0&, 0&, 1&, _
        NORMAL_PRIORITY_CLASS, 0&, 0&, Start, proc

    With moTimer
        If PollingInterval > 0 Then
            .Interval = PollingInterval
        Else
            .Interval = 1000
        End If
        .Enabled = True
    End With
End Sub

'-----
'Aborting:
Public Sub Abort()
    Dim nCode As Long
    Dim X As Integer
    Dim ReturnVal As Integer

    On Error GoTo AbortErr

    If Not mfShelling Then
        Call WriteError(errProgramError, mstrSource)
    Else
        If IsWindow(proc.hProcess) = False Then Exit Sub
    End If

```

```

'      If (GetWindowLong(proc.hProcess, GWL_STYLE) And WS_DISABLED)
Then Exit Sub
'
'      If IsWindow(proc.hProcess) Then
'          If Not (GetWindowLong(proc.hProcess, GWL_STYLE) And
WS_DISABLED) Then
'              X = PostMessage(proc.hProcess, WM_CANCELMODE, 0, 0&)
'              X = PostMessage(proc.hProcess, WM_CLOSE, 0, 0&)
'          End If
'      End If

If TerminateProcess(proc.hProcess, 0&) = 0 Then
    Debug.Print "Unable to terminate process: " & proc.hProcess
    Call WriteError(errTerminateProcessFailed, mstrSource, _
        ApiError(GetLastError()))
Else
    ' Should always come here!
    GetExitCodeProcess proc.hProcess, nCode
    If nCode = STILL_ACTIVE Then
        ' Write an error and close the handles to the
        ' process anyway
        Call WriteError(errTerminateProcessFailed, mstrSource)
    End If
End If

' Close all open handles to the shelled process, even
' if any of the above calls error out
CloseHandle proc.hProcess
moTimer.Enabled = False
mfShelling = False
RaiseEvent Terminated

End If

Exit Sub

AbortErr:
Call LogErrors(Errors)
mstrSource = mstrModuleName & "Abort"
On Error GoTo 0
Err.Raise vbObjectError + errProgramError, _
    mstrSource, _
    LoadResString(errProgramError)

End Sub
Private Sub moTimer_Timer()
Dim nCode As Long

GetExitCodeProcess proc.hProcess, nCode
If nCode <> STILL_ACTIVE Then
    CloseHandle proc.hProcess
    moTimer.Enabled = False
    mfShelling = False
    RaiseEvent Terminated
End If
End Sub

```

## cConnDtl.cls

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cConnDtl"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:      cConnDtl.cls
'            Microsoft TPC-H Kit Ver. 1.00
'            Copyright Microsoft, 1999
'            All Rights Reserved
'
' PURPOSE:   Encapsulates the properties and methods of a connection.
'            Contains functions to insert, update and delete
'            connection_dtls records from the database.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit
Option Base 0

' Local variable(s) to hold property value(s)
Public WorkspaceId As Long
Public ConnNameId As Long
Public ConnName As String
Public ConnectionString As String
Public ConnType As ConnectionType
Public Position As Long
Public NodeDB As Database

Private mintOperation As Operation

' Used to indicate the source module name when errors
' are raised by this class
Private mstrSource As String
Private Const mstrModuleName As String = "cConnDtl."

' The cSequence class is used to generate unique Connection identifiers
Private mConnectionSeq As cSequence

' The StringSM class is used to carry out string operations
Private mFieldValue As cStringSM

Private Sub AssignParameters(qyExec As DAO.QueryDef)
' Assigns values to the parameters in the querydef object
' The parameter names are cryptic to differentiate them from the
field names.
' When the parameter names are the same as the field names,
parameters in the where
' clause do not get created.

```

```

Dim prmParam As DAO.Parameter

On Error GoTo AssignParametersErr

For Each prmParam In qyExec.Parameters
    Select Case prmParam.Name
        Case "[w_id]"
            prmParam.Value = WorkspaceId

        Case "[c_id]"
            prmParam.Value = ConnNameId

        Case "[c_name]"
            prmParam.Value = ConnName

        Case "[c_str]"
            prmParam.Value = ConnectionString

        Case "[c_type]"
            prmParam.Value = ConnType

        Case Else
            ' Write the parameter name that is faulty
            WriteError errInvalidParameter, mstrSource,
prmParam.Name
            On Error GoTo 0
            Err.Raise errInvalidParameter, mstrModuleName &
"AssignParameters", _
                LoadResString(errInvalidParameter)
    End Select
Next prmParam

Exit Sub

AssignParametersErr:

Call LogErrors(Errors)
On Error GoTo 0
Err.Raise vbObjectError + errAssignParametersFailed, _
    mstrModuleName & "AssignParameters", _
LoadResString(errAssignParametersFailed)

End Sub

Public Function Clone() As cConnDtl

    ' Creates a copy of a given Connection

    Dim cCloneConn As cConnDtl

    On Error GoTo CloneErr

    Set cCloneConn = New cConnDtl

    ' Copy all the Connection properties to the newly created Connection
    cCloneConn.WorkspaceId = WorkspaceId

```

```

cCloneConn.ConnNameId = ConnNameId
cCloneConn.ConnName = ConnName
cCloneConn.ConnectionString = ConnectionString
cCloneConn.ConnType = ConnType
cCloneConn.IndOperation = mintOperation
cCloneConn.Position = Position

' And set the return value to the newly created Connection
Set Clone = cCloneConn
Set cCloneConn = Nothing

Exit Function

CloneErr:
LogErrors Errors
mstrSource = mstrModuleName & "Clone"
On Error GoTo 0
Err.Raise vbObjectError + errCloneFailed, mstrSource,
LoadResString(errCloneFailed)

End Function

Private Sub CheckDupConnectionName()
    ' Check if the Connection name already exists in the workspace

    Dim rstConnection As Recordset
    Dim strSql As String
    Dim qy As DAO.QueryDef

    On Error GoTo CheckDupConnectionNameErr
    mstrSource = mstrModuleName & "CheckDupConnectionName"

    ' Create a recordset object to retrieve the count of all Connections
    ' for the workspace with the same name
    strSql = "Select count(*) as Connection_count " & _
        " from " & TBL_CONNECTION_DTLS & " _
        " where " & FLD_ID_WORKSPACE & " = [w_id]" & _
        " and " & FLD_CONN_DTL_CONNECTION_NAME & " = [c_name]" & _
        " and " & FLD_ID_CONN_NAME & " <> [c_id]"

    Set qy = dbsAttTool.CreateQueryDef(gstrEmptyString, strSql)
    Call AssignParameters(qy)

    Set rstConnection = qy.OpenRecordset(dbOpenForwardOnly)

    If rstConnection![Connection_count] > 0 Then
        rstConnection.Close
        qy.Close
        ShowError errDupConnDtlName
        On Error GoTo 0
        Err.Raise vbObjectError + errDupConnDtlName, _
            mstrSource, LoadResString(errDupConnDtlName)
    End If

    rstConnection.Close
    qy.Close

```

```

Exit Sub

CheckDupConnectionNameErr:
LogErrors Errors
mstrSource = mstrModuleName & "CheckDupConnectionName"
On Error GoTo 0
Err.Raise vbObjectError + errProgramError, _
    mstrSource, LoadResString(errProgramError)

End Sub
Public Property Let IndOperation(ByVal vdata As Operation)

' The valid operations are define in the cOperations
' class. Check if the operation is valid
Select Case vdata
    Case QueryOp, InsertOp, UpdateOp, DeleteOp
        mintOperation = vdata

    Case Else
        BugAssert True
End Select

End Property
Public Sub Validate()
' Each distinct object will have a Validate method which
' will check if the class properties are valid. This method
' will be used to check interdependant properties that
' cannot be validated by the let procedures.
' It should be called by the add and modify methods of the class

If ConnName = gstrEmptyString Then

    ShowError errConnectionNameMandatory
    On Error GoTo 0
    ' Propagate this error back to the caller
    Err.Raise vbObjectError + errConnectionNameMandatory, _
        mstrSource, LoadResString(errConnectionNameMandatory)
End If

' Raise an error if the Connection name already exists in the
workspace
Call CheckDupConnectionName

End Sub
Public Sub Add()

Dim strInsert As String
Dim qy As DAO.QueryDef

On Error GoTo AddErr

' Validate the record before trying to insert the record
Call Validate

' Create a temporary querydef object
strInsert = "insert into " & TBL_CONNECTION_DTLS & _

```

```

" ( " & FLD_ID_WORKSPACE & _
", " & FLD_ID_CONN_NAME & _
", " & FLD_CONN_DTL_CONNECTION_NAME & _
", " & FLD_CONN_DTL_CONNECTION_STRING & _
", " & FLD_CONN_DTL_CONNECTION_TYPE & " ) " & _
" values ( [w_id], [c_id], " & _
" [c_name], [c_str], [c_type] )"

Set qy = dbsAttTool.CreateQueryDef(gstrEmptyString, strInsert)

' Call a procedure to assign the Connection values
Call AssignParameters(qy)

qy.Execute dbFailOnError
qy.Close

Exit Sub

AddErr:

Call LogErrors(Errors)
On Error GoTo 0
Err.Raise vbObjectError + errInsertFailed, _
    mstrModuleName & "Add", LoadResString(errInsertFailed)

End Sub
Public Sub Delete()

Dim strDelete As String
Dim qy As DAO.QueryDef

On Error GoTo DeleteErr

strDelete = "delete from " & TBL_CONNECTION_DTLS & _
    " where " & FLD_ID_CONN_NAME & " = [c_id]"
Set qy = dbsAttTool.CreateQueryDef(gstrEmptyString, strDelete)

Call AssignParameters(qy)
qy.Execute dbFailOnError

qy.Close

Exit Sub

DeleteErr:
LogErrors Errors
On Error GoTo 0
Err.Raise vbObjectError + errDeleteFailed, _
    mstrModuleName & "Delete", LoadResString(errDeleteFailed)

End Sub

Public Sub Modify()

Dim strUpdate As String
Dim qy As QueryDef

```

```

On Error GoTo ModifyErr

' Validate the updated values before trying to modify the db
Call Validate

' Create a temporary querydef object with the modify string
strUpdate = "update " & TBL_CONNECTION_DTLS &
    " set " & FLD_ID_WORKSPACE & " = [w_id], " & _
    FLD_CONN_DTL_CONNECTION_NAME & " = [c_name], " & _
    FLD_CONN_DTL_CONNECTION_STRING & " = [c_str], " & _
    FLD_CONN_DTL_CONNECTION_TYPE & " = [c_type] " & _
    " where " & FLD_ID_CONN_NAME & " = [c_id]"
Set qy = dbsAttTool.CreateQueryDef(gstrEmptyString, strUpdate)

' Call a procedure to assign the Connection values to the
' querydef object
Call AssignParameters(qy)
qy.Execute dbFailOnError

qy.Close

Exit Sub

ModifyErr:

Call LogErrors(Errors)
On Error GoTo 0
Err.Raise vbObjectError + errModifyFailed, _
    mstrModuleName & "Modify", LoadResString(errModifyFailed)

End Sub
Public Property Get NextIdentifier() As Long

    Dim lngNextId As Long

    On Error GoTo NextIdentifierErr

    ' Retrieve the next identifier using the sequence class
    Set mConnectionSeq = New cSequence
    Set mConnectionSeq.IdDatabase = dbsAttTool
    mConnectionSeq.IdentifierColumn = FLD_ID_CONN_NAME
    lngNextId = mConnectionSeq.Identifier
    Set mConnectionSeq = Nothing

    NextIdentifier = lngNextId
    Exit Property

NextIdentifierErr:
    LogErrors Errors
    On Error GoTo 0
    Err.Raise vbObjectError + errIdGetFailed, _
        mstrModuleName & "NextIdentifier", LoadResString(errIdGetFailed)

End Property
Public Property Get IndOperation() As Operation

```

```

    IndOperation = mintOperation
End Property

Private Sub Class_Initialize()

    Set mFieldValue = New cStringSM

    ' Initialize the operation indicator variable to Query
    ' It will be modified later by the collection class when
    ' inserts, updates or deletes are performed
    mintOperation = QueryOp

    ConnType = giDefaultConnType

End Sub

Private Sub Class_Terminate()

    Set mFieldValue = Nothing

End Sub

```

## cConnDtls.cls

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cConnDtls"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:      cConnDtls.cls
'           Microsoft TPC-H Kit Ver. 1.00
'           Copyright Microsoft, 1999
'           All Rights Reserved
'
' PURPOSE:   Implements an array of cConnDtl objects.
'           Type-safe wrapper around cNodeCollections.
'           Also contains additional functions to determine the
connection
'           string value, validation functions, etc.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

Private mcarrConnDtls As cNodeCollections

' Used to indicate the source module name when errors
' are raised by this class
Private mstrSource As String
Private Const mstrModuleName As String = "cConnDtls."

```

```

Public Property Set ConnDb(vdata As Database)
    Set mcarrConnDtls.NodeDB = vdata
End Property
Public Sub Modify(cModifiedConn As cConnDtl)
    ' First check if the parameter record is valid
    Call CheckDupConnName(cModifiedConn)

    Call mcarrConnDtls.Modify(cModifiedConn)
End Sub
Public Sub Load(ByRef cConnToAdd As cConnDtl)
    Call mcarrConnDtls.Load(cConnToAdd)
End Sub
Public Sub Add(ByRef cConnToAdd As cConnDtl)
    ' First check if the record is valid
    Call Validate(cConnToAdd)

    ' Retrieve a unique identifier
    cConnToAdd.ConnNameId = cConnToAdd.NextIdentifier

    Call mcarrConnDtls.Add(cConnToAdd)
End Sub
Public Sub Unload(lConnNameId As Long)
    Dim lngDeleteElement As Long

    lngDeleteElement = QueryIndex(lConnNameId)

    Call mcarrConnDtls.Unload(lngDeleteElement)
End Sub
Public Sub SaveConnDtlsInWsp(ByVal lngWorkspace As Long)
    ' Call a procedure to save all connection details records for the
    workspace
    Call mcarrConnDtls.Save(lngWorkspace)
End Sub
Public Function GetConnectionDtl(ByVal lngWorkspace As Long, _
    ByVal strConnectionName As String) As cConnDtl
    ' Returns the connection dtl for the passed in connection name

    Dim lngIndex As Long

    ' Find all parameters in the array with a matching workspace id
    For lngIndex = 0 To mcarrConnDtls.Count - 1
        If mcarrConnDtls(lngIndex).WorkspaceId = lngWorkspace And _
            mcarrConnDtls(lngIndex).ConnName = strConnectionName
            Then
                Set GetConnectionDtl = mcarrConnDtls(lngIndex)
                Exit For
            End If
        Next lngIndex

    If lngIndex > mcarrConnDtls.Count - 1 Then
        ' The parameter has not been defined for the workspace
        ' Raise an error
        On Error GoTo 0
        Err.Raise vbObjectError + errConnNameInvalid, mstrModuleName &
        "GetConnection", _
            LoadResString(errConnNameInvalid)
    End If
End Function
Public Sub Delete(lConnNameId As Long)
    ' Delete the passed in parameter

    Dim lngDeleteElement As Long

    lngDeleteElement = QueryIndex(lConnNameId)
    Call mcarrConnDtls.Delete(lngDeleteElement)
End Sub
Private Function QueryIndex(lConnNameId As Long) As Long
    Dim lngIndex As Long

    ' Find the matching parameter record in the array
    For lngIndex = 0 To mcarrConnDtls.Count - 1
        If mcarrConnDtls(lngIndex).ConnNameId = lConnNameId And _
            mcarrConnDtls(lngIndex).IndOperation <> DeleteOp Then
            QueryIndex = lngIndex
            Exit Function
        End If
    Next lngIndex

    ' Raise error that parameter has not been found
    On Error GoTo 0
    Err.Raise vbObjectError + errQueryIndexFailed,
    "cArrParameters.QueryIndex", _
        LoadResString(errQueryIndexFailed)
End Function
Public Function QueryConnDtl(lConnNameId As Long) As cConnDtl
    Dim lngQueryElement As Long

    lngQueryElement = QueryIndex(lConnNameId)

    ' Return the queried connection object
    Set QueryConnDtl = mcarrConnDtls(lngQueryElement)

```

```

End Function
Public Property Get Count() As Long

    Count = mcarrConnDtls.Count

End Property
Public Property Get Item(lngIndex As Long) As cConnDtl
Attribute Item.VB_UserMemId = 0

    Set Item = mcarrConnDtls(lngIndex)

End Property

Private Sub Validate(ByVal cConnToValidate As cConnDtl)
' This procedure is necessary since the class cannot validate
' all the connection_dtl properties on it's own. This is 'coz we
' might have created new connections in the workspace, but not
' saved them to the database yet - hence the duplicate check
' has to be repeated in the array

Dim lngIndex As Long
Dim cTempParam As cConnDtl

' Check if the parameter name already exists in the workspace
For lngIndex = 0 To mcarrConnDtls.Count - 1
    Set cTempParam = mcarrConnDtls(lngIndex)
    If cTempParam.WorkspaceId = cConnToValidate.WorkspaceId And _
        cTempParam.ConnName = cConnToValidate.ConnName And _
        cTempParam.IndOperation <> DeleteOp Then
        On Error GoTo 0
        Err.Raise vbObjectError + errDupConnDtlName, _
            mstrSource, LoadResString(errDupConnDtlName)
    End If
Next lngIndex

End Sub

Private Sub CheckDupConnName(ByVal cConnToValidate As cConnDtl)

Dim lngIndex As Long
Dim cTempParam As cConnDtl

' Check if the parameter name already exists in the workspace
For lngIndex = 0 To mcarrConnDtls.Count - 1
    Set cTempParam = mcarrConnDtls(lngIndex)
    If cTempParam.WorkspaceId = cConnToValidate.WorkspaceId And _
        cTempParam.ConnName = cConnToValidate.ConnName And _
        cTempParam.ConnNameId <> cConnToValidate.ConnNameId And
-
        cTempParam.IndOperation <> DeleteOp Then
        ShowError errDupConnDtlName
        On Error GoTo 0
        Err.Raise vbObjectError + errDupConnDtlName, _
            mstrSource, LoadResString(errDupConnDtlName)
    End If
Next lngIndex

```

```

End Sub

Private Sub Class_Initialize()

    Set mcarrConnDtls = New cNodeCollections

End Sub

Private Sub Class_Terminate()

    Set mcarrConnDtls = Nothing

End Sub

```

### cConnection.cls

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cConnection"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:          cConnection.cls
'                Microsoft TPC-H Kit Ver. 1.00
'                Copyright Microsoft, 1999
'                All Rights Reserved
'
' PURPOSE:       Encapsulates the properties and methods of a connection
string.
'
'                Contains functions to insert, update and delete
workspace_connections records from the database.
' Contact:       Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit
Option Base 0

' Local variable(s) to hold property value(s)
Public WorkspaceId As Long
Public ConnectionId As Long
Public ConnectionValue As String
Public Description As String
Public NodeDB As Database
Public Position As Long
Public NoCountDisplay As Boolean
Public NoExecute As Boolean
Public ParseQueryOnly As Boolean
Public QuotedIdentifiers As Boolean
Public AnsiNulls As Boolean
Public ShowQueryPlan As Boolean
Public ShowStatsTime As Boolean
Public ShowStatsIO As Boolean

```

```

Public ParseOdbcMsg As Boolean
Public RowCount As Long
Public TsqlBatchSeparator As String
Public QueryTimeOut As Long
Public ServerLanguage As String
Public CharacterTranslation As Boolean
Public RegionalSettings As Boolean

Private mstrConnectionName As String
Private mintOperation As Operation

' Used to indicate the source module name when errors
' are raised by this class
Private mstrSource As String
Private Const mstrModuleName As String = "cConnection."

' The cSequence class is used to generate unique Connection identifiers
Private mConnectionSeq As cSequence

' The StringSM class is used to carry out string operations
Private mFieldValue As cStringSM

Private Sub AssignParameters(qyExec As DAO.QueryDef)
    ' Assigns values to the parameters in the querydef object
    ' The parameter names are cryptic to differentiate them from the
    field names.
    ' When the parameter names are the same as the field names,
    parameters in the where
    ' clause do not get created.

    Dim prmParam As DAO.Parameter

    On Error GoTo AssignParametersErr

    For Each prmParam In qyExec.Parameters
        Select Case prmParam.Name
            Case "[w_id]"
                prmParam.Value = WorkspaceId

            Case "[c_id]"
                prmParam.Value = ConnectionId

            Case "[c_name]"
                prmParam.Value = mstrConnectionName

            Case "[c_value]"
                prmParam.Value = ConnectionValue

            Case "[desc]"
                prmParam.Value = Description

            Case "[no_count]"
                prmParam.Value = NoCountDisplay

            Case "[no_exec]"
                prmParam.Value = NoExecute

```

```

            Case "[parse_only]"
                prmParam.Value = ParseQueryOnly

            Case "[quoted_id]"
                prmParam.Value = QuotedIdentifiers

            Case "[a_nulls]"
                prmParam.Value = AnsiNulls

            Case "[show_qp]"
                prmParam.Value = ShowQueryPlan

            Case "[stats_tm]"
                prmParam.Value = ShowStatsTime

            Case "[stats_io]"
                prmParam.Value = ShowStatsIO

            Case "[parse_odbc]"
                prmParam.Value = ParseOdbcMsg

            Case "[row_cnt]"
                prmParam.Value = RowCount

            Case "[batch_sep]"
                prmParam.Value = TsqlBatchSeparator

            Case "[qry_tmout]"
                prmParam.Value = QueryTimeOut

            Case "[lang]"
                prmParam.Value = ServerLanguage

            Case "[char_trans]"
                prmParam.Value = CharacterTranslation

            Case "[reg_settings]"
                prmParam.Value = RegionalSettings

            Case Else
                ' Write the parameter name that is faulty
                WriteError errInvalidParameter, mstrSource,
                prmParam.Name
                On Error GoTo 0
                Err.Raise errInvalidParameter, mstrModuleName &
                "AssignParameters", _
                LoadResString(errInvalidParameter)

            End Select
        Next prmParam

    Exit Sub

AssignParametersErr:
    Call LogErrors(Errors)

```



```

    On Error GoTo 0
    Err.Raise vbObjectError + errAssignParametersFailed, _
        mstrModuleName & "AssignParameters", _
LoadResString(errAssignParametersFailed)

End Sub

Public Function Clone() As cConnection

    ' Creates a copy of a given Connection

    Dim cCloneConn As cConnection

    On Error GoTo CloneErr

    Set cCloneConn = New cConnection

    ' Copy all the Connection properties to the newly
    ' created Connection
    Set cCloneConn.NodeDB = NodeDB
    cCloneConn.WorkspaceId = WorkspaceId
    cCloneConn.ConnectionId = ConnectionId
    cCloneConn.ConnectionName = mstrConnectionName
    cCloneConn.ConnectionValue = ConnectionValue
    cCloneConn.Description = Description
    cCloneConn.IndOperation = mintOperation
    cCloneConn.Position = Position
    cCloneConn.NoCountDisplay = NoCountDisplay
    cCloneConn.NoExecute = NoExecute
    cCloneConn.ParseQueryOnly = ParseQueryOnly
    cCloneConn.QuotedIdentifiers = QuotedIdentifiers
    cCloneConn.AnsiNulls = AnsiNulls
    cCloneConn.ShowQueryPlan = ShowQueryPlan
    cCloneConn.ShowStatsTime = ShowStatsTime
    cCloneConn.ShowStatsIO = ShowStatsIO
    cCloneConn.ParseOdbcMsg = ParseOdbcMsg
    cCloneConn.RowCount = RowCount
    cCloneConn.TsqlBatchSeparator = TsqlBatchSeparator
    cCloneConn.QueryTimeout = QueryTimeout
    cCloneConn.ServerLanguage = ServerLanguage
    cCloneConn.CharacterTranslation = CharacterTranslation
    cCloneConn.RegionalSettings = RegionalSettings

    ' And set the return value to the newly created Connection
    Set Clone = cCloneConn
    Set cCloneConn = Nothing

Exit Function

CloneErr:
    LogErrors Errors
    mstrSource = mstrModuleName & "Clone"
    On Error GoTo 0
    Err.Raise vbObjectError + errCloneFailed, mstrSource,
LoadResString(errCloneFailed)

```

```

End Function
Private Sub CheckDupConnectionName()
    ' Check if the Connection name already exists in the workspace

    Dim rstConnection As Recordset
    Dim strSql As String
    Dim qy As DAO.QueryDef

    On Error GoTo CheckDupConnectionNameErr
    mstrSource = mstrModuleName & "CheckDupConnectionName"

    ' Create a recordset object to retrieve the count of all Connections
    ' for the workspace with the same name
    strSql = "Select count(*) as Connection_count " & _
        " from workspace_connections " & _
        " where workspace_id = [w_id]" & _
        " and connection_name = [c_name]" & _
        " and connection_id <> [c_id]"

    Set qy = NodeDB.CreateQueryDef(gstrEmptyString, strSql)
    Call AssignParameters(qy)

    Set rstConnection = qy.OpenRecordset(dbOpenForwardOnly)

    If rstConnection![Connection_count] > 0 Then
        rstConnection.Close
        qy.Close
        ShowError errDuplicateConnectionName
        On Error GoTo 0
        Err.Raise vbObjectError + errDuplicateConnectionName, _
            mstrSource, LoadResString(errDuplicateConnectionName)
    End If

    rstConnection.Close
    qy.Close

Exit Sub

CheckDupConnectionNameErr:
    LogErrors Errors
    mstrSource = mstrModuleName & "CheckDupConnectionName"
    On Error GoTo 0
    Err.Raise vbObjectError + errProgramError, _
        mstrSource, LoadResString(errProgramError)

End Sub
Private Sub CheckDB()
    ' Check if the database object has been initialized

    If NodeDB Is Nothing Then
        On Error GoTo 0
        Err.Raise vbObjectError + errInvalidDB, _
            mstrModuleName & "CheckDB", LoadResString(errInvalidDB)
    End If

End Sub

```

```

Public Property Let ConnectionName(vdata As String)
    If vdata = gstrEmptyString Then
        ShowError errConnectionNameMandatory
        On Error GoTo 0
        ' Propagate this error back to the caller
        Err.Raise vbObjectError + errConnectionNameMandatory, _
            mstrSource, LoadResString(errConnectionNameMandatory)
    Else
        mstrConnectionName = vdata
    End If
End Property

Public Property Let IndOperation(ByVal vdata As Operation)
    ' The valid operations are define in the cOperations
    ' class. Check if the operation is valid
    Select Case vdata
        Case QueryOp, InsertOp, UpdateOp, DeleteOp
            mstrOperation = vdata

        Case Else
            BugAssert True
    End Select

End Property

Public Sub Validate()
    ' Each distinct object will have a Validate method which
    ' will check if the class properties are valid. This method
    ' will be used to check interdependant properties that
    ' cannot be validated by the let procedures.
    ' It should be called by the add and modify methods of the class

    ' Check if the db object is valid
    Call CheckDB

    ' Raise an error if the Connection name already exists in the
    workspace
    Call CheckDupConnectionName
End Sub

Public Sub Add()
    Dim strInsert As String
    Dim qy As DAO.QueryDef

    On Error GoTo AddErr

    ' Validate the record before trying to insert the record
    Call Validate

    ' Create a temporary querydef object
    strInsert = "insert into workspace_connections " & _
        "( workspace_id, connection_id, " & _
        "connection_name, connection_value, " & _
        "description, no_count_display, " & _
        "no_execute, parse_query_only, " & _
        "ANSI_quoted_identifiers, ANSI_nulls, " & _
        "show_query_plan, show_stats_time, " & _
        "show_stats_io, parse_odbc_msg_prefixes, " & _
        "row_count, tsq_batch_separator, " & _
        "query_time_out, server_language, " & _
        "character_translation, regional_settings ) " & _
        "values ( [w_id], [c_id], [c_name], [c_value], " & _
        "[desc], [no_count], [no_exec], [parse_only], " & _
        "[quoted_id], [a_nulls], [show_qp], [stats_tm], " & _
        "[stats_io], [parse_odbc], [row_cnt], [batch_sep], " & _
        "[qry_tmout], [lang], [char_trans], [reg_settings] ) " & _

Set qy = NodeDB.CreateQueryDef(gstrEmptyString, strInsert)

' Call a procedure to assign the Connection values
Call AssignParameters(qy)

qy.Execute dbFailOnError
qy.Close

Exit Sub

AddErr:

Call LogErrors(Errors)
On Error GoTo 0
Err.Raise vbObjectError + errInsertFailed, _
    mstrModuleName & "Add", LoadResString(errInsertFailed)

End Sub

Public Sub Delete()
    Dim strDelete As String
    Dim qy As DAO.QueryDef

    On Error GoTo DeleteErr

    ' Check if the db object is valid
    Call CheckDB

    strDelete = "delete from workspace_connections " & _
        " where connection_id = [c_id]"
    Set qy = NodeDB.CreateQueryDef(gstrEmptyString, strDelete)

    Call AssignParameters(qy)
    qy.Execute dbFailOnError

    qy.Close

    Exit Sub

DeleteErr:
    LogErrors Errors

```

```

On Error GoTo 0
Err.Raise vbObjectError + errDeleteFailed, _
    mstrModuleName & "Delete", LoadResString(errDeleteFailed)
End Sub

Public Sub Modify()

    Dim strUpdate As String
    Dim qy As QueryDef

    On Error GoTo ModifyErr

    ' Validate the updated values before trying to modify the db
    Call Validate

    ' Create a temporary querydef object with the modify string
    strUpdate = "update workspace_connections " & _
        " set workspace_id = [w_id], " & _
        "connection_name = [c_name], " & _
        "connection_value = [c_value], " & _
        "description = [desc], " & _
        "no_count_display = [no_count], " & _
        "no_execute = [no_exec], " & _
        "parse_query_only = [parse_only], " & _
        "ANSI_quoted_identifiers = [quoted_id], " & _
        "ANSI_nulls = [a_nulls], " & _
        "show_query_plan = [show_qp], " & _
        "show_stats_time = [stats_tm], " & _
        "show_stats_io = [stats_io], " & _
        "parse_odbc_msg_prefixes = [parse_odbc], " & _
        "row_count = [row_cnt], " & _
        "tsql_batch_separator = [batch_sep], " & _
        "query_time_out = [qry_tmout], " & _
        "server_language = [lang], " & _
        "character_translation = [char_trans], " & _
        "regional_settings = [reg_settings] " & _
        " where connection_id = [c_id]"
    Set qy = NodeDB.CreateQueryDef(gstrEmptyString, strUpdate)

    ' Call a procedure to assign the Connection values to the
    ' querydef object
    Call AssignParameters(qy)
    qy.Execute dbFailOnError

    qy.Close

    Exit Sub

ModifyErr:

    Call LogErrors(Errors)
    On Error GoTo 0
    Err.Raise vbObjectError + errModifyFailed, _
        mstrModuleName & "Modify", LoadResString(errModifyFailed)

```

```

End Sub
Public Property Get ConnectionName() As String

    ConnectionName = mstrConnectionName
End Property

Public Property Get NextIdentifier() As Long

    Dim lngNextId As Long

    On Error GoTo NextIdentifierErr

    ' First check if the database object is valid
    Call CheckDB

    ' Retrieve the next identifier using the sequence class
    Set mConnectionSeq = New cSequence
    Set mConnectionSeq.IdDatabase = NodeDB
    mConnectionSeq.IdentifierColumn = "connection_id"
    lngNextId = mConnectionSeq.Identifier
    Set mConnectionSeq = Nothing

    NextIdentifier = lngNextId
    Exit Property

NextIdentifierErr:
    LogErrors Errors
    On Error GoTo 0
    Err.Raise vbObjectError + errIdGetFailed, _
        mstrModuleName & "NextIdentifier", LoadResString(errIdGetFailed)
End Property

Public Property Get IndOperation() As Operation

    IndOperation = mintOperation
End Property

Private Sub Class_Initialize()

    Set mFieldValue = New cStringSM

    ' Initialize the operation indicator variable to Query
    ' It will be modified later by the collection class when
    ' inserts, updates or deletes are performed
    mintOperation = QueryOp

    ' Initialize connection properties to their default values
    NoCountDisplay = DEF_NO_COUNT_DISPLAY
    NoExecute = DEF_NO_EXECUTE
    ParseQueryOnly = DEF_PARSE_QUERY_ONLY
    QuotedIdentifiers = DEF_ANSI_QUOTED_IDENTIFIERS
    AnsiNulls = DEF_ANSI_NULLS
    ShowQueryPlan = DEF_SHOW_QUERY_PLAN
    ShowStatsTime = DEF_SHOW_STATS_TIME

```

```

ShowStatsIO = DEF_SHOW_STATS_IO
ParseOdbcMsg = DEF_PARSE_ODBC_MSG_PREFIXES
RowCount = DEF_ROW_COUNT
TsqlBatchSeparator = DEF_TSQL_BATCH_SEPARATOR
QueryTimeOut = DEF_QUERY_TIME_OUT
ServerLanguage = DEF_SERVER_LANGUAGE
CharacterTranslation = DEF_CHARACTER_TRANSLATION
RegionalSettings = DEF_REGIONAL_SETTINGS

End Sub

Private Sub Class_Terminate()

    Set NodeDB = Nothing
    Set mFieldValue = Nothing

End Sub

```

## cConnections.cls

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cConnections"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:      cConnections.cls
'           Microsoft TPC-H Kit Ver. 1.00
'           Copyright Microsoft, 1999
'           All Rights Reserved
'
' PURPOSE:   Implements an array of cConnection objects.
'           Type-safe wrapper around cNodeCollections.
'           Also contains validation functions, etc.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

Private mcarrConnections As cNodeCollections

' Used to indicate the source module name when errors
' are raised by this class
Private mstrSource As String
Private Const mstrModuleName As String = "cConnections."

Public Property Set ConnDb(vdata As Database)

    Set mcarrConnections.NodeDB = vdata

End Property
Public Sub Modify(cModifiedConn As cConnection)

```

```

' First check if the parameter record is valid
Call CheckDupConnName(cModifiedConn)

Call mcarrConnections.Modify(cModifiedConn)

End Sub
Public Sub Load(ByRef cConnToAdd As cConnection)

    Call mcarrConnections.Load(cConnToAdd)

End Sub
Public Sub Add(ByRef cConnToAdd As cConnection)

    Set cConnToAdd.NodeDB = mcarrConnections.NodeDB

' First check if the record is valid
Call Validate(cConnToAdd)

' Retrieve a unique identifier
cConnToAdd.ConnectionId = cConnToAdd.NextIdentifier

Call mcarrConnections.Add(cConnToAdd)

End Sub

Public Sub Unload(lngConnId As Long)

    Dim lngDeleteElement As Long

    lngDeleteElement = QueryIndex(lngConnId)

    Call mcarrConnections.Unload(lngDeleteElement)

End Sub

Public Sub SaveConnectionsInWsp(ByVal lngWorkspace As Long)
' Call a procedure to save all connection records for the workspace
Call mcarrConnections.Save(lngWorkspace)

End Sub
Public Function GetConnection(ByVal lngWorkspace As Long, _
    ByVal strConnectionName As String) As cConnection
' Returns the connection string for the passed in connection name

    Dim lngIndex As Long

' Find all parameters in the array with a matching workspace id
For lngIndex = 0 To mcarrConnections.Count - 1
    If mcarrConnections(lngIndex).WorkspaceId = lngWorkspace And _
        mcarrConnections(lngIndex).ConnectionName = _
strConnectionName Then

        Set GetConnection = mcarrConnections(lngIndex)
        Exit For
    End If
Next lngIndex

```

```

    If lngIndex > mcarrConnections.Count - 1 Then
        ' The parameter has not been defined for the workspace
        ' Raise an error
        On Error GoTo 0
        Err.Raise vbObjectError + errConnNameInvalid, mstrModuleName &
"GetConnection", _
            LoadResString(errConnNameInvalid)
    End If
End Function
Public Sub Delete(lngConnId As Long)
    ' Delete the passed in parameter

    Dim lngDeleteElement As Long

    lngDeleteElement = QueryIndex(lngConnId)
    Call mcarrConnections.Delete(lngDeleteElement)
End Sub
Private Function QueryIndex(lngConnId As Long) As Long

    Dim lngIndex As Long

    ' Find the matching parameter record in the array
    For lngIndex = 0 To mcarrConnections.Count - 1
        If mcarrConnections(lngIndex).ConnectionId = lngConnId And _
            mcarrConnections(lngIndex).IndOperation <> DeleteOp Then
            QueryIndex = lngIndex
            Exit Function
        End If
    Next lngIndex

    ' Raise error that parameter has not been found
    On Error GoTo 0
    Err.Raise vbObjectError + errQueryIndexFailed,
"cArrParameters.QueryIndex", _
    LoadResString(errQueryIndexFailed)
End Function
Public Function QueryConnection(lngConnId As Long) As cConnection

    Dim lngQueryElement As Long

    lngQueryElement = QueryIndex(lngConnId)

    ' Return the queried connection object
    Set QueryConnection = mcarrConnections(lngQueryElement)
End Function
Public Property Get Count() As Long

    Count = mcarrConnections.Count
End Property

```

```

Public Property Get Item(lngIndex As Long) As cConnection
Attribute Item.VB_UserMemId = 0

    Set Item = mcarrConnections(lngIndex)
End Property

Public Sub Validate(ByVal cConnToValidate As cConnection)
    ' This procedure is necessary since the class cannot validate
    ' all the parameter properties on it's own. This is 'coz we
    ' might have created new parameters in the workspace, but not
    ' saved them to the database yet - hence the duplicate check
    ' has to be repeated in the array

    Dim lngIndex As Long
    Dim cTempParam As cConnection

    ' Check if the parameter name already exists in the workspace
    For lngIndex = 0 To mcarrConnections.Count - 1
        Set cTempParam = mcarrConnections(lngIndex)
        If cTempParam.WorkspaceId = cConnToValidate.WorkspaceId And _
            cTempParam.ConnectionName =
cConnToValidate.ConnectionName And _
            cTempParam.IndOperation <> DeleteOp Then
            On Error GoTo 0
            Err.Raise vbObjectError + errDuplicateConnectionName, _
                mstrSource, LoadResString(errDuplicateConnectionName)
        End If
    Next lngIndex
End Sub
Public Sub CheckDupConnName(ByVal cConnToValidate As cConnection)

    Dim lngIndex As Long
    Dim cTempParam As cConnection

    ' Check if the parameter name already exists in the workspace
    For lngIndex = 0 To mcarrConnections.Count - 1
        Set cTempParam = mcarrConnections(lngIndex)
        If cTempParam.WorkspaceId = cConnToValidate.WorkspaceId And _
            cTempParam.ConnectionName =
cConnToValidate.ConnectionName And _
            cTempParam.ConnectionId <> cConnToValidate.ConnectionId
And _
            cTempParam.IndOperation <> DeleteOp Then
            ShowError errDuplicateConnectionName
            On Error GoTo 0
            Err.Raise vbObjectError + errDuplicateConnectionName, _
                mstrSource, LoadResString(errDuplicateConnectionName)
        End If
    Next lngIndex
End Sub
Private Sub Class_Initialize()

```

```

    Set mcarrConnections = New cNodeCollections

End Sub

Private Sub Class_Terminate()

    Set mcarrConnections = Nothing

End Sub

```

## cConstraint.cls

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1    'True
END
Attribute VB_Name = "cConstraint"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:          cConstraint.cls
'               Microsoft TPC-H Kit Ver. 1.00
'               Copyright Microsoft, 1999
'               All Rights Reserved
'
' PURPOSE:      Encapsulates the properties and methods of a constraint.
'               Contains functions to insert, update and delete
'               step_constraints records from the database.
' Contact:      Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

' Module level variables to store the property values
Private mlngConstraintId As Long
Private mlngStepId As Long
Private mstrVersionNo As String
Private mintConstraintType As Integer
Private mlngGlobalStepId As Long
Private mstrGlobalVersionNo As String
Private mintSequenceNo As Integer
Private mdbConstraintDB As Database
Private mlngWorkspaceId As Integer
Private mintOperation As Operation
Private mlngPosition As Long

' The cSequence class is used to generate unique step identifiers
Private mConstraintSeq As cSequence

Private Const mstrModuleName As String = ".cConstraint."
Private mstrSource As String

Public Enum ConstraintType
    gintPreStep = 1
    gintPostStep = 2

```

```

End Enum

Private Const mstrSQ As String = ""
Public Property Get WorkspaceId() As Long
    WorkspaceId = mlngWorkspaceId
End Property
Public Property Let WorkspaceId(ByVal vdata As Long)
    mlngWorkspaceId = vdata
End Property

Public Property Get IndOperation() As Operation

    IndOperation = mintOperation

End Property
Public Property Let IndOperation(ByVal vdata As Operation)

    On Error GoTo IndOperationErr
    mstrSource = mstrModuleName & "IndOperation"

' The valid operations are define in the cOperations
' class. Check if the operation is valid
Select Case vdata
    Case QueryOp, InsertOp, UpdateOp, DeleteOp
        mintOperation = vdata

    Case Else
        On Error GoTo 0
        Err.Raise vbObjectError + errInvalidOperation, _
            mstrSource, LoadResString(errInvalidOperation)
End Select

Exit Property

IndOperationErr:
    LogErrors Errors
    mstrSource = mstrModuleName & "IndOperation"
    On Error GoTo 0
    Err.Raise vbObjectError + errLetOperationFailed, _
        mstrSource, LoadResString(errLetOperationFailed)

End Property

Public Function Clone() As cConstraint

' Creates a copy of a given constraint

Dim cConsClone As cConstraint

On Error GoTo CloneErr
mstrSource = mstrModuleName & "Clone"

Set cConsClone = New cConstraint

' Copy all the workspace properties to the newly
' created workspace

```

```

cConsClone.ConstraintId = mlngConstraintId
cConsClone.StepId = mlngStepId
cConsClone.VersionNo = mstrVersionNo
cConsClone.ConstraintType = mintConstraintType
cConsClone.GlobalStepId = mlngGlobalStepId
cConsClone.GlobalVersionNo = mstrGlobalVersionNo
cConsClone.SequenceNo = mintSequenceNo
cConsClone.WorkspaceId = mlngWorkspaceId
cConsClone.IndOperation = mintOperation

' And set the return value to the newly created constraint
Set Clone = cConsClone

Exit Function

CloneErr:
LogErrors Errors
mstrSource = mstrModuleName & "Clone"
On Error GoTo 0
Err.Raise vbObjectError + errCloneFailed, _
    mstrSource, LoadResString(errCloneFailed)

End Function

Public Property Get SequenceNo() As Integer

    SequenceNo = mintSequenceNo

End Property

Public Property Let SequenceNo(ByVal vdata As Integer)
    mintSequenceNo = vdata
End Property

Public Sub Add()
    ' Inserts a new step constraint into the database

    Dim strInsert As String
    Dim qy As DAO.QueryDef

    On Error GoTo AddErr

    ' First check if the database object is valid
    Call CheckDB

    ' Any record validations
    Call Validate

    ' Create a temporary querydef object
    strInsert = "insert into step_constraints " & _
        "( constraint_id, step_id, version_no, " & _
        " constraint_type, global_step_id, global_version_no,
sequence_no ) " & _
        " values ( [cons_id], [s_id], [ver_no], " & _
        " [cons_type], [g_step_id], [g_ver_no], " & _
        " [seq_no] )"

```

```

Set qy = mdbaConstraintDB.CreateQueryDef(gstrEmptyString, strInsert)

' Call a procedure to execute the Querydef object
Call AssignParameters(qy)

qy.Execute dbFailOnError
qy.Close

' strInsert = "insert into step_constraints " & _
' "( constraint_id, step_id, version_no, " & _
' " constraint_type, global_step_id, global_version_no,
sequence_no ) " & _
' " values ( " & _
' Str(mlngConstraintId) & ", " & Str(mlngStepId) & ", " & _
' mstrSQ & mstrVersionNo & mstrSQ & ", " &
Str(mintConstraintType) & ", " &
' Str(mlngGlobalStepId) & ", " & mstrSQ & mstrGlobalVersionNo &
mstrSQ & ", " &
' Str(mintSequenceNo) & " ) "
'
' BugMessage strInsert
' mdbaConstraintDB.Execute strInsert, dbFailOnError
Exit Sub

AddErr:
LogErrors Errors
mstrSource = mstrModuleName & "Add"
On Error GoTo 0
Err.Raise vbObjectError + errAddConstraintFailed, _
    mstrSource,
    LoadResString(errAddConstraintFailed)

End Sub

Private Sub AssignParameters(qyExec As DAO.QueryDef)
    ' Assigns values to the parameters in the querydef object
    ' The parameter names are cryptic to make them different
    ' from the field names. When the parameter names are
    ' the same as the field names, parameters in the where
    ' clause do not get created.

    Dim prmParam As DAO.Parameter

    On Error GoTo AssignParametersErr
    mstrSource = mstrModuleName & "AssignParameters"

    For Each prmParam In qyExec.Parameters
        Select Case prmParam.Name
            Case "[cons_id]"
                prmParam.Value = mlngConstraintId

            Case "[s_id]"
                prmParam.Value = mlngStepId

            Case "[ver_no]"
                prmParam.Value = mstrVersionNo

            Case "[cons_type]"

```

```

        prmParam.Value = mintConstraintType

    Case "[g_step_id]"
        prmParam.Value = mlngGlobalStepId

    Case "[g_ver_no]"
        prmParam.Value = mstrGlobalVersionNo

    Case "[seq_no]"
        prmParam.Value = mintSequenceNo

    Case Else
        ' Write the parameter name that is faulty
        WriteError errInvalidParameter, mstrSource, _
            prmParam.Name
        On Error GoTo 0
        Err.Raise errInvalidParameter, mstrSource, _
            LoadResString(errInvalidParameter)
    End Select
Next prmParam

Exit Sub

AssignParametersErr:

mstrSource = mstrModuleName & "AssignParameters"
Call LogErrors(Errors)
On Error GoTo 0
Err.Raise vbObjectError + errAssignParametersFailed, _
    mstrSource, LoadResString(errAssignParametersFailed)

End Sub
Public Property Get NextIdentifier() As Long

    Dim lngNextId As Long

    On Error GoTo NextIdentifierErr

    ' First check if the database object is valid
    Call CheckDB

    ' Retrieve the next constraint identifier using the
    ' sequence class
    Set mConstraintSeq = New cSequence
    Set mConstraintSeq.IdDatabase = mdbConstraintDB
    mConstraintSeq.IdentifierColumn = "constraint_id"
    lngNextId = mConstraintSeq.Identifier
    Set mConstraintSeq = Nothing

    NextIdentifier = lngNextId
Exit Property

NextIdentifierErr:
    LogErrors Errors
    mstrSource = mstrModuleName & "NextIdentifier"
    On Error GoTo 0

```

```

        Err.Raise vbObjectError + errStepIdGetFailed, _
            mstrSource, LoadResString(errStepIdGetFailed)
    End Property

Private Sub CheckDB()
    ' Check if the database object has been initialized

    If mdbConstraintDB Is Nothing Then
        ShowError errInvalidDB
        On Error GoTo 0
        Err.Raise vbObjectError + errInvalidDB, _
            mstrModuleName, LoadResString(errInvalidDB)
    End If
End Sub

Public Sub Delete()
    ' Deletes the step constraint record from the database

    Dim strDelete As String
    Dim qy As DAO.QueryDef

    On Error GoTo DeleteErr
    mstrSource = mstrModuleName & "Delete"

    ' There can be multiple constraints for a step,
    ' meaning that there can be multiple constraint records
    ' with the same constraint_id. Only a combination
    ' of the step_id, version and constraint_id will be
    ' unique
    strDelete = "delete from step_constraints " & _
        " where constraint_id = [cons_id]" & _
        " and step_id = [s_id] " & _
        " and version_no = [ver_no] "
    Set qy = mdbConstraintDB.CreateQueryDef(gstrEmptyString, strDelete)

    Call AssignParameters(qy)
    qy.Execute dbFailOnError

    qy.Close

    ' strDelete = "Delete from step_constraints " & _
    ' " where constraint_id = " & Str(mlngConstraintId) & _
    ' " and step_id = " & Str(mlngStepId) & _
    ' " and version_no = " & mstrSQ & mstrVersionNo & mstrSQ

    ' BugMessage strDelete
    ' mdbConstraintDB.Execute strDelete, dbFailOnError

Exit Sub

DeleteErr:
    LogErrors Errors
    mstrSource = mstrModuleName & "Delete"
    On Error GoTo 0

```



```

    Err.Raise vbObjectError + errDeleteConstraintFailed, _
        mstrSource, _
        LoadResString(errDeleteConstraintFailed)
End Sub
Public Sub Modify()
    ' Updates the sequence_no of the step constraint record
    ' in the database

    Dim strUpdate As String
    Dim qy As QueryDef

    On Error GoTo Modify

    ' First check if the database object is valid
    Call CheckDB

    ' Any record validations
    Call Validate

    ' There can be multiple constraints for a step,
    ' meaning that there can be multiple constraint records
    ' with the same constraint_id. Only a combination
    ' of the step_id, version and constraint_id will be
    ' unique
    ' Create a temporary querydef object with the modify string
    strUpdate = "Update step_constraints " & _
        " set sequence_no = [seq_no] " & _
        " where constraint_id = [cons_id] " & _
        " and step_id = [s_id] " & _
        " and version_no = [ver_no] "
    Set qy = mdbaConstraintDB.CreateQueryDef(gstrEmptyString, strUpdate)

    ' Call a procedure to assign the parameter values to the
    ' querydef object
    Call AssignParameters(qy)
    qy.Execute dbFailOnError

    qy.Close

    '
    ' strUpdate = "Update step_constraints " & _
    ' " set sequence_no = " & Str(mintSequenceNo) & _
    ' " where constraint_id = " & Str(mlngConstraintId) & _
    ' " and step_id = " & Str(mlngStepId) & _
    ' " and version_no = " & mstrSQ & mstrVersionNo & mstrSQ
    '
    ' BugMessage strUpdate
    ' mdbaConstraintDB.Execute strUpdate, dbFailOnError
    Exit Sub

Modify:
    LogErrors Errors
    mstrSource = mstrModuleName & "Modify"
    On Error GoTo 0
    Err.Raise vbObjectError + errUpdateConstraintFailed, _
        mstrSource, _
        LoadResString(errUpdateConstraintFailed)

```

```

End Sub
Public Property Get Position() As Long

    Position = mlngPosition

End Property
Public Property Let Position(ByVal RHS As Long)

    mlngPosition = RHS

End Property

Public Sub Validate()
    ' Each distinct object will have a Validate method which
    ' will check if the class properties are valid. This method
    ' will be used to check interdependant properties that
    ' cannot be validated by the let procedures.
    ' It should be called by the add and modify methods of the class

    ' No validations are necessary for the constraint object

End Sub

Public Property Set NodeDB(vdata As Database)

    Set mdbaConstraintDB = vdata

End Property

Public Property Get NodeDB() As Database

    Set NodeDB = mdbaConstraintDB

End Property

Public Property Get GlobalVersionNo() As String

    GlobalVersionNo = mstrGlobalVersionNo

End Property

Public Property Let GlobalVersionNo(ByVal vdata As String)

    mstrGlobalVersionNo = vdata

End Property

Public Property Get GlobalStepId() As Long

    GlobalStepId = mlngGlobalStepId

End Property

Public Property Get ConstraintId() As Long

    ConstraintId = mlngConstraintId

```

```

End Property

Public Property Get VersionNo() As String
    VersionNo = mstrVersionNo
End Property

Public Property Get StepId() As Long
    StepId = mlngStepId
End Property

Public Property Let VersionNo(ByVal vdata As String)
    mstrVersionNo = vdata
End Property

Public Property Let StepId(ByVal vdata As Long)
    mlngStepId = vdata
End Property

Public Property Let ConstraintId(ByVal vdata As Long)
    On Error GoTo ConstraintIdErr
    mstrSource = mstrModuleName & "ConstraintId"

    If (vdata > 0) Then
        mlngConstraintId = vdata
    Else
        ' Propagate this error back to the caller
        On Error GoTo 0
        Err.Raise vbObjectError + errConstraintIdInvalid, _
            mstrSource, LoadResString(errConstraintIdInvalid)
    End If

    Exit Property

ConstraintIdErr:
    LogErrors Errors
    mstrSource = mstrModuleName & "ConstraintId"
    On Error GoTo 0
    Err.Raise vbObjectError + errConstraintIdSetFailed, _
        mstrSource, LoadResString(errConstraintIdSetFailed)
End Property

Public Property Let GlobalStepId(ByVal vdata As Long)
    On Error GoTo GlobalStepIdErr
    mstrSource = mstrModuleName & "GlobalStepId"

    If (vdata > 0) Then
        mlngGlobalStepId = vdata
    Else
        ' Propagate this error back to the caller
        On Error GoTo 0
        Err.Raise vbObjectError + errGlobalStepIdInvalid, _
            mstrSource, LoadResString(errGlobalStepIdInvalid)
    End If

    Exit Property

GlobalStepIdErr:
    LogErrors Errors
    mstrSource = mstrModuleName & "GlobalStepId"
    On Error GoTo 0
    Err.Raise vbObjectError + errGlobalStepIdSetFailed, _
        mstrSource, LoadResString(errGlobalStepIdSetFailed)
End Property

Public Property Let ConstraintType(ByVal vdata As ConstraintType)
    On Error GoTo ConstraintTypeErr

    ' A global step can be either a pre- or a post-execution step.
    ' These constants have been defined in the enumeration,
    ' ConstraintType, which is exposed
    Select Case vdata
        Case gintPreStep, gintPostStep
            mintConstraintType = vdata

        Case Else
            On Error GoTo 0
            Err.Raise vbObjectError + errConstraintTypeInvalid, _
                mstrSource, LoadResString(errConstraintTypeInvalid)
    End Select

    Exit Property

ConstraintTypeErr:
    LogErrors Errors
    mstrSource = mstrModuleName & "ConstraintType"
    On Error GoTo 0
    Err.Raise vbObjectError + errConstraintTypeLetFailed, _
        mstrSource, LoadResString(errConstraintTypeLetFailed)
End Property

Public Property Get ConstraintType() As ConstraintType
    ConstraintType = mintConstraintType
End Property

Private Sub Class_Initialize()

```

```

' Initialize the operation indicator variable to Query
' It will be modified later by the collection class when
' inserts, updates or deletes are performed
mintOperation = QueryOp

```

End Sub

### cFailedStep.cls

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cFailedStep"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:          cFailedStep.cls
'                Microsoft TPC-H Kit Ver. 1.00
'                Copyright Microsoft, 1999
'                All Rights Reserved
'
' PURPOSE:       Properties of a step execution failure.
' Contact:       Reshma Tharamal (reshmat@microsoft.com)

```

Option Explicit

```

Public InstanceId As Long
Public StepId As Long
Public ParentStepId As Long
Public ContCriteria As ContinuationCriteria
Public EndTime As Currency
Public AskResponse As Long

```

### cFailedSteps.cls

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cFailedSteps"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:          cFailedSteps.cls
'                Microsoft TPC-H Kit Ver. 1.00
'                Copyright Microsoft, 1999
'                All Rights Reserved
'
' PURPOSE:       This module encapsulates a collection of failed steps.
It

```

```

'                also determines whether sub-steps of a passed in step
need
'                to be skipped due to a failure.
' Contact:       Reshma Tharamal (reshmat@microsoft.com)

```

Option Explicit

```

Private mcFailedSteps As cVector
Public Function ExecuteSubStep(lParentStepId As Long) As Boolean
    ' Returns False if there is any condition that prevents sub-steps of
the passed
    ' in instance from being executed
    Dim lIndex As Long

    ExecuteSubStep = True

    For lIndex = 0 To Count() - 1
        If mcFailedSteps(lIndex).ContCriteria =
gintOnFailureCompleteSiblings And _
            lParentStepId <> mcFailedSteps(lIndex).ParentStepId Then
            ExecuteSubStep = False
            Exit For
        End If

        If mcFailedSteps(lIndex).ContCriteria =
gintOnFailureAbortSiblings And _
            lParentStepId = mcFailedSteps(lIndex).ParentStepId Then
            ExecuteSubStep = False
            Exit For
        End If

        If mcFailedSteps(lIndex).ContCriteria =
gintOnFailureSkipSiblings And _
            lParentStepId = mcFailedSteps(lIndex).ParentStepId Then
            ExecuteSubStep = False
            Exit For
        End If

        If mcFailedSteps(lIndex).ContCriteria = gintOnFailureAbort Then
            ExecuteSubStep = False
            Exit For
        End If

    Next lIndex
End Function
Public Sub Add(ByVal objItem As cFailedStep)

    mcFailedSteps.Add objItem
End Sub
Public Function Delete(ByVal lPosition As Long) As cFailedStep

    Set Delete = mcFailedSteps.Delete(lPosition)
End Function

```

```

Public Sub Clear()

    mcFailedSteps.Clear

End Sub
Public Function Count() As Long

    Count = mcFailedSteps.Count

End Function
Public Property Get Item(ByVal Position As Long) As cFailedStep
Attribute Item.VB_UserMemId = 0

    Set Item = mcFailedSteps.Item(Position)

End Property

Public Function StepFailed(lStepId As Long) As Boolean

    ' Returns True if a failure record already exists for the passed in
step
    Dim lIndex As Long

    StepFailed = False

    For lIndex = 0 To Count() - 1
        If mcFailedSteps(lIndex).StepId = lStepId Then
            StepFailed = True
            Exit For
        End If
    Next lIndex

End Function

Private Sub Class_Initialize()

    Set mcFailedSteps = New cVector

End Sub

Private Sub Class_Terminate()

    Set mcFailedSteps = Nothing

End Sub

```

### **cFileInfo.cls**

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cFileInfo"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True

```

```

Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:      cFileInfo.cls
'           Microsoft TPC-H Kit Ver. 1.00
'           Copyright Microsoft, 1999
'           All Rights Reserved
'
' PURPOSE:   File Properties viz. name, handle, etc.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

Private mstrFileName As String
Private mintFileHandle As Integer
Private mdbsNodeDb As Database ' Since it is used to form a
cNodeCollection
Private mlngPosition As Long ' Since it is used to form a
cNodeCollection
Public Property Get FileName() As String

    FileName = mstrFileName

End Property
Public Property Let FileName(ByVal vdata As String)

    mstrFileName = vdata

End Property
Public Property Let FileHandle(ByVal vdata As Integer)

    mintFileHandle = vdata

End Property
Public Property Set NodeDB(vdata As Database)

    Set mdbsNodeDb = vdata

End Property

Public Property Get NodeDB() As Database

    Set NodeDB = mdbsNodeDb

End Property

Public Property Get Position() As Long

    Position = mlngPosition

End Property
Public Property Let Position(ByVal vdata As Long)

    mlngPosition = vdata

End Property

```

```
Public Property Get FileHandle() As Integer
```

```
    FileHandle = mintFileHandle
```

```
End Property
```

## cFileSM.cls

```
VERSION 1.0 CLASS
```

```
BEGIN
```

```
    MultiUse = -1    'True
```

```
END
```

```
Attribute VB_Name = "cFileSM"
```

```
Attribute VB_GlobalNameSpace = False
```

```
Attribute VB_Creatable = True
```

```
Attribute VB_PredeclaredId = False
```

```
Attribute VB_Exposed = False
```

```
Attribute VB_Ext_KEY = "SavedWithClassBuilder" , "Yes"
```

```
Attribute VB_Ext_KEY = "Top_Level" , "Yes"
```

```
' FILE:      cFileSM.cls  
'           Microsoft TPC-H Kit Ver. 1.00  
'           Copyright Microsoft, 1999  
'           All Rights Reserved  
'  
'  
'
```

```
' PURPOSE:   Encapsulates functions to open a file and write to it.
```

```
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
```

```
Option Explicit
```

```
' Used to indicate the source module name when errors  
' are raised by this class
```

```
Private Const mstrModuleName As String = "cFileSM."
```

```
Private mstrSource As String
```

```
Private mstrFileName As String
```

```
Private mintHFile As Integer
```

```
Private mstrFileHeader As String
```

```
Private mstrProjectName As String
```

```
Public Sub CloseFile()
```

```
    ' Close the file
```

```
    If mintHFile > 0 Then
```

```
        Call CloseFileSM(mstrFileName)
```

```
        mintHFile = 0
```

```
    End If
```

```
End Sub
```

```
Public Property Let ProjectName(ByVal vdata As String)
```

```
    ' An optional field - will be appended to the file
```

```
    ' header string if specified
```

```
    Const strProjectHdr As String = "Project Name:"
```

```
    mstrProjectName = vdata
```

```
    mstrFileHeader = mstrFileHeader & _  
        Space$(1) & strProjectHdr & Space$(1) & _  
        gstrSQ & vdata & gstrSQ
```

```
End Property
```

```
Public Property Get ProjectName() As String
```

```
    ProjectName = mstrProjectName
```

```
End Property
```

```
Public Property Get FileName() As String
```

```
    FileName = mstrFileName
```

```
End Property
```

```
Public Property Let FileName(ByVal vdata As String)
```

```
    mstrFileName = vdata
```

```
End Property
```

```
Public Sub WriteLine(strMsg As String)
```

```
    ' Writes the passed in string to the file
```

```
    Call WriteToFile(strMsg, False)
```

```
End Sub
```

```
Public Sub WriteField(strMsg As String)
```

```
    ' Writes the passed in string to the file
```

```
    Call WriteToFile(strMsg, True)
```

```
End Sub
```

```
Private Sub WriteToFile(strMsg As String, _  
    blnContinue As Boolean)
```

```
    ' Writes the passed in string to the file - the
```

```
    ' Continue flag indicates whether the next line will
```

```
    ' be continued on the same line or printed on a new one
```

```
On Error GoTo WriteToFileErr
```

```
    ' Open the file if it hasn't been already
```

```
    If mintHFile = 0 Then
```

```
        ' If the filename has not been initialized, do not
```

```
        ' attempt to open it
```

```
        If mstrFileName <> gstrEmptyString Then
```

```
            mintHFile = OpenFileSM(mstrFileName)
```

```
            If mintHFile = 0 Then
```

```
                ' The Open File command failed for some reason
```

```
                ' No point in trying to write the file header
```

```
            Else
```

```

        ' Print a file header, if a header string has been
        ' initialized
    If mstrFileHeader <> gstrEmptyString Then
        Print #mintHFile,
        Print #mintHFile, mstrFileHeader
        Print #mintHFile,
    End If
End If
End If
End If

If mintHFile <> 0 Then
    If strMsg = gstrEmptyString Then
        Print #mintHFile,
    Else
        If blnContinue Then
            ' Write the message to the file - continue
            ' all subsequent characters on the same line
            Print #mintHFile, strMsg;
        Else
            ' Write the message to the file
            Print #mintHFile, strMsg
        End If
    End If
Else
    ' Display the string to the user instead of
    ' trying to write it to the file
    ' This could be the project error log that we were
    ' trying to open! Play it safe and display errors - do
    ' not try to log them.
    MsgBox strMsg, vbOKOnly
End If

Exit Sub

WriteToFileErr:
' Log the error code raised by Visual Basic
Call DisplayErrors(Errors)

' Display the string to the user instead of
' trying to write it to the file
MsgBox strMsg, vbOKOnly

End Sub
Public Property Let FileHeader(ByVal vdata As String)

    mstrFileHeader = vdata

End Property
Public Property Get FileHeader() As String

    FileHeader = mstrFileHeader

End Property

Private Sub Class_Terminate()

```

```

        ' Close the file opened by this instance
        Call CloseFile
End Sub

```

## cGlobalStep.cls

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cGlobalStep"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:          cGlobalStep.cls
'                Microsoft TPC-H Kit Ver. 1.00
'                Copyright Microsoft, 1999
'                All Rights Reserved
'
' PURPOSE:       Encapsulates the properties and methods of a global step.
'                Implements the cStep class - carries out initializations
'                and validations that are specific to global steps.
' Contact:       Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

Implements cStep

' Object variable to keep the reference in
Private mcStep As cStep

' Used to indicate the source module name when errors
' are raised by this class
Private mstrSource As String
Private Const mstrModuleName As String = "cGlobalStep."

Private Sub cStep_AddAllIterators()

    Call mcStep.AddAllIterators

End Sub

Private Sub cStep_AddIterator(cItRecord As cIterator)

    Call mcStep.AddIterator(cItRecord)

End Sub

Private Property Let cStep_ArchivedFlag(ByVal RHS As Boolean)

    mcStep.ArchivedFlag = RHS

```

```

End Property

Private Property Get cStep_ArchivedFlag() As Boolean

    cStep_ArchivedFlag = mcStep.ArchivedFlag

End Property

Private Sub Class_Initialize()

    ' Create the object
    Set mcStep = New cStep

    ' Initialize the object with valid values for a global step
    ' The global flag should be the first field to be initialized
    ' since subsequent validations might try to check if the
    ' step being created is global
    mcStep.GlobalFlag = True
    mcStep.StepType = gintGlobalStep

    ' A global step cannot have any sub-steps associated with it
    ' Hence, it will always be at Step Level 0
    mcStep.ParentStepId = 0
    mcStep.ParentVersionNo = gstrMinVersion
    mcStep.StepLevel = 0

    ' The enabled flag must be False for all global steps
    ' Global steps can be of two types
    ' a. Those that are run globally within a workspace either
    ' before every step, after every step or during the entire
    ' run, depending on the global run method
    ' b. Those that are not run globally, but qualify to be either
    ' pre or post-execution steps for other steps in the workspace.
    ' Whether or not such a step will be executed depends on
    ' whether the step for which it is defined as a pre/post
    ' step will be executed
    mcStep.EnabledFlag = False

    mcStep.ContinuationCriteria = gintNoOption
    mcStep.DegreeParallelism = gstrGlobalParallelism

End Sub

Private Sub Class_Terminate()

    ' Remove the step object
    Set mcStep = Nothing

End Sub

Private Sub cStep_Add()

    ' Call a private procedure to see if the step text has been
    ' entered - since a global step actually executes a step, entry
    ' of the text is mandatory
    Call StepTextOrFileEntered

```

```

    ' Call the Add method of the step class to carry out the insert
    mcStep.Add

End Sub

Private Function cStep_Clone(Optional cCloneStep As cStep) As cStep

    Dim cNewGlobal As cGlobalStep

    Set cNewGlobal = New cGlobalStep
    Set cStep_Clone = mcStep.Clone(cNewGlobal)

End Function

Private Property Get cStep_ContinuationCriteria() As
ContinuationCriteria

    cStep_ContinuationCriteria = mcStep.ContinuationCriteria

End Property

Private Property Let cStep_ContinuationCriteria(ByVal RHS As
ContinuationCriteria)

    ' The continuation criteria field will always be empty for a
    ' global step
    mcStep.ContinuationCriteria = 0

End Property

Private Property Let cStep_DegreeParallelism(ByVal RHS As String)

    ' Will always be zero for a global step
    mcStep.DegreeParallelism = gstrGlobalParallelism

End Property

Private Property Get cStep_DegreeParallelism() As String

    cStep_DegreeParallelism = mcStep.DegreeParallelism

End Property

Private Sub cStep_DeleteIterator(cItRecord As cIterator)

    Call mcStep.DeleteIterator(cItRecord)

End Sub

Private Sub cStep_Delete()

    mcStep.Delete

End Sub

```

```

Private Property Get cStep_EnabledFlag() As Boolean
    cStep_EnabledFlag = mcStep.EnabledFlag
End Property

Private Property Let cStep_EnabledFlag(ByVal RHS As Boolean)
    ' The enabled flag must be False for all global steps
    ' Global steps can be of two types
    ' a. Those that are run globally within a workspace either
    '     before every step, after every step or during the entire
    '     run, depending on the global run method
    ' b. Those that are not run globally, but qualify to be either
    '     pre or post-execution steps for other steps in the workspace.
    '     Whether or not such a step will be executed depends on
    '     whether the step for which it is defined as a pre/post
    '     step will be executed
    mcStep.EnabledFlag = False
End Property

Private Property Let cStep_ErrorFile(ByVal RHS As String)
    mcStep.ErrorFile = RHS
End Property

Private Property Get cStep_ErrorFile() As String
    cStep_ErrorFile = mcStep.ErrorFile
End Property

Private Property Let cStep_ExecutionMechanism(ByVal RHS As
ExecutionMethod)
    ' Whether or not the Execution Mechanism is valid will be
    ' checked by the Step class
    mcStep.ExecutionMechanism = RHS
End Property

Private Property Get cStep_ExecutionMechanism() As ExecutionMethod
    cStep_ExecutionMechanism = mcStep.ExecutionMechanism
End Property

Private Property Let cStep_FailureDetails(ByVal RHS As String)
    ' Whether or not the Failure Details are valid for the
    ' selected failure criteria will be checked by the Step class
    mcStep.FailureDetails = RHS

```

```

End Property

Private Property Get cStep_FailureDetails() As String
    cStep_FailureDetails = mcStep.FailureDetails
End Property

Private Property Get cStep_GlobalFlag() As Boolean
    cStep_GlobalFlag = mcStep.GlobalFlag
End Property

Private Property Let cStep_GlobalFlag(ByVal RHS As Boolean)
    ' Set the global flag to true
    mcStep.GlobalFlag = True
End Property

Private Function cStep_IncVersionX() As String
    cStep_IncVersionX = mcStep.IncVersionX
End Function

Private Function cStep_IncVersionY() As String
    cStep_IncVersionY = mcStep.IncVersionY
End Function

'Private Property Let cStep_GlobalRunMethod(ByVal RHS As Integer)
'
'     ' Whether or not the Global Run Method is valid for the step
'     ' will be checked by the Step class
'     mcStep.GlobalRunMethod = RHS
'
'End Property
'
'Private Property Get cStep_GlobalRunMethod() As Integer
'
'     cStep_GlobalRunMethod = mcStep.GlobalRunMethod
'
'End Property
'
Private Property Get cStep_IndOperation() As Operation
    cStep_IndOperation = mcStep.IndOperation
End Property

Private Property Let cStep_IndOperation(ByVal RHS As Operation)

```



```

        mcStep.IndOperation = RHS
End Property

Private Sub cStep_InsertIterator(cItRecord As cIterator)

    Call mcStep.InsertIterator(cItRecord)

End Sub

Private Function cStep_IsNewVersion() As Boolean
    cStep_IsNewVersion = mcStep.IsNewVersion
End Function

Private Function cStep_IteratorCount() As Long

    cStep_IteratorCount = mcStep.IteratorCount

End Function

Private Property Let cStep_IteratorName(ByVal RHS As String)

    mcStep.IteratorName = RHS

End Property

Private Property Get cStep_IteratorName() As String

    cStep_IteratorName = mcStep.IteratorName

End Property

Private Function cStep_Iterators() As Variant

    cStep_Iterators = mcStep.Iterators

End Function

Private Sub cStep_LoadIterator(cItRecord As cIterator)

    Call mcStep.LoadIterator(cItRecord)

End Sub

'Private Property Let cStep_LogFile(ByVal RHS As String)
',
'    mcStep.LogFile = RHS
',
'End Property
',
'Private Property Get cStep_LogFile() As String
',
'    cStep_LogFile = mcStep.LogFile
',
'End Property

```

```

Private Sub cStep_ModifyIterator(cItRecord As cIterator)

    Call mcStep.ModifyIterator(cItRecord)

End Sub

Private Sub cStep_Modify()

    ' Call a private procedure to see if the step text has been
    ' entered - since a global step actually executes a step,
    ' entry of the text is mandatory
    Call StepTextOrFileEntered

    ' Call the Modify method of the step class to carry out the update
    mcStep.Modify

End Sub

Private Property Get cStep_NextStepId() As Long

    cStep_NextStepId = mcStep.NextStepId

End Property

Private Property Set cStep_NodeDB(RHS As DAO.Database)

    Set mcStep.NodeDB = RHS

End Property

Private Property Get cStep_NodeDB() As DAO.Database

    Set cStep_NodeDB = mcStep.NodeDB

End Property

Private Function cStep_OldVersionNo() As String
    cStep_OldVersionNo = mcStep.OldVersionNo
End Function

Private Property Let cStep_OutputFile(ByVal RHS As String)

    mcStep.OutputFile = RHS

End Property

Private Property Get cStep_OutputFile() As String

    cStep_OutputFile = mcStep.OutputFile

End Property

Private Property Let cStep_ParentStepId(ByVal RHS As Long)

    ' A global step cannot have any sub-steps associated with it
    ' Hence, the parent step id and parent version number will be zero

```

```

        mcStep.ParentStepId = 0
    End Property

    Private Property Get cStep_ParentStepId() As Long
        cStep_ParentStepId = mcStep.ParentStepId
    End Property

    Private Property Let cStep_ParentVersionNo(ByVal RHS As String)
        ' A global step cannot have any sub-steps associated with it
        ' Hence, the parent step id and parent version number will be zero
        mcStep.ParentVersionNo = gstrMinVersion
    End Property

    Private Property Get cStep_ParentVersionNo() As String
        cStep_ParentVersionNo = mcStep.ParentVersionNo
    End Property

    Private Property Let cStep_Position(ByVal RHS As Long)
        mcStep.Position = RHS
    End Property

    Private Property Get cStep_Position() As Long
        cStep_Position = mcStep.Position
    End Property

    Private Sub cStep_RemoveIterator(cItRecord As cIterator)
        Call mcStep.RemoveIterator(cItRecord)
    End Sub

    Private Sub cStep_SaveIterators()
        Call mcStep.SaveIterators
    End Sub

    Private Property Let cStep_SequenceNo(ByVal RHS As Integer)
        mcStep.SequenceNo = RHS
    End Property

    Private Property Get cStep_SequenceNo() As Integer

```

```

        cStep_SequenceNo = mcStep.SequenceNo
    End Property

    Private Property Let cStep_StepId(ByVal RHS As Long)
        mcStep.StepId = RHS
    End Property

    Private Property Get cStep_StepId() As Long
        cStep_StepId = mcStep.StepId
    End Property

    Private Property Let cStep_StepLabel(ByVal RHS As String)
        mcStep.StepLabel = RHS
    End Property

    Private Property Get cStep_StepLabel() As String
        cStep_StepLabel = mcStep.StepLabel
    End Property

    Private Property Let cStep_StartDir(ByVal RHS As String)
        mcStep.StartDir = RHS
    End Property

    Private Property Get cStep_StartDir() As String
        cStep_StartDir = mcStep.StartDir
    End Property

    Private Property Let cStep_StepLevel(ByVal RHS As Integer)
        ' A global step cannot have any sub-steps associated with it
        ' Hence, it will always be at step level 0
        mcStep.StepLevel = 0
    End Property

    Private Property Get cStep_StepLevel() As Integer
        cStep_StepLevel = mcStep.StepLevel
    End Property

    Private Property Let cStep_StepText(ByVal RHS As String)

```

```

    mcStep.StepText = RHS
End Property

Private Property Get cStep_StepText() As String
    cStep_StepText = mcStep.StepText
End Property

Private Property Let cStep_StepTextFile(ByVal RHS As String)
    mcStep.StepTextFile = RHS
End Property

Private Property Get cStep_StepTextFile() As String
    cStep_StepTextFile = mcStep.StepTextFile
End Property

Private Property Let cStep_StepType(RHS As gintStepType)
    mcStep.StepType = gintGlobalStep
End Property

Private Property Get cStep_StepType() As gintStepType
    cStep_StepType = mcStep.StepType
End Property

Private Sub cStep_UnloadIterators()
    Call mcStep.UnloadIterators
End Sub

Private Sub cStep_UpdateIterator(cItRecord As cIterator)
    Call mcStep.UpdateIterator(cItRecord)
End Sub

Private Sub cStep_UpdateIteratorVersion()
    Call mcStep.UpdateIteratorVersion
End Sub

Private Sub cStep_Validate()
    ' The validate routines for each of the steps will
    ' carry out the specific validations for the type and
    ' call the generic validation routine

```

```

On Error GoTo cStep_ValidateErr
mstrSource = mstrModuleName & "cStep_Validate"

' Validations specific to global steps

' Check if the step text or a file name has been
' specified
Call StepTextOrFileEntered

' The step level must be zero for all globals
If mcStep.StepLevel <> 0 Then
    ShowError errStepLevelZeroForGlobal
    On Error GoTo 0
    Err.Raise vbObjectError + errValidateFailed, _
        gstrSource, _
        LoadResString(errValidateFailed)
End If

If mcStep.EnabledFlag Then
    ShowError errEnabledFlagFalseForGlobal
    On Error GoTo 0
    Err.Raise vbObjectError + errValidateFailed, _
        gstrSource, _
        LoadResString(errValidateFailed)
End If

If mcStep.DegreeParallelism > 0 Then
    ShowError errDegParallelismNullForGlobal
    On Error GoTo 0
    Err.Raise vbObjectError + errValidateFailed, _
        gstrSource, _
        LoadResString(errValidateFailed)
End If

If mcStep.ContinuationCriteria > 0 Then
    ShowError errContCriteriaNullForGlobal
    On Error GoTo 0
    Err.Raise vbObjectError + errValidateFailed, _
        gstrSource, _
        LoadResString(errValidateFailed)
End If

mcStep.Validate

Exit Sub

cStep_ValidateErr:
LogErrors Errors
mstrSource = mstrModuleName & "cStep_Validate"
On Error GoTo 0
Err.Raise vbObjectError + errValidateFailed, _
    mstrSource, _
    LoadResString(errValidateFailed)
End Sub
Private Sub StepTextOrFileEntered()

```

```

' Checks if either the step text or the name of the file containing
' the text has been entered
' If both of them are null or both of them are not null,
' the global step is invalid and an error is raised

If StringEmpty(mcStep.StepText) And StringEmpty(mcStep.StepTextFile)
Then
    ShowError errStepTextAndFileNull
    On Error GoTo 0
    Err.Raise vbObjectError + errStepTextAndFileNull, _
        mstrSource, LoadResString(errStepTextAndFileNull)
    ElseIf Not StringEmpty(mcStep.StepText) And Not
StringEmpty(mcStep.StepTextFile) Then
        ShowError errStepTextOrFile
        On Error GoTo 0
        Err.Raise vbObjectError + errStepTextOrFile, _
            mstrSource, LoadResString(errStepTextOrFile)
    End If
End Sub

Private Property Let cStep_VersionNo(ByVal RHS As String)

    mcStep.VersionNo = RHS

End Property

Private Property Get cStep_VersionNo() As String

    cStep_VersionNo = mcStep.VersionNo

End Property

Private Property Let cStep_WorkspaceId(ByVal RHS As Long)

    mcStep.WorkspaceId = RHS

End Property

Private Property Get cStep_WorkspaceId() As Long

    cStep_WorkspaceId = mcStep.WorkspaceId

End Property

```

## cInstance.cls

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cInstance"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False

```

```

' FILE:         cInstance.cls
'               Microsoft TPC-H Kit Ver. 1.00
'               Copyright Microsoft, 1999
'               All Rights Reserved
'
'
' PURPOSE:      Encapsulates the properties and methods of an instance.
'               An instance is created when a step is executed for a
'               particular iterator value (if applicable) at 'run' time.
'               Contains functions to determine if an instance is
running,
'               complete, and so on.
' Contact:      Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

' Used to indicate the source module name when errors
' are raised by this class
Private Const mstrModuleName As String = "cInstance."
Private mstrSource As String

Private mcStep As cStep
Public Key As String ' Node key for the step being executed
Public InstanceId As Long
Public ParentInstanceId As Long ' The parent instance
Private mblnNoMoreToStart As Boolean
Private mblnComplete As Boolean
Public StartTime As Currency
Public EndTime As Currency
Public ElapsedTime As Currency
Private mintStatus As InstanceStatus
Public DegreeParallelism As Integer
Private mcIterators As cRunColIt

' A collection of all the sub-steps for this step
Private mcSubSteps As cSubSteps
Public Sub UpdateStartTime(lStepId As Long, Optional ByVal StartTm As
Currency = gdtmEmpty, _
    Optional ByVal EndTm As Currency = gdtmEmpty, _
    Optional ByVal Elapsed As Currency = 0)
' We do not maintain start and end timestamps for the constraint
' of a step. Hence we check if the process that just started/
' terminated is the worker step that is being executed. If so,
' we update the start/end time and status on the instance record.

    BugAssert (StartTm <> gdtmEmpty) Or (EndTm <> gdtmEmpty), "Mandatory
parameter missing."

' Make sure that we are executing the actual step and not
' a pre or post-execution constraint
If mcStep.StepId = lStepId Then
    If StartTm <> 0 Then
        StartTime = StartTm
        mintStatus = gintRunning
    Else
        EndTime = EndTm

```

```

        ElapsedTime = Elapsed
        mintStatus = gintComplete
    End If
End If

End Sub

Public Function ValidForIteration(cParentInstance As cInstance, _
    ByVal intConsType As ConstraintType) As Boolean
    ' Returns true if the instance passed in is the first or
    ' last iteration for the step, depending on the constraint type

    Dim cSubStepRec As cSubStep
    Dim vntIterators As Variant

    On Error GoTo ValidForIterationErr

    If cParentInstance Is Nothing Then
        ' This will only be true for the dummy instance, which
        ' cannot have any iterators defined for it
        ValidForIteration = True
        Exit Function
    End If

    vntIterators = mcStep.Iterators

    If Not StringEmpty(mcStep.IteratorName) And Not
    IsEmpty(vntIterators) Then

        Set cSubStepRec = cParentInstance.QuerySubStep(mcStep.StepId)

        If intConsType = gintPreStep Then
            ' Pre-execution constraints will only be executed
            ' before the first iteration
            If cSubStepRec.LastIterator.IteratorType = gintValue Then
                ValidForIteration = (cSubStepRec.LastIterator.Sequence =
                gintMinIteratorSequence)
            Else
                ValidForIteration = (cSubStepRec.LastIterator.Value = _
                cSubStepRec.LastIterator.RangeFrom)
            End If
        Else
            ' Post-execution constraints will only be executed
            ' after the last iteration - check if there are any
            ' pending iterations
            ValidForIteration = cSubStepRec.NextIteration(mcStep) Is
            Nothing
        End If
    Else
        ValidForIteration = True
    End If

    Exit Function

ValidForIterationErr:
    ' Log the error code raised by Visual Basic

```

```

    Call LogErrors(Errors)
    On Error GoTo 0
    mstrSource = mstrModuleName & "ValidForIteration"
    Err.Raise vbObjectError + errExecInstanceFailed, _
        mstrSource, LoadResString(errExecInstanceFailed)

End Function

Public Sub CreateSubStep(cSubStepDtls As cStep, RunParams As
cArrParameters)

    Dim cNewSubStep As cSubStep

    On Error GoTo CreateSubStepErr

    Set cNewSubStep = New cSubStep

    cNewSubStep.StepId = cSubStepDtls.StepId
    cNewSubStep.TasksComplete = 0
    cNewSubStep.TasksRunning = 0

    ' Initialize the iterator for the instance
    Set cNewSubStep.LastIterator = New cRunItDetails
    Call cNewSubStep.InitializeIt(cSubStepDtls, RunParams)

    ' Add add the substep to the collection
    mcSubSteps.Add cNewSubStep

    Set cNewSubStep = Nothing

    Exit Sub

CreateSubStepErr:
    ' Log the error code raised by Visual Basic
    Call LogErrors(Errors)
    On Error GoTo 0
    mstrSource = mstrModuleName & "CreateSubStep"
    Err.Raise vbObjectError + errProgramError, mstrSource, _
        LoadResString(errProgramError)

End Sub

Public Function QuerySubStep(ByVal SubStepId As Long) As cSubStep
    ' Retrieves the sub-step record for the passed in sub-step id

    Dim lngIndex As Long

    On Error GoTo QuerySubStepErr

    ' Find the sub-step node with the matching step id
    For lngIndex = 0 To mcSubSteps.Count - 1
        If mcSubSteps(lngIndex).StepId = SubStepId Then
            Set QuerySubStep = mcSubSteps(lngIndex)
            Exit For
        End If
    Next lngIndex

QuerySubStepErr:

```

```

Exit Function

QuerySubStepErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
On Error GoTo 0
mstrSource = mstrModuleName & "QuerySubStep"
Err.Raise vbObjectError + errNavInstancesFailed, _
    mstrSource, LoadResString(errNavInstancesFailed)

End Function
Public Property Let AllStarted(ByVal vdata As Boolean)

    'bugmessage "Set All Started to " & vData & " for : " & _
        mstrKey

    mblnNoMoreToStart = vdata

End Property
Public Property Get AllStarted() As Boolean

    AllStarted = mblnNoMoreToStart

End Property
Public Property Let AllComplete(ByVal vdata As Boolean)

    'bugmessage "Set All Complete to " & vData & " for : " & _
        mstrKey

    mblnComplete = vdata

End Property
Public Property Get AllComplete() As Boolean

    AllComplete = mblnComplete

End Property
Public Sub ChildExecuted(mlngStepId As Long)
' This procedure is called when a sub-step executes.

Dim lngIndex As Long

On Error GoTo ChildExecutedErr

BugAssert mcStep.StepType = gintManagerStep

For lngIndex = 0 To mcSubSteps.Count - 1
    If mcSubSteps(lngIndex).StepId = mlngStepId Then
        mcSubSteps(lngIndex).TasksRunning = _
            mcSubSteps(lngIndex).TasksRunning - 1
        '
        ' BugMessage "Tasks Running for Step Id : " & _
        '           CStr(mcSubSteps(lngIndex).StepId) & _
        '           " Instance Id: " & InstanceId & _
        '           " = " & mcSubSteps(lngIndex).TasksRunning
        '
        BugAssert mcSubSteps(lngIndex).TasksRunning >= 0, _
            "Tasks running for " & CStr(mlngStepId) & _
            " Instance Id " & InstanceId & " is less than 0."
    End If
Next lngIndex

If lngIndex > mcSubSteps.Count - 1 Then
' The child step wasn't found - raise an error
On Error GoTo 0
Err.Raise errInvalidChild, mstrModuleName, _
    LoadResString(errInvalidChild)

End Sub
Public Sub ChildTerminated(mlngStepId As Long)
' This procedure is called when any sub-step process
' terminates. Note: The TasksComplete field will be
' updated only when all the instances for a sub-step
' complete execution.
Dim lngIndex As Long

On Error GoTo ChildTerminatedErr

BugAssert mcStep.StepType = gintManagerStep

For lngIndex = 0 To mcSubSteps.Count - 1

    If mcSubSteps(lngIndex).StepId = mlngStepId Then
        mcSubSteps(lngIndex).TasksRunning = _
            mcSubSteps(lngIndex).TasksRunning + 1
        '
        ' BugMessage "Tasks Running for Step Id : " & _
        '           CStr(mcSubSteps(lngIndex).StepId) & _
        '           " Instance Id: " & InstanceId & _
        '           " = " & mcSubSteps(lngIndex).TasksRunning
        '
        BugAssert mcSubSteps(lngIndex).TasksRunning <= 0, _
            "Tasks running for " & CStr(mlngStepId) & _
            " Instance Id " & InstanceId & " is more than 0."
    End If
Next lngIndex

If lngIndex > mcSubSteps.Count - 1 Then
' The child step wasn't found - raise an error
On Error GoTo 0
Err.Raise errInvalidChild, mstrModuleName & "ChildTerminated", _
    LoadResString(errInvalidChild)

End Sub

```

```

End If

Exit Sub

ChildTerminatedErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
On Error GoTo 0
mstrSource = mstrModuleName & "ChildTerminated"
Err.Raise vbObjectError + errInstanceOpFailed, mstrSource, _
    LoadResString(errInstanceOpFailed)

End Sub

Public Sub ChildCompleted(mlngStepId As Long)
' This procedure is called when any a sub-step completes
' execution. Note: The TasksComplete field will be
' incremented.
Dim lngIndex As Long

On Error GoTo ChildCompletedErr

BugAssert mcStep.StepType = gintManagerStep

For lngIndex = 0 To mcSubSteps.Count - 1
    BugAssert mcSubSteps(lngIndex).TasksComplete >= 0, _
        "Tasks complete for " &
CStr(mcSubSteps(lngIndex).StepId) & _
    " Instance Id " & InstanceId & " is less than 0."

    If mcSubSteps(lngIndex).StepId = mlngStepId Then
        mcSubSteps(lngIndex).TasksComplete = _
            mcSubSteps(lngIndex).TasksComplete + 1
        BugMessage "Tasks Complete for Step Id : " & _
            CStr(mcSubSteps(lngIndex).StepId) & _
            " Instance Id: " & InstanceId & _
            " = " & mcSubSteps(lngIndex).TasksComplete
    End If
Next lngIndex

If lngIndex > mcSubSteps.Count - 1 Then
' The child step wasn't found - raise an error
On Error GoTo 0
Err.Raise errInvalidChild, mstrModuleName, _
    LoadResString(errInvalidChild)
End If

Exit Sub

ChildCompletedErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
On Error GoTo 0
Err.Raise vbObjectError + errInstanceOpFailed, mstrModuleName &
"ChildCompleted", _
    LoadResString(errInstanceOpFailed)

```

```

End Sub

Public Sub ChildDeleted(mlngStepId As Long)
' This procedure is called when a sub-step needs to be re-executed
' Note: The TasksComplete field is decremented. We needn't worry
about
' the TasksRunning field since no steps are currently running.
Dim lngIndex As Long

On Error GoTo ChildDeletedErr

BugAssert mcStep.StepType = gintManagerStep

For lngIndex = 0 To mcSubSteps.Count - 1

    If mcSubSteps(lngIndex).StepId = mlngStepId Then
        mcSubSteps(lngIndex).TasksRunning = _
            mcSubSteps(lngIndex).TasksRunning - 1

        BugAssert mcSubSteps(lngIndex).TasksRunning >= 0, _
            "Tasks running for " &
CStr(mcSubSteps(lngIndex).StepId) & _
    " Instance Id " & InstanceId & " is less than 0."

        Exit For
    End If
Next lngIndex

If lngIndex > mcSubSteps.Count - 1 Then
' The child step wasn't found - raise an error
On Error GoTo 0
Err.Raise errInvalidChild, mstrModuleName, _
    LoadResString(errInvalidChild)
End If

Exit Sub

ChildDeletedErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
On Error GoTo 0
Err.Raise vbObjectError + errInstanceOpFailed, mstrModuleName &
"ChildDeleted", _
    LoadResString(errInstanceOpFailed)

End Sub

Private Sub RaiseErrForWorker()

    If mcStep.StepType <> gintManagerStep Then
        On Error GoTo 0
        mstrSource = mstrModuleName & "RaiseErrForWorker"
        Err.Raise vbObjectError + errInvalidForWorker, _
            mstrSource, _
            LoadResString(errInvalidForWorker)
    End If

End Sub

```

```

Public Property Get Step() As cStep

    Set Step = mcStep

End Property
Public Property Get Iterators() As cRunColIt

    Set Iterators = mcIterators

End Property
Public Property Get SubSteps() As cSubSteps

    Call RaiseErrForWorker

    Set SubSteps = mcSubSteps

End Property
Public Property Set Step(cRunStep As cStep)

    Set mcStep = cRunStep

End Property
Public Property Set Iterators(cIts As cRunColIt)

    Set mcIterators = cIts

End Property
Public Property Get IsPending() As Boolean
' Returns true if the step has any substeps that need
' execution
Dim lngIndex As Long
Dim lngRunning As Long

Call RaiseErrForWorker

If Not mblnComplete And Not mblnNoMoreToStart Then
    ' Get a count of all the substeps that are already being
    ' executed
    lngRunning = 0
    For lngIndex = 0 To mcSubSteps.Count - 1
        lngRunning = lngRunning + mcSubSteps(lngIndex).TasksRunning
    Next lngIndex

    IsPending = (lngRunning < DegreeParallelism)
Else
    ' This should be sufficient to prove that there r no
    ' more sub-steps to be executed.
    ' mblnComplete: Handles the case where all steps have
    ' been executed
    ' mblnNoMoreToStart: Handles the case where the step
    ' has a degree of parallelism greater than the total
    ' number of sub-steps available to execute
    IsPending = False
End If

```

```

End Property
Public Property Get IsRunning() As Boolean
' Returns true if the any one of the substeps is still
' executing
Dim lngIndex As Long

Call RaiseErrForWorker

IsRunning = False

' If a substep has no currently executing tasks and
' the tasks completed is greater than zero, then we can
' assume that it has completed execution (otherwise we
' would've run a new task the moment one completed!)
For lngIndex = 0 To mcSubSteps.Count - 1
    If mcSubSteps(lngIndex).TasksRunning > 0 Then
        IsRunning = True
        Exit For
    End If
Next lngIndex

End Property
Public Property Get TotalRunning() As Long
' Returns the total number of substeps that are executing
Dim lngTotalProcesses As Long
Dim lngIndex As Long

Call RaiseErrForWorker

lngTotalProcesses = 0
For lngIndex = 0 To mcSubSteps.Count - 1
    BugAssert mcSubSteps(lngIndex).TasksRunning >= 0, _
        "Tasks running for " & CStr(mcSubSteps(lngIndex).StepId)
    & _
        " is less than 0."
    lngTotalProcesses = lngTotalProcesses +
mcSubSteps(lngIndex).TasksRunning
Next lngIndex

TotalRunning = lngTotalProcesses
End Property
Public Property Get RunningForStep(lngSubStepId As Long) As Long
' Returns the total number of instances of the substep
' that are executing
Dim lngIndex As Long

Call RaiseErrForWorker

For lngIndex = 0 To mcSubSteps.Count - 1
    BugAssert mcSubSteps(lngIndex).TasksRunning >= 0, _
        "Tasks running for " & CStr(mcSubSteps(lngIndex).StepId)
    & _
        " is less than 0."

    If mcSubSteps(lngIndex).StepId = lngSubStepId Then

```



```

        RunningForStep = mcSubSteps(lngIndex).TasksRunning
    Exit For
End If
Next lngIndex

If lngIndex > mcSubSteps.Count - 1 Then
    ' The child step wasn't found - raise an error
    On Error GoTo 0
    Err.Raise errInvalidChild, mstrSource, _
        LoadResString(errInvalidChild)
End If

End Property

Public Property Let Status(ByVal vdata As InstanceStatus)

    mintStatus = vdata

End Property

Public Property Get Status() As InstanceStatus

    Status = mintStatus

End Property
Private Sub Class_Initialize()

    Set mcSubSteps = New cSubSteps

    mblnNoMoreToStart = False
    mblnComplete = False
    StartTime = gdtmEmpty
    EndTime = gdtmEmpty

End Sub

Private Sub Class_Terminate()

    mcSubSteps.Clear
    Set mcSubSteps = Nothing

End Sub

```

## cInstances.cls

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cInstances"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:      cInstances.cls
'           Microsoft TPC-H Kit Ver. 1.00

```

```

'           Copyright Microsoft, 1999
'           All Rights Reserved
'
'
' PURPOSE:   Implements a collection of cInstance objects.
'           Type-safe wrapper around cVector.
'           Also contains additional functions to query an instance,
etc.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

' Used to indicate the source module name when errors
' are raised by this class
Private Const mstrModuleName As String = "cInstance."
Private mstrSource As String

Private mcInstances As cVector

Public Function QueryInstance(ByVal InstanceId As Long) As cInstance
    ' Retrieves the record for the passed in instance from
    ' the collection

    Dim lngIndex As Long

    On Error GoTo QueryInstanceErr

    ' Check for valid values of the instance id
    If InstanceId > 0 Then
        ' Find the run node with the matching step id
        For lngIndex = 0 To Count() - 1
            If mcInstances(lngIndex).InstanceId = InstanceId Then
                Set QueryInstance = mcInstances(lngIndex)
                Exit For
            End If
        Next lngIndex

        If lngIndex > mcInstances.Count - 1 Then
            On Error GoTo 0
            Err.Raise vbObjectError + errQueryFailed, mstrSource, _
                LoadResString(errQueryFailed)
        End If
    Else
        On Error GoTo 0
        Err.Raise vbObjectError + errQueryFailed, mstrSource, _
            LoadResString(errQueryFailed)
    End If

    Exit Function

QueryInstanceErr:
    ' Log the error code raised by Visual Basic
    Call LogErrors(Errors)
    On Error GoTo 0
    mstrSource = mstrModuleName & "QueryInstance"
    Err.Raise vbObjectError + errQueryFailed, _

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```

        mstrSource, LoadResString(errQueryFailed)
End Function

Public Function QueryPendingInstance(ByVal ParentInstanceId As Long, _
    ByVal lngSubStepId As Long) As cInstance
    ' Retrieves a pending instance for the passed in substep
    ' and the given parent instance id.

    Dim lngIndex As Long

    On Error GoTo QueryPendingInstanceErr

    ' Find the run node with the matching step id
    For lngIndex = 0 To Count() - 1
        If mcInstances(lngIndex).ParentInstanceId = ParentInstanceId And
            mcInstances(lngIndex).Step.StepId = lngSubStepId Then
            ' Put in a separate if condition since the IsPending
            ' property is valid only for manager steps. If the
            ' calling procedure does not pass a manager step
            ' identifier, the procedure will error out.
            If mcInstances(lngIndex).IsPending Then
                Set QueryPendingInstance = mcInstances(lngIndex)
                Exit For
            End If
        End If
    Next lngIndex

    Exit Function

QueryPendingInstanceErr:
    ' Log the error code raised by Visual Basic
    Call LogErrors(Errors)
    On Error GoTo 0
    mstrSource = mstrModuleName & "QueryPendingInstance"
    Err.Raise vbObjectError + errQueryFailed, _
        mstrSource, LoadResString(errQueryFailed)

End Function

Public Function InstanceAborted(cSubStepRec As cSubStep) As Boolean

    Dim lIndex As Long

    InstanceAborted = False

    For lIndex = 0 To Count() - 1
        If mcInstances(lIndex).Step.StepId = cSubStepRec.StepId And _
            mcInstances(lIndex).Status = gintAborted Then
            InstanceAborted = True
            Exit For
        End If
    Next lIndex

End Function

Public Function CompletedInstanceExists(lParentInstance As Long, _

```

```

    cSubStepDtIs As cStep) As Boolean
    ' Checks if there is a completed instance of the passed in step

    Dim lngIndex As Long

    CompletedInstanceExists = False

    If cSubStepDtIs.StepType = gintManagerStep Then
        ' Find the run node with the matching step id
        For lngIndex = 0 To Count() - 1
            If mcInstances(lngIndex).ParentInstanceId = lParentInstance
                And _
                    mcInstances(lngIndex).Step.StepId =
                    cSubStepDtIs.StepId Then
                ' Put in a separate if condition since the IsPending
                ' property is valid only for manager steps.
                BugAssert (Not mcInstances(lngIndex).IsPending),
                    "Pending instance exists!"

                CompletedInstanceExists = True
                Exit Function
            End If
        Next lngIndex
    End If

End Function

Public Sub Add(ByVal objItem As cInstance)

    mcInstances.Add objItem

End Sub

Public Sub Clear()

    mcInstances.Clear

End Sub

Public Function Count() As Long

    Count = mcInstances.Count

End Function

Public Function Delete(ByVal lngDelete As Long) As cInstance

    Set Delete = mcInstances.Delete(lngDelete)

End Function

Public Property Set Item(Optional ByVal Position As Long, _
    RHS As cInstance)

```

```

    If Position = -1 Then
        Position = 0
    End If
    Set mcInstances(Position) = RHS
End Property

Public Property Get Item(Optional ByVal Position As Long = -1) _
    As cInstance
Attribute Item.VB_UserMemId = 0

    If Position = -1 Then
        Position = 0
    End If
    Set Item = mcInstances.Item(Position)
End Property

Private Sub Class_Initialize()

    Set mcInstances = New cVector

End Sub

Private Sub Class_Terminate()

    Set mcInstances = Nothing

End Sub

```

## cIterator.cls

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cIterator"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:      cIterator.cls
'            Microsoft TPC-H Kit Ver. 1.00
'            Copyright Microsoft, 1999
'            All Rights Reserved
'
' PURPOSE:   Encapsulates the properties and methods of an iterator.
'            Contains functions to insert, update and delete
'            iterator_values records from the database.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

```

```

Implements cNode

' Module level variables to store the property values
Private mintType As Integer
Private mintSequenceNo As Integer
Private mstrValue As String
Private mdbaIteratorDB As Database
Private mintOperation As Integer
Private mlngPosition As Long

Private Const mstrModuleName As String = "cIterator."
Private mstrSource As String

Public Enum ValueType
    gintFrom = 1
    gintTo
    gintStep
    gintValue
End Enum
Public Property Get Value() As String

    Value = mstrValue

End Property
Public Property Let Value(ByVal vdata As String)

    mstrValue = vdata

End Property

Public Property Get IndOperation() As Operation

    IndOperation = mintOperation

End Property
Public Property Let IndOperation(ByVal vdata As Operation)

    On Error GoTo IndOperationErr
    mstrSource = mstrModuleName & "IndOperation"

' The valid operations are define in the cOperations
' class. Check if the operation is valid
Select Case vdata
    Case QueryOp, InsertOp, UpdateOp, DeleteOp
        mintOperation = vdata

    Case Else
        On Error GoTo 0
        Err.Raise vbObjectError + errInvalidOperation, _
            mstrSource, LoadResString(errInvalidOperation)
End Select

Exit Property

IndOperationErr:

```

```

LogErrors Errors
mstrSource = mstrModuleName & "IndOperation"
On Error GoTo 0
Err.Raise vbObjectError + errLetOperationFailed, _
    mstrSource, LoadResString(errLetOperationFailed)
End Property

Public Function Clone() As cIterator
    ' Creates a copy of a given Iterator

    Dim cItClone As cIterator

    On Error GoTo CloneErr

    Set cItClone = New cIterator

    ' Copy all the iterator properties to the newly
    ' created object
    cItClone.IteratorType = mintType
    cItClone.SequenceNo = mintSequenceNo
    cItClone.IndOperation = mintOperation
    cItClone.Value = mstrValue

    ' And set the return value to the newly created Iterator
    Set Clone = cItClone

    Exit Function

CloneErr:
    LogErrors Errors
    mstrSource = mstrModuleName & "Clone"
    On Error GoTo 0
    Err.Raise vbObjectError + errCloneFailed, _
        mstrSource, LoadResString(errCloneFailed)
End Function
Public Property Get SequenceNo() As Integer

    SequenceNo = mintSequenceNo
End Property

Public Property Let SequenceNo(ByVal vdata As Integer)
    mintSequenceNo = vdata
End Property

Public Sub Add(ByVal lngStepId As Long, _
    strVersion As String)
    ' Inserts a new iterator values record into the database

    Dim strInsert As String
    Dim qy As DAO.QueryDef

    On Error GoTo AddIteratorErr

```

```

' First check if the database object is valid
Call CheckDB

' Create a temporary querydef object
strInsert = "insert into iterator_values " & _
    "( step_id, version_no, type, " & _
    " iterator_value, sequence_no ) " & _
    " values ([st_id], [ver_no], [it_typ], " & _
    " [it_val], [seq_no] )"
Set qy = mdbaIteratorDB.CreateQueryDef(gstrEmptyString, strInsert)

' Call a procedure to execute the Querydef object
Call AssignParameters(qy, lngStepId, strVersion)

qy.Execute dbFailOnError
qy.Close

Exit Sub

AddIteratorErr:
    LogErrors Errors
    mstrSource = mstrModuleName & "AddIterator"
    On Error GoTo 0
    Err.Raise vbObjectError + errInsertIteratorFailed, _
        mstrSource, _
        LoadResString(errInsertIteratorFailed)
End Sub

Private Sub AssignParameters(qyExec As DAO.QueryDef, _
    ByVal lngStepId As Long, _
    strVersion As String)
    ' Assigns values to the parameters in the querydef object
    ' The parameter names are cryptic to make them different
    ' from the field names. When the parameter names are
    ' the same as the field names, parameters in the where
    ' clause do not get created.

    Dim prmParam As DAO.Parameter

    On Error GoTo AssignParametersErr
    mstrSource = mstrModuleName & "AssignParameters"

    For Each prmParam In qyExec.Parameters
        Select Case prmParam.Name
            Case "[st_id]"
                prmParam.Value = lngStepId

            Case "[ver_no]"
                prmParam.Value = strVersion

            Case "[it_typ]"
                prmParam.Value = mintType

            Case "[it_val]"
                prmParam.Value = mstrValue

```

```

        Case "[seq_no]"
            prmParam.Value = mintSequenceNo

        Case Else
            ' Write the parameter name that is faulty
            WriteError errInvalidParameter, mstrSource, _
                prmParam.Name
            On Error GoTo 0
            Err.Raise errInvalidParameter, mstrSource, _
                LoadResString(errInvalidParameter)
        End Select
    Next prmParam

Exit Sub

AssignParametersErr:
    mstrSource = mstrModuleName & "AssignParameters"
    Call LogErrors(Errors)
    On Error GoTo 0
    Err.Raise vbObjectError + errAssignParametersFailed, _
        mstrSource, LoadResString(errAssignParametersFailed)

End Sub

Private Sub CheckDB()
    ' Check if the database object has been initialized

    If mdbIteratorDB Is Nothing Then
        ShowError errInvalidDB
        On Error GoTo 0
        Err.Raise vbObjectError + errInvalidDB, _
            mstrModuleName, LoadResString(errInvalidDB)
    End If

End Sub

Public Sub Delete(ByVal lngStepId As Long, _
    strVersion As String)
    ' Deletes the step iterator record from the database

    Dim strDelete As String
    Dim qy As DAO.QueryDef

    On Error GoTo DeleteIteratorErr
    mstrSource = mstrModuleName & "DeleteIterator"

    ' There can be multiple iterators for a step.
    ' However the values that an iterator for a step can
    ' assume will be unique, meaning that a combination of
    ' the iterator_id and value will be unique.
    strDelete = "delete from iterator values " & _
        " where step_id = [st_id]" & _
        " and version_no = [ver_no]" & _
        " and iterator_value = [it_val] "
    Set qy = mdbIteratorDB.CreateQueryDef(gstrEmptyString, strDelete)

```

```

        Call AssignParameters(qy, lngStepId, strVersion)
        qy.Execute dbFailOnError

    qy.Close

Exit Sub

DeleteIteratorErr:
    LogErrors Errors
    mstrSource = mstrModuleName & "DeleteIterator"
    On Error GoTo 0
    Err.Raise vbObjectError + errDeleteIteratorFailed, _
        mstrSource, _
            LoadResString(errDeleteIteratorFailed)

End Sub

Public Sub Update(ByVal lngStepId As Long, strVersion As String)
    ' Updates the sequence no of the step iterator record
    ' in the database

    Dim strUpdate As String
    Dim qy As QueryDef

    On Error GoTo UpdateErr

    ' First check if the database object is valid
    Call CheckDB

    If mintType = gintValue Then
        ' If the iterator is of type value, only the sequence of the
        values can get updated
        strUpdate = "Update iterator_values " & _
            " set sequence_no = [seq_no] " & _
            " where step_id = [st_id]" & _
            " and version_no = [ver_no]" & _
            " and iterator_value = [it_val] "
    Else
        ' If the iterator is of type range, only the values can get
        updated
        strUpdate = "Update iterator_values " & _
            " set iterator_value = [it_val] " & _
            " where step_id = [st_id]" & _
            " and version_no = [ver_no]" & _
            " and type = [it_typ] "
    End If

    Set qy = mdbIteratorDB.CreateQueryDef(gstrEmptyString, strUpdate)

    ' Call a procedure to assign the parameter values to the
    ' querydef object
    Call AssignParameters(qy, lngStepId, strVersion)
    qy.Execute dbFailOnError

    qy.Close

Exit Sub

```

```

UpdateErr:
    LogErrors Errors
    mstrSource = mstrModuleName & "Update"
    On Error GoTo 0
    Err.Raise vbObjectError + errUpdateConstraintFailed, _
        mstrSource, _
        LoadResString(errUpdateConstraintFailed)

End Sub
Public Property Set NodeDB(vdata As Database)

    Set mdbsIteratorDB = vdata

End Property

Public Property Get NodeDB() As Database

    Set NodeDB = mdbsIteratorDB

End Property
Public Property Get Position() As Long

    Position = mlngPosition

End Property
Public Property Let Position(ByVal vdata As Long)

    mlngPosition = vdata

End Property

Public Property Let IteratorType(ByVal vdata As ValueType)

    On Error GoTo TypeErr
    mstrSource = mstrModuleName & "Type"

    ' These constants have been defined in the enumeration,
    ' Type, which is exposed
    Select Case vdata
        Case gintFrom, gintTo, gintStep, gintValue
            mintType = vdata

        Case Else
            On Error GoTo 0
            Err.Raise vbObjectError + errTypeInvalid, _
                mstrSource, LoadResString(errTypeInvalid)
    End Select

    Exit Property

TypeErr:
    LogErrors Errors
    mstrSource = mstrModuleName & "Type"
    On Error GoTo 0
    Err.Raise vbObjectError + errTypeInvalid, _

        mstrSource, LoadResString(errTypeInvalid)

End Property

Public Property Get IteratorType() As ValueType

    IteratorType = mintType

End Property
Public Sub Validate()

    ' No validations necessary for the iterator class

End Sub

Private Sub Class_Initialize()

    ' Initialize the operation indicator variable to Query
    ' It will be modified later by the collection class when
    ' inserts, updates or deletes are performed
    mintOperation = QueryOp

End Sub

Private Property Let cNode_IndOperation(ByVal vdata As Operation)

    On Error GoTo IndOperationErr
    mstrSource = mstrModuleName & "IndOperation"

    ' The valid operations are define in the cOperations
    ' class. Check if the operation is valid
    Select Case vdata
        Case QueryOp, InsertOp, UpdateOp, DeleteOp
            mintOperation = vdata

        Case Else
            On Error GoTo 0
            Err.Raise vbObjectError + errInvalidOperation, _
                mstrSource, LoadResString(errInvalidOperation)
    End Select

    Exit Property

IndOperationErr:
    LogErrors Errors
    mstrSource = mstrModuleName & "IndOperation"
    On Error GoTo 0
    Err.Raise vbObjectError + errLetOperationFailed, _
        mstrSource, LoadResString(errLetOperationFailed)

End Property

Private Property Get cNode_IndOperation() As Operation

    IndOperation = mintOperation

```

```

End Property

Private Property Set cNode_NodeDB(RHS As DAO.Database)

    Set mdbIteratorDB = RHS

End Property

Private Property Get cNode_NodeDB() As DAO.Database

    Set cNode_NodeDB = mdbIteratorDB

End Property

Private Property Let cNode_Position(ByVal vdata As Long)

    mlngPosition = vdata

End Property

Private Property Get cNode_Position() As Long

    cNode_Position = mlngPosition

End Property

Private Sub cNode_Validate()

    ' No validations necessary for the iterator class

End Sub

Private Property Let cNode_Value(ByVal vdata As String)

    mstrValue = vdata

End Property

Private Property Get cNode_Value() As String

    Value = mstrValue

End Property

```

## **cManager.cls**

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1    'True
END
Attribute VB_Name = "cManager"

```

```

Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:      cManager.cls
'           Microsoft TPC-H Kit Ver. 1.00
'           Copyright Microsoft, 1999
'           All Rights Reserved
'
' PURPOSE:   Encapsulates the properties and methods of a manager
step.
'           Implements the cStep class - carries out initializations
and validations that are specific to manager steps.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

Implements cStep

' Object variable to keep the step reference in
Private mcStep As cStep

' Used to indicate the source module name when errors
' are raised by this class
Private mstrSource As String
Private Const mstrModuleName As String = "cManager."
Private Sub cStep_AddAllIterators()

    Call mcStep.AddAllIterators

End Sub

Private Property Let cStep_StartDir(ByVal RHS As String)

    mcStep.StartDir = RHS

End Property

Private Property Get cStep_StartDir() As String

    cStep_StartDir = mcStep.StartDir

End Property

Private Sub cStep_Delete()

    Call mcStep.Delete

End Sub

Private Property Set cStep_NodeDB(RHS As DAO.Database)

    Set mcStep.NodeDB = RHS

End Property

```

```

Private Function cStep_IncVersionY() As String
    cStep_IncVersionY = mcStep.IncVersionY
End Function
Private Function cStep_IsNewVersion() As Boolean
    cStep_IsNewVersion = mcStep.IsNewVersion
End Function
Private Function cStep_OldVersionNo() As String
    cStep_OldVersionNo = mcStep.OldVersionNo
End Function

Private Function cStep_IncVersionX() As String
    cStep_IncVersionX = mcStep.IncVersionX
End Function
Private Sub cStep_UpdateIteratorVersion()
    Call mcStep.UpdateIteratorVersion
End Sub

Private Function cStep_IteratorCount() As Long
    cStep_IteratorCount = mcStep.IteratorCount
End Function

Private Sub cStep_UnloadIterators()
    Call mcStep.UnloadIterators
End Sub

Private Sub cStep_DeleteIterator(cItRecord As cIterator)
    Call mcStep.DeleteIterator(cItRecord)
End Sub
Private Property Get cStep_IteratorName() As String
    cStep_IteratorName = mcStep.IteratorName
End Property
Private Property Let cStep_IteratorName(ByVal RHS As String)
    mcStep.IteratorName = RHS
End Property

Private Sub cStep_SaveIterators()
    Call mcStep.SaveIterators
End Sub

```

```

Private Sub cStep_LoadIterator(cItRecord As cIterator)
    Call mcStep.LoadIterator(cItRecord)
End Sub
Private Property Let cStep_Position(ByVal RHS As Long)
    mcStep.Position = RHS
End Property
Private Sub cStep_InsertIterator(cItRecord As cIterator)
    Call mcStep.InsertIterator(cItRecord)
End Sub
Private Function cStep_Iterators() As Variant
    cStep_Iterators = mcStep.Iterators
End Function
Private Sub cStep_ModifyIterator(cItRecord As cIterator)
    Call mcStep.ModifyIterator(cItRecord)
End Sub
Private Sub cStep_RemoveIterator(cItRecord As cIterator)
    Call mcStep.RemoveIterator(cItRecord)
End Sub
Private Sub cStep_UpdateIterator(cItRecord As cIterator)
    Call mcStep.UpdateIterator(cItRecord)
End Sub
Private Sub cStep_AddIterator(cItRecord As cIterator)
    Call mcStep.AddIterator(cItRecord)
End Sub
Private Property Get cStep_Position() As Long
    cStep_Position = mcStep.Position
End Property
Private Function cStep_Clone(Optional cCloneStep As cStep) As cStep
    Dim cNewManager As cManager
    Set cNewManager = New cManager
    Set cStep_Clone = mcStep.Clone(cNewManager)
End Function

```



```

Private Property Get cStep_IndOperation() As Operation
    cStep_IndOperation = mcStep.IndOperation
End Property

Private Property Let cStep_IndOperation(ByVal RHS As Operation)
    mcStep.IndOperation = RHS
End Property

Private Property Get cStep_NextStepId() As Long
    cStep_NextStepId = mcStep.NextStepId
End Property

Private Property Let cStep_OutputFile(ByVal RHS As String)
    mcStep.OutputFile = RHS
End Property

Private Property Get cStep_OutputFile() As String
    cStep_OutputFile = mcStep.OutputFile
End Property

Private Property Let cStep_ErrorFile(ByVal RHS As String)
    mcStep.ErrorFile = RHS
End Property

Private Property Get cStep_ErrorFile() As String
    cStep_ErrorFile = mcStep.ErrorFile
End Property
'Private Property Let cStep_LogFile(ByVal RHS As String)
'
'    mcStep.LogFile = RHS
'
'End Property
'
'Private Property Get cStep_LogFile() As String
'
'    cStep_LogFile = mcStep.LogFile
'
'End Property

Private Property Let cStep_ArchivedFlag(ByVal RHS As Boolean)

```

```

    mcStep.ArchivedFlag = RHS
End Property

Private Property Get cStep_ArchivedFlag() As Boolean
    cStep_ArchivedFlag = mcStep.ArchivedFlag
End Property

Private Property Get cStep_NodeDB() As DAO.Database
    Set cStep_NodeDB = mcStep.NodeDB
End Property

Private Sub Class_Initialize()
    ' Create the object
    Set mcStep = New cStep

    ' Initialize the object with valid values for a manager step
    ' The global flag should be the first field to be initialized
    ' since subsequent validations might try to check if the
    ' step being created is global
    mcStep.GlobalFlag = False
    '
    mcStep.GlobalRunMethod = gintNoOption
    mcStep.StepType = gintManagerStep

    ' Since the manager step does not take any action, the step
    ' text and file name will always be empty
    mcStep.StepText = gstrEmptyString
    mcStep.StepTextFile = gstrEmptyString

    ' Since the manager step does not take any action, execution
    ' properties for the step will be empty
    mcStep.ExecutionMechanism = gintNoOption
    mcStep.FailureDetails = gstrEmptyString
    mcStep.ContinuationCriteria = gintNoOption
End Sub

Private Sub Class_Terminate()
    ' Remove the step object
    Set mcStep = Nothing
End Sub

Private Sub cStep_Add()
    ' Call the Add method of the step class to carry out the insert
    mcStep.Add
End Sub

Private Property Get cStep_ContinuationCriteria() As
ContinuationCriteria

```

```

    cStep_ContinuationCriteria = mcStep.ContinuationCriteria
End Property

Private Property Let cStep_ContinuationCriteria(ByVal RHS As
ContinuationCriteria)

    ' Since a manager step cannot take any action, the continuation
    ' criteria property does not apply to it
    mcStep.ContinuationCriteria = gintNoOption

End Property

Private Property Let cStep_DegreeParallelism(ByVal RHS As String)

    mcStep.DegreeParallelism = RHS

End Property

Private Property Get cStep_DegreeParallelism() As String

    cStep_DegreeParallelism = mcStep.DegreeParallelism

End Property

Private Sub cStep_DeleteStep()

    On Error GoTo cStep_DeleteStepErr
    mstrSource = mstrModuleName & "cStep_DeleteStep"

    mcStep.Delete
    Exit Sub

cStep_DeleteStepErr:
    LogErrors Errors
    mstrSource = mstrModuleName & "cStep_DeleteStep"
    On Error GoTo 0
    Err.Raise vbObjectError + errDeleteStepFailed, _
        mstrSource, _
        LoadResString(errDeleteStepFailed)

End Sub

Private Property Get cStep_EnabledFlag() As Boolean

    cStep_EnabledFlag = mcStep.EnabledFlag

End Property

Private Property Let cStep_EnabledFlag(ByVal RHS As Boolean)

    mcStep.EnabledFlag = RHS

End Property

```

```

Private Property Let cStep_ExecutionMechanism(ByVal RHS As
ExecutionMethod)

    ' Since a manager step cannot take any action, the Execution
    ' Mechanism property does not apply to it
    mcStep.ExecutionMechanism = gintNoOption

End Property

Private Property Get cStep_ExecutionMechanism() As ExecutionMethod

    cStep_ExecutionMechanism = mcStep.ExecutionMechanism

End Property

Private Property Let cStep_FailureDetails(ByVal RHS As String)

    ' Since a manager step cannot take any action, the Failure
    ' Details property does not apply to it
    mcStep.FailureDetails = gstrEmptyString

End Property

Private Property Get cStep_FailureDetails() As String

    cStep_FailureDetails = mcStep.FailureDetails

End Property

Private Property Get cStep_GlobalFlag() As Boolean

    cStep_GlobalFlag = mcStep.GlobalFlag

End Property

Private Property Let cStep_GlobalFlag(ByVal RHS As Boolean)

    ' Set the global flag to false - this flag is initialized when
    ' an instance of the class is created. Just making sure that
    ' nobody changes the value inadvertently
    mcStep.GlobalFlag = False

End Property

Private Sub cStep_Modify()

    ' Call the Modify method of the step class to carry out the update
    mcStep.Modify

End Sub

Private Property Let cStep_ParentStepId(ByVal RHS As Long)

    mcStep.ParentStepId = RHS

End Property

```

```

Private Property Get cStep_ParentStepId() As Long
    cStep_ParentStepId = mcStep.ParentStepId
End Property

Private Property Let cStep_ParentVersionNo(ByVal RHS As String)
    mcStep.ParentVersionNo = RHS
End Property

Private Property Get cStep_ParentVersionNo() As String
    cStep_ParentVersionNo = mcStep.ParentVersionNo
End Property

Private Property Let cStep_SequenceNo(ByVal RHS As Integer)
    mcStep.SequenceNo = RHS
End Property

Private Property Get cStep_SequenceNo() As Integer
    cStep_SequenceNo = mcStep.SequenceNo
End Property

Private Property Let cStep_StepId(ByVal RHS As Long)
    mcStep.StepId = RHS
End Property

Private Property Get cStep_StepId() As Long
    cStep_StepId = mcStep.StepId
End Property

Private Property Let cStep_StepLabel(ByVal RHS As String)
    mcStep.StepLabel = RHS
End Property

Private Property Get cStep_StepLabel() As String
    cStep_StepLabel = mcStep.StepLabel
End Property

```

```

Private Property Let cStep_StepLevel(ByVal RHS As Integer)
    mcStep.StepLevel = RHS
End Property

Private Property Get cStep_StepLevel() As Integer
    cStep_StepLevel = mcStep.StepLevel
End Property

Private Property Let cStep_StepText(ByVal RHS As String)
    ' Since the manager step does not take any action, the step
    ' text and file name will always be empty
    mcStep.StepText = gstrEmptyString
End Property

Private Property Get cStep_StepText() As String
    cStep_StepText = mcStep.StepText
End Property

Private Property Let cStep_StepTextFile(ByVal RHS As String)
    ' Since the manager step does not take any action, the step
    ' text and file name will always be empty
    mcStep.StepTextFile = gstrEmptyString
End Property

Private Property Get cStep_StepTextFile() As String
    cStep_StepTextFile = mcStep.StepTextFile
End Property

Private Property Let cStep_StepType(RHS As gintStepType)
    mcStep.StepType = gintManagerStep
End Property

Private Property Get cStep_StepType() As gintStepType
    cStep_StepType = mcStep.StepType
End Property

Private Sub cStep_Validate()
    ' The validate routines for each of the steps will
    ' carry out the specific validations for the type and
    ' call the generic validation routine

```

```

On Error GoTo cStep_ValidateErr
mstrSource = mstrModuleName & "cStep_Validate"

' Validations specific to manager steps

' Check if the step text or a file name has been
' specified
If Not StringEmpty(mcStep.StepText) Or Not
StringEmpty(mcStep.StepTextFile) Then
    ShowError errTextAndFileNullForManager
    On Error GoTo 0
    Err.Raise vbObjectError + errValidateFailed, _
        gstrSource, _
        LoadResString(errValidateFailed)
End If

If mcStep.ExecutionMechanism <> gintNoOption Then
    ShowError errExecutionMechanismInvalid
    On Error GoTo 0
    Err.Raise vbObjectError + errValidateFailed, _
        gstrSource, _
        LoadResString(errValidateFailed)
End If

If mcStep.FailureDetails <> gstrEmptyString Then
    ShowError errFailureDetailsNullForMgr
    On Error GoTo 0
    Err.Raise vbObjectError + errValidateFailed, _
        gstrSource, _
        LoadResString(errValidateFailed)
End If

If mcStep.ContinuationCriteria <> gintNoOption Then
    ShowError errContCriteriaInvalid
    On Error GoTo 0
    Err.Raise vbObjectError + errValidateFailed, _
        gstrSource, _
        LoadResString(errValidateFailed)
End If

mcStep.Validate

Exit Sub

cStep_ValidateErr:
LogErrors Errors
mstrSource = mstrModuleName & "cStep_Validate"
On Error GoTo 0
Err.Raise vbObjectError + errValidateFailed, _
    mstrSource, _
    LoadResString(errValidateFailed)
End Sub

Private Property Let cStep_VersionNo(ByVal RHS As String)

```

```

mcStep.VersionNo = RHS
End Property

Private Property Get cStep_VersionNo() As String
    cStep_VersionNo = mcStep.VersionNo
End Property

Private Property Let cStep_WorkspaceId(ByVal RHS As Long)
    mcStep.WorkspaceId = RHS
End Property

Private Property Get cStep_WorkspaceId() As Long
    cStep_WorkspaceId = mcStep.WorkspaceId
End Property

```

## cNode.cls

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cNode"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:      cNode.cls
'            Microsoft TPC-H Kit Ver. 1.00
'            Copyright Microsoft, 1999
'            All Rights Reserved
'
' PURPOSE:   Defines the properties that an object has to implement.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

Public Property Get IndOperation() As Operation
End Property
Public Property Let IndOperation(ByVal vdata As Operation)
End Property
Public Sub Validate()
End Sub
Public Property Get Value() As String
End Property
Public Property Let Value(ByVal vdata As String)
End Property

Public Property Get NodeDB() As Database

```

```

End Property
Public Property Set NodeDB(vdata As Database)
End Property

Public Property Get Position() As Long
End Property
Public Property Let Position(ByVal vdata As Long)
End Property

```

## cNodeCollections.cls

```

VERSION 1.0 CLASS
BEGIN
  MultiUse = -1  'True
END
Attribute VB_Name = "cNodeCollections"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:      cNodeCollections.cls
'           Microsoft TPC-H Kit Ver. 1.00
'           Copyright Microsoft, 1999
'           All Rights Reserved
'
' PURPOSE:   Implements an array of objects.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

' Node counter
Private mlngNodeCount As Long
Private mdbNodeDb As Database
Private mcarrNodes() As Object

' Used to indicate the source module name when errors
' are raised by this class
Private mstrSource As String
Private Const mstrModuleName As String = "cNodeCollections."

Public Property Set Item(ByVal Position As Long, _
  ByVal objNode As Object)

  ' Returns the element at the passed in position in the array
  If Position >= 0 And Position < mlngNodeCount Then
    Set mcarrNodes(Position) = objNode
  Else
    On Error GoTo 0
    Err.Raise vbObjectError + errItemDoesNotExist, mstrSource, _
      LoadResString(errItemDoesNotExist)
  End If
End Property

Public Property Get Item(ByVal Position As Long) As Object
Attribute Item.VB_UserMemId = 0

```

```

' Returns the element at the passed in position in the array
If Position >= 0 And Position < mlngNodeCount Then
  Set Item = mcarrNodes(Position)
Else
  On Error GoTo 0
  Err.Raise vbObjectError + errItemDoesNotExist, mstrSource, _
    LoadResString(errItemDoesNotExist)
End If

End Property

Public Sub Commit(ByVal cSaveObj As Object, _
  ByVal lngIndex As Long)
  ' This procedure checks if any changes have been made to the
  ' passed in object. If so, it calls the corresponding method
  ' to commit the changes.

  On Error GoTo CommitErr
  mstrSource = mstrModuleName & "Commit"

  Select Case cSaveObj.IndOperation
    Case QueryOp
      ' No changes were made to the queried parameter.
      ' Do nothing

    Case InsertOp
      cSaveObj.Add
      cSaveObj.IndOperation = QueryOp

    Case UpdateOp
      cSaveObj.Modify
      cSaveObj.IndOperation = QueryOp

    Case DeleteOp
      cSaveObj.Delete
      ' Now we can remove the record from the array
      Call Unload(lngIndex)

  End Select

Exit Sub

CommitErr:
  LogErrors Errors
  mstrSource = mstrModuleName & "Commit"
  On Error GoTo 0
  Err.Raise vbObjectError + errCommitFailed, _
    mstrSource, _
    LoadResString(errCommitFailed)

End Sub

Public Sub Save(ByVal lngWorkspace As Long)
  ' Calls a procedure to commit all changes for the passed
  ' in workspace.

```

```

Dim lngIndex As Long

On Error GoTo SaveErr

' Find all parameters in the array with a matching workspace id
' It is important to step backwards through the array, since
' we delete parameter records as we go along!
For lngIndex = mlngNodeCount - 1 To 0 Step -1
    If mcarrNodes(lngIndex).WorkspaceId = lngWorkspace Then

        ' Call a procedure to commit all changes to the
        ' parameter record, if any
        Call Commit(mcarrNodes(lngIndex), lngIndex)

    End If
Next lngIndex

Exit Sub

SaveErr:
LogErrors Errors
mstrSource = mstrModuleName & "Save"
On Error GoTo 0
Err.Raise vbObjectError + errSaveFailed, _
    mstrSource, _
    LoadResString(errSaveFailed)

End Sub
Public Property Get Count() As Long

    Count = mlngNodeCount

End Property

Public Property Get NodeDB() As Database

    Set NodeDB = mdbsNodeDb

End Property
Public Property Set NodeDB(vdata As Database)

    Set mdbsNodeDb = vdata

End Property

Public Sub Load(cNodeToLoad As Object)
' Adds the passed in object to the array

On Error GoTo LoadErr

' If this procedure is called by the add to array procedure,
' the database object has already been initialized
If cNodeToLoad.NodeDB Is Nothing Then

    ' All the Nodes will be initialized with the database
    ' objects before being added to the array

```

```

        Set cNodeToLoad.NodeDB = mdbsNodeDb

    End If

    ReDim Preserve mcarrNodes(mlngNodeCount)

    ' Set the newly added element in the array to the passed in Node
    cNodeToLoad.Position = mlngNodeCount
    Set mcarrNodes(mlngNodeCount) = cNodeToLoad

    mlngNodeCount = mlngNodeCount + 1

Exit Sub

LoadErr:
LogErrors Errors
On Error GoTo 0
Err.Raise vbObjectError + errLoadFailed, mstrModuleName & "Load", _
    LoadResString(errLoadFailed)

End Sub
Public Sub Unload(lngDeletePosition As Long)
' Unloads the passed in object from the array

On Error GoTo UnloadErr

If lngDeletePosition < (mlngNodeCount - 1) Then

    ' Set the Node at the position being deleted to
    ' the last Node in the Node array
    Set mcarrNodes(lngDeletePosition) = mcarrNodes(mlngNodeCount -
1)

    mcarrNodes(lngDeletePosition).Position = lngDeletePosition
End If

' Delete the last Node from the array
mlngNodeCount = mlngNodeCount - 1
If mlngNodeCount > 0 Then
    ReDim Preserve mcarrNodes(0 To mlngNodeCount - 1)
Else
    ReDim mcarrNodes(0)
End If

Exit Sub

UnloadErr:
LogErrors Errors
mstrSource = mstrModuleName & "Unload"
On Error GoTo 0
Err.Raise vbObjectError + errUnloadFailed, _
    mstrSource, _
    LoadResString(errUnloadFailed)

End Sub
Public Sub Delete(lngDeletePosition As Long)
' Deletes the object at the specified position in the

```

```

' array
Dim cDeleteObj As Object

On Error GoTo DeleteErr
mstrSource = mstrModuleName & "Delete"

Set cDeleteObj = mcarrNodes(lngDeletePosition)

If cDeleteObj.IndOperation = InsertOp Then
    ' If we are deleting a record that has just been inserted,
    ' blow it away
    Call Unload(lngDeletePosition)
Else
    ' Set the operation for the deleted object to indicate a
    ' delete - we actually delete the element only at the time
    ' of a save operation
    cDeleteObj.IndOperation = DeleteOp
End If

Exit Sub

DeleteErr:
LogErrors Errors
mstrSource = mstrModuleName & "Delete"
On Error GoTo 0
Err.Raise vbObjectError + errDeleteFailed, _
    mstrSource, _
    LoadResString(errDeleteFailed)

End Sub
Public Sub Modify(cModifiedNode As Object)
    ' Sets the object at the passed in position to the
    ' modified object passed in

    On Error GoTo ModifyErr

    ' First check if the record is valid - all objects that
    ' use this collection class must have a Validate routine
    cModifiedNode.Validate

    ' If we are updating a record that hasn't yet been inserted,
    ' do not change the operation indicator - or we try to update
    ' a non-existent record
    If cModifiedNode.IndOperation <> InsertOp Then
        ' Set the operations to indicate an update
        cModifiedNode.IndOperation = UpdateOp
    End If

    ' Modify the object at the queried position - the Position
    ' will be maintained by this class
    Set mcarrNodes(cModifiedNode.Position) = cModifiedNode

    Exit Sub

ModifyErr:

```

```

LogErrors Errors
mstrSource = mstrModuleName & "Modify"
On Error GoTo 0
Err.Raise vbObjectError + errModifyFailed, _
    mstrSource, _
    LoadResString(errModifyFailed)

End Sub
Public Sub Add(cNodeToAdd As Object)

    On Error GoTo AddErr

    Set cNodeToAdd.NodeDB = mdbsNodeDb

    ' First check if the record is valid
    cNodeToAdd.Validate

    ' Set the operation to indicate an insert
    cNodeToAdd.IndOperation = InsertOp

    ' Call a procedure to load the record in the array
    Call Load(cNodeToAdd)

    Exit Sub

AddErr:
LogErrors Errors
mstrSource = mstrModuleName & "Add"
On Error GoTo 0
Err.Raise vbObjectError + errAddFailed, _
    mstrSource, _
    LoadResString(errAddFailed)

End Sub

Private Sub Class_Terminate()

    ReDim mcarrNodes(0)
    mlngNodeCount = 0

End Sub

```

## Common.bas

```

Attribute VB_Name = "Common"
' FILE:      Common.bas
'           Microsoft TPC-H Kit Ver. 1.00
'           Copyright Microsoft, 1999
'           All Rights Reserved
'
' PURPOSE:   Module containing common functionality throughout
'           StepMaster
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'

```

```

Option Explicit

Private Const mstrModuleName As String = "Common."

' Used to separate the variable data from the constant error
' message being raised when a context-sensitive error is displayed
Private Const mintDelimiter As String = " : "
Private Const mstrFormatString = "mmddy"

' Identifiers for the different labels that need to be loaded
' into the tree view for each workspace
Public Const mstrWorkspacePrefix = "W"
Public Const mstrParameterPrefix = "P"
Public Const mstrParamConnectionPrefix = "C"
Public Const mstrConnectionDtlPrefix = "N"
Public Const mstrParamExtensionPrefix = "E"
Public Const mstrParamBuiltInPrefix = "B"
Public Const gstrGlobalStepPrefix = "G"
Public Const gstrManagerStepPrefix = "M"
Public Const gstrWorkerStepPrefix = "S"
Public Const gstrDummyPrefix = "D"
Public Const mstrLabelPrefix = "L"
Public Const mstrInstancePrefix = "I"
Public Function LabelStep(lngWorkspaceIdentifier As Long) As String
    ' Returns the step label for the workspace identifier passed in
    ' Basically this is a wrapper around the MakeKeyValid function

    LabelStep = MakeKeyValid(gintStepLabel, gintStepLabel,
lngWorkspaceIdentifier)
End Function

Public Function JulianDateToString(dt64Bit As Currency) As String

    Dim lYear As Long
    Dim lMonth As Long
    Dim lDay As Long
    Dim lHour As Long
    Dim lMin As Long
    Dim lSec As Long
    Dim lMs As Long

    Call JulianToTime(dt64Bit, lYear, lMonth, lDay, lHour, lMin, lSec,
lMs)
    JulianDateToString = Format$(lYear, gsYearFormat) & gsDateSeparator
& _
        Format$(lMonth, gsDtFormat) & gsDateSeparator & _
        Format$(lDay, gsDtFormat) & gstrBlank & _
        Format$(lHour, gsTmFormat) & gsTimeSeparator & _
        Format$(lMin, gsTmFormat) & gsTimeSeparator & _
        Format$(lSec, gsTmFormat) & gsMsSeparator & _
        Format$(lMs, gsMSecondFormat)
End Function

```

```

Public Sub DeleteFile(strFile As String, Optional ByVal bCheckIfEmpty As
Boolean = False)

    ' Ensure that there is only a single file of the name before delete,
since
    ' Kill supports wildcards and can potentially delete a number of
files
    Dim strTemp As String

    If CheckFileExists(strFile) Then
        If bCheckIfEmpty Then
            If FileLen(strFile) = 0 Then
                Kill strFile
            End If
        Else
            Kill strFile
        End If
    End If

End Sub

Public Function CheckFileExists(strFile As String) As Boolean

    ' Returns true if the passed in file exists
    ' Raises an error if multiple files are found (filename contains a
wildcard)
    CheckFileExists = False

    If Not StringEmpty(Dir(strFile)) Then
        If Not StringEmpty(Dir()) Then
            On Error GoTo 0
            Err.Raise vbObjectError + errDeleteSingleFile, _
mstrModuleName & "DeleteFile",
LoadResString(errDeleteSingleFile)
        End If

        CheckFileExists = True
    End If

End Function

Public Function GetVersionString() As String
GetVersionString = "Version " & gsVersion
End Function

Function IsLabel(strKey As String) As Boolean

    ' The tree view control on frmMain can contain two types of
' nodes -
' 1. Nodes that contain data for the workspace - this could
' be data for the different types of steps or parameters
' 2. Nodes that display static data - these kind of nodes
' are referred to as label nodes e.g. "Global Steps" is a
' label node
' This function returns True if the passed in key corresponds
' to a label node

```



```

IsLabel = InStr(strKey, mstrLabelPrefix) > 0

End Function

Function MakeKeyValid(lngIdentifier As Long, _
    intTypeOfNode As Integer, _
    Optional ByVal WorkspaceId As Long = 0, _
    Optional ByVal InstanceId As Long = 0) As String

    ' We use a numbering scheme while loading the tree view with
    ' all node data, since it needs a unique key and we want to
    ' use the key to identify the data it contains.
    ' Moreover, add a character to the beginning of the identifier
    ' so that the tree view control accepts it as a valid string,
    ' viz. "456" doesn't work, so change it to "W456"
    ' The general scheme is to concatenate a Label with the Identifier
    ' e.g A Global Step Node will have the Label, G and the Step Id
    ' concatenated to form the unique key
    ' The list of all such node types is given below
    ' 1. "W" + Workspace_Id for Workspace nodes
    ' 2. "P" + Parameter_Id for Parameter nodes
    ' 3. "M" + Step_Id for Manager Step nodes
    ' 4. "S" + Step_Id for Worker Step nodes
    ' 5. "G" + Step_Id for Global Step nodes
    ' 6. Instance_id + "I" + Step_Id for Instance nodes
    ' 7. Workspace_id + "L" + the label identifier = node type for all
Label nodes
    ' Since the manager, worker and global steps are stored in the
    ' same table and the step identifiers will always be unique, we
    ' can use the same character as the prefix, but this is a
    ' convenient way to know the type of step being processed.
    ' The workspace id is appended to the label identifier to make
    ' it unique, since multiple workspaces may be open during a session
    ' Strip the prefix characters off while saving the Ids to the db

    Dim strPrefixChar As String

    On Error GoTo MakeKeyValidErr
    gstrSource = mstrModuleName & "MakeKeyValid"

    Select Case intTypeOfNode
        Case gintWorkspace
            strPrefixChar = mstrWorkspacePrefix
        Case gintGlobalStep
            strPrefixChar = gstrGlobalStepPrefix
        Case gintManagerStep
            strPrefixChar = gstrManagerStepPrefix
        Case gintWorkerStep
            strPrefixChar = gstrWorkerStepPrefix
        Case gintRunManager, gintRunWorker
            If InstanceId = 0 Then
                On Error GoTo 0
                Err.Raise vbObjectError + errMandatoryParameterMissing,
                    _
                    gstrSource, _
                    LoadResString(errMandatoryParameterMissing)
            End If
    End Select

    MakeKeyValid = strPrefixChar & Trim$(Str$(lngIdentifier))

Exit Function

MakeKeyValidErr:
    Call LogErrors(Errors)
    On Error GoTo 0
    Err.Raise vbObjectError + errMakeKeyValidFailed, _
        gstrSource, _
        LoadResString(errMakeKeyValidFailed)

End Function

Function MakeIdentifierValid(strKey As String) As Long
    ' Returns the Identifier corresponding to the passed in key

```

```

End If
    ' Concatenate the instance identifier and the step
    ' identifier to form a unique key
    strPrefixChar = Trim$(Str$(InstanceId)) & mstrInstancePrefix
Case gintParameter
    strPrefixChar = mstrParameterPrefix
Case gintNodeParamConnection
    strPrefixChar = mstrParamConnectionPrefix
Case gintConnectionDtl
    strPrefixChar = mstrConnectionDtlPrefix
Case gintNodeParamExtension
    strPrefixChar = mstrParamExtensionPrefix
Case gintNodeParamBuiltIn
    strPrefixChar = mstrParamBuiltInPrefix
Case gintGlobalsLabel, gintParameterLabel,
gintParamConnectionLabel, _
gintConnDtlLabel, _
gintParamExtensionLabel, gintParamBuiltInLabel,
gintGlobalStepLabel, _
gintStepLabel
    If WorkspaceId = 0 Then
        ' The Workspace Id has to be specified for a label node
        ' Otherwise it will not be possible to generate unique
label
        ' identifiers if multiple workspaces are open
        On Error GoTo 0
        Err.Raise vbObjectError + errWorkspaceIdMandatory, _
            gstrSource, _
            LoadResString(errWorkspaceIdMandatory)
    End If
    ' For all labels, the workspace identifier and the
    ' label prefix are concatenated to form the key
    strPrefixChar = Trim$(Str$(WorkspaceId)) & mstrLabelPrefix
Case Else
    On Error GoTo 0
    Err.Raise vbObjectError + errInvalidNodeType, _
        gstrSource, _
        LoadResString(errInvalidNodeType)
End Select

MakeKeyValid = strPrefixChar & Trim$(Str$(lngIdentifier))

Exit Function

MakeKeyValidErr:
    Call LogErrors(Errors)
    On Error GoTo 0
    Err.Raise vbObjectError + errMakeKeyValidFailed, _
        gstrSource, _
        LoadResString(errMakeKeyValidFailed)

End Function

Function MakeIdentifierValid(strKey As String) As Long
    ' Returns the Identifier corresponding to the passed in key

```

```

' (Reverse of what was done in MakeKeyValid)
On Error GoTo MakeIdentifierValidErr

If IsLabel(strKey) Then
    ' If the key corresponds to a label node, the identifier
    ' appears to the right of the label prefix
    MakeIdentifierValid = Val(Mid(strKey, InStr(strKey,
mstrLabelPrefix) + 1))
ElseIf InStr(strKey, mstrInstancePrefix) = 0 Then
    ' For all other nodes, stripping the first character off
    ' returns a valid Id
    MakeIdentifierValid = Val(Mid(strKey, 2))
Else
    ' Instance node - strip of all characters till the
    ' instance prefix
    MakeIdentifierValid = Val(Mid(strKey, InStr(strKey,
mstrInstancePrefix) + 1))
End If

Exit Function

MakeIdentifierValidErr:
Call LogErrors(Errors)
On Error GoTo 0
Err.Raise vbObjectError + errMakeIdentifierValidFailed, _
    mstrModuleName & "MakeIdentifierValid", _
    LoadResString(errMakeIdentifierValidFailed)

End Function
Public Function IsInstanceNode(strNodeKey As String) As Boolean

    ' Returns true if the passed in node key corresponds to a step
instance
    IsInstanceNode = InStr(strNodeKey, mstrInstancePrefix) > 0

End Function
Public Function IsBuiltInLabel(strNodeKey As String) As Boolean

    ' Returns true if the passed in node key corresponds to a step
instance
    IsBuiltInLabel = (IsLabel(strNodeKey) And _
        (MakeIdentifierValid(strNodeKey) = gintParamBuiltInLabel))

End Function

Public Sub ShowBusy()
    ' Modifies the mousepointer to indicate that the
    ' application is busy

    On Error Resume Next

    Screen.MousePointer = vbHourglass

End Sub
Public Sub ShowFree()

```

```

' Modifies the mousepointer to indicate that the
' application has finished processing and is ready
' to accept user input

On Error Resume Next

Screen.MousePointer = vbDefault

End Sub

Public Function InstrR(strMain As String, _
    strSearch As String) As Integer
    ' Finds the last occurrence of the passed in string

    Dim intPos As Integer
    Dim intPrev As Integer

    On Error GoTo InstrRErr

    intPrev = intPos
    intPos = InStr(1, strMain, strSearch)

    Do While intPos > 0
        intPrev = intPos
        intPos = InStr(intPos + 1, strMain, strSearch)
    Loop
    InstrR = intPrev

    Exit Function

InstrRErr:
Call LogErrors(Errors)
gstrSource = mstrModuleName & "InstrR"
On Error GoTo 0
Err.Raise vbObjectError + errInstrRFailed, _
    gstrSource, _
    LoadResString(errInstrRFailed)

End Function

Public Function GetDefaultDir(lWspId As Long, WspParameters As
cArrParameters) As String

    Dim sDir As String
    sDir = SubstituteParameters( _
        gstrEnvVarSeparator & PARAM_DEFAULT_DIR &
gstrEnvVarSeparator, _
        lWspId, WspParameters:=WspParameters)
    MakePathValid(sDir & gstrFileSeparator & "a.txt")
    GetDefaultDir = GetShortName(sDir)
    If StringEmpty(GetDefaultDir) Then
        GetDefaultDir = App.Path
    End If

End Function

```

```

Public Sub AddArrayElement(ByRef arrNodes() As Object, _
    ByVal objToAdd As Object, _
    ByRef lngCount As Long)
    ' Adds the passed in object to the array

    On Error GoTo AddArrayElementErr

    ' Increase the array dimension and add the object to it
    ReDim Preserve arrNodes(lngCount)
    Set arrNodes(lngCount) = objToAdd
    lngCount = lngCount + 1

Exit Sub

AddArrayElementErr:
    LogErrors Errors
    gstrSource = mstrModuleName & "AddArrayElement"
    On Error GoTo 0
    Err.Raise vbObjectError + errAddArrayElementFailed, _
        gstrSource, _
        LoadResString(errAddArrayElementFailed)

End Sub

Public Function CheckForNullField(rstRecords As Recordset, strFieldName
As String) As String

    ' Returns an empty string if a given field is null
    On Error GoTo CheckForNullFieldErr

    If IsNull(rstRecords.Fields(strFieldName)) Then
        CheckForNullField = gstrEmptyString
    Else
        CheckForNullField = rstRecords.Fields(strFieldName)
    End If
    Exit Function

CheckForNullFieldErr:
    Call LogErrors(Errors)
    On Error GoTo 0
    Err.Raise vbObjectError + errCheckForNullFieldFailed, _
        mstrModuleName & "CheckForNullField", _
        LoadResString(errCheckForNullFieldFailed)

End Function

Public Function ErrorOnNullField(rstRecords As Recordset, strFieldName
As String) As Variant

    ' If a given field is null, raises an error
    ' Else, returns the field value in a variant
    ' The calling function must convert the return value to the
    ' appropriate type
    On Error GoTo ErrorOnNullFieldErr
    gstrSource = mstrModuleName & "ErrorOnNullField"

```

```

    If IsNull(rstRecords.Fields(strFieldName)) Then
        On Error GoTo 0
        Err.Raise vbObjectError + errMandatoryFieldNull, _
            gstrSource, _
            strFieldName & mintDelimiter &
            LoadResString(errMandatoryFieldNull)
    Else
        ErrorOnNullField = rstRecords.Fields(strFieldName)
    End If
    Exit Function

ErrorOnNullFieldErr:
    Call LogErrors(Errors)
    On Error GoTo 0
    Err.Raise vbObjectError + errUnableToCheckNull, _
        gstrSource, _
        strFieldName & mintDelimiter &
        LoadResString(errUnableToCheckNull)

End Function

Public Function StringEmpty(strCheckString As String) As Boolean

    StringEmpty = (strCheckString = gstrEmptyString)

End Function

Public Function GetIteratorValue(cStepIterators As cRunColIt, _
    ByVal strItName As String)

    Dim lngIndex As Long
    Dim strValue As String

    On Error GoTo GetIteratorValueErr
    gstrSource = mstrModuleName & "GetIteratorValue"

    ' Find the iterator in the Iterators collection
    For lngIndex = 0 To cStepIterators.Count - 1
        If cStepIterators(lngIndex).IteratorName = strItName Then
            strValue = cStepIterators(lngIndex).Value
            Exit For
        End If
    Next lngIndex

    If lngIndex > cStepIterators.Count - 1 Then
        ' The iterator has not been defined for the branch
        ' Raise an error
        On Error GoTo 0
        Err.Raise vbObjectError + errParamNameInvalid, _
            gstrSource, _
            LoadResString(errParamNameInvalid)
    End If

    GetIteratorValue = strValue
    Exit Function

GetIteratorValueErr:

```

```

' Log the error code raised by Visual Basic
Call LogErrors(Errors)
gstrSource = mstrModuleName & "GetIteratorValue"
On Error GoTo 0
Err.Raise vbObjectError + errGetParamValueFailed, _
    gstrSource, _
    LoadResString(errGetParamValueFailed)

End Function
Public Function SubstituteParameters(ByVal strComString As String, _
    ByVal lngWorkspaceId As Long, _
    Optional StepIterators As cRunColIt = Nothing, _
    Optional WspParameters As cArrParameters = Nothing) As String
' This function substitutes all parameter names and
' environment variables in the passed in string with
' their values. It also substitutes the value for the
' iterators, if any.
' Since the syntax is to enclose parameter names and
' environment variables in "%", we check if a given
' variable is a parameter - if so, we substitute the
' parameter value - else we try to get the value from
' the environment

Dim intPos As Integer
Dim intEndPos As Integer
Dim strEnvVariable As String
Dim strValue As String
Dim strCommand As String
Dim cTempStr As cStringSM

' Initialize the return value of the function to the
' passed in command
strCommand = strComString

If WspParameters Is Nothing Then Set WspParameters = gcParameters

Set cTempStr = New cStringSM

intPos = InStr(strCommand, gstrEnvVarSeparator)
Do While intPos <> 0
    If Mid(strCommand, intPos + 1, 1) = gstrEnvVarSeparator Then
        ' Wildcard character - to be substituted by a single % -
        later!
        intPos = intPos + 2
        If intPos > Len(strCommand) Then Exit Do
    Else
        ' Extract the environment variable from the passed
        ' in string
        intEndPos = InStr(intPos + 1, strCommand,
gstrEnvVarSeparator)

        If intEndPos > 0 Then
            strEnvVariable = Mid(strCommand, intPos + 1, intEndPos -
intPos - 1)
        Else
            On Error GoTo 0

```

```

Err.Raise vbObjectError + errParamSeparatorMissing, _
    gstrSource, _
    LoadResString(errParamSeparatorMissing)

End If
strValue = gstrEmptyString

' Get the value of the variable and call a function
' to replace the variable with it's value
strValue = GetValue(strEnvVariable, lngWorkspaceId,
StepIterators, WspParameters)
' The function raises an error if the variable is
' not found
strCommand = cTempStr.ReplaceSubString(strCommand, _
    gstrEnvVarSeparator & strEnvVariable &
gstrEnvVarSeparator, _
    strValue)

End If

intPos = InStr(intPos, strCommand, gstrEnvVarSeparator)
Loop

strCommand = cTempStr.ReplaceSubString(strCommand, _
    gstrEnvVarSeparator & gstrEnvVarSeparator,
gstrEnvVarSeparator)

Set cTempStr = Nothing
SubstituteParameters = strCommand

End Function
Private Function GetValue(ByVal strParameter As String, _
    ByVal lngWorkspaceId As Long, _
    cStepIterators As cRunColIt, _
    WspParameters As cArrParameters) As String
' This function returns the value for the passed in
' parameter - it may be a workspace parameter, an
' environment variable or an iterator

Dim intPos As Integer
Dim intEndPos As Integer
Dim strVariable As String
Dim strValue As String
Dim cParamRec As cParameter

On Error GoTo GetValueErr

' Initialize the return value of the function to the
' empty
strValue = gstrEmptyString

intPos = InStr(strParameter, gstrEnvVarSeparator)
If intPos > 0 Then
    ' Extract the variable from the passed in string
    intEndPos = InStr(intPos + 1, strParameter, gstrEnvVarSeparator)
    If intEndPos = 0 Then
        intEndPos = Len(strParameter)
    End If

```

```

    strVariable = Mid(strParameter, intPos + 1, intEndPos - intPos -
1)
Else
' The separator character has not been passed in -
' try to find the value of the passed in parameter
strVariable = strParameter
End If

If Not StringEmpty(strVariable) Then
' Check if this is the timestamp parameter first
If strVariable = gstrTimeStamp Then
    strValue = Format$(Now, mstrFormatString, _
        vbUseSystemDayOfWeek, vbUseSystem)
Else
' Try to find a parameter for the workspace with
' the same name
Set cParamRec =
WspParameters.GetParameterValue(lngWorkspaceId, _
    strVariable)
If cParamRec Is Nothing Then
    If Not cStepIterators Is Nothing Then
        ' If the string is not a parameter, then check
        ' if it is an iterator
        strValue = GetIteratorValue(cStepIterators,
strVariable)
    End If

    If StringEmpty(strValue) Then
        ' Neither - Check if it is an environment variable
        strValue = Environ$(strVariable)
        If StringEmpty(strValue) Then
            On Error GoTo 0
            WriteError errSubValuesFailed, _
                OptArgs:="Invalid parameter: " & gstrSQ
& strVariable & gstrSQ
            Err.Raise vbObjectError + errSubValuesFailed, _
                mstrModuleName & "GetValue", _
                LoadResString(errSubValuesFailed) &
"Invalid parameter: " & gstrSQ & strVariable & gstrSQ
        End If
    End If
Else
    strValue = cParamRec.ParameterValue
End If
End If

GetValue = strValue

Exit Function

GetValueErr:
If Err.Number = vbObjectError + errParamNameInvalid Then
' If the parameter has not been defined for the
' workspace then check if it is an environment

```

```

' variable
Resume Next
End If

' Log the error code raised by Visual Basic
Call LogErrors(Errors)
gstrSource = mstrModuleName & "GetValue"
WriteError errSubValuesFailed, gstrSource, "Parameter: " & gstrSQ &
strVariable & gstrSQ
On Error GoTo 0
Err.Raise vbObjectError + errSubValuesFailed, _
    gstrSource, _
    LoadResString(errSubValuesFailed) & "Parameter: " & gstrSQ &
strVariable & gstrSQ

End Function

Public Function SQLFixup(strField As String) As String
' Returns a string that can be executed by SQL Server

Dim cMyStr As New cStringSM
Dim strTemp As String

On Error GoTo SQLFixupErr

strTemp = strField
SQLFixup = strTemp

' Single-quotes have to be replaced by two single-quotes,
' since a single-quote is the identifier delimiter
' character - call a procedure to do the replace
SQLFixup = cMyStr.ReplaceSubString(strTemp, gstrDQ, "\" & gstrDQ)

' Replace pipe characters with the corresponding chr function
' SQLFixup = cMyStr.ReplaceSubString(strTemp, gstrDQ, gstrDQ &
gstrDQ)

Exit Function

SQLFixupErr:
gstrSource = mstrModuleName & "SQLFixup"
LogErrors Errors
On Error GoTo 0
Err.Raise vbObjectError + errMakeFieldValidFailed, _
    gstrSource, LoadResString(errMakeFieldValidFailed)

End Function

Public Function TranslateStepLabel(sLabel As String) As String
' Translates the passed in step label to a valid file name
' All characters in the label that are invalid for filenames (viz.
\ / : * ? " < > |)
' and spaces are substituted with underscores - also ensure that the
resulting filename
' is not greater than 255 characters
Dim cTempStr As New cStringSM
TranslateStepLabel = cTempStr.ReplaceSubString(sLabel,
gstrFileSeparator, "_")

```

```

    TranslateStepLabel = cTempStr.ReplaceSubString(TranslateStepLabel,
"/", gstrUnderscore)
    TranslateStepLabel = cTempStr.ReplaceSubString(TranslateStepLabel,
":", gstrUnderscore)
    TranslateStepLabel = cTempStr.ReplaceSubString(TranslateStepLabel,
"*", gstrUnderscore)
    TranslateStepLabel = cTempStr.ReplaceSubString(TranslateStepLabel,
"?", gstrUnderscore)
    TranslateStepLabel = cTempStr.ReplaceSubString(TranslateStepLabel,
gstrDQ, gstrUnderscore)
    TranslateStepLabel = cTempStr.ReplaceSubString(TranslateStepLabel,
"<", gstrUnderscore)
    TranslateStepLabel = cTempStr.ReplaceSubString(TranslateStepLabel,
">", gstrUnderscore)
    TranslateStepLabel = cTempStr.ReplaceSubString(TranslateStepLabel,
"|", gstrUnderscore)
    TranslateStepLabel = cTempStr.ReplaceSubString(TranslateStepLabel,
gstrBlank, gstrUnderscore)

' Commas are substituted with underscores since the command shell
uses a comma to
' delimit commands
    TranslateStepLabel = cTempStr.ReplaceSubString(TranslateStepLabel,
",", gstrUnderscore)

    If Len(TranslateStepLabel) > MAX_PATH Then
        TranslateStepLabel = Mid(TranslateStepLabel, 1, MAX_PATH)
    End If

End Function

Public Function TypeOfObject(ByVal objNode As Object) As Integer
' Determines the type of object that is passed in

On Error GoTo TypeOfObjectErr
gstrSource = mstrModuleName & "TypeOfObject"

Select Case TypeName(objNode)
    Case "cWorkspace"
        TypeOfObject = gintWorkspace

    Case "cParameter"
        TypeOfObject = gintParameter

    Case "cConnection"
        TypeOfObject = gintParameterConnect

    Case "cConnDtl"
        TypeOfObject = gintConnectionDtl

    Case "cGlobalStep"
        TypeOfObject = gintGlobalStep

    Case "cManager"
        TypeOfObject = gintManagerStep

```

```

Case "cWorker"
    TypeOfObject = gintWorkerStep

Case "cStep"
' If a step record is passed in, call a function
' to determine the type of step
    TypeOfObject = TypeOfStep(StepClass:=objNode)

Case Else
    WriteError errTypeOfObjectFailed, gstrSource, _
        TypeName(objNode)
    On Error GoTo 0
    Err.Raise vbObjectError + errTypeOfObjectFailed, _
        gstrSource, _
        LoadResString(errTypeOfObjectFailed)

End Select

Exit Function

TypeOfObjectErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
On Error GoTo 0
Err.Raise vbObjectError + errTypeOfObjectFailed, _
    gstrSource, _
    LoadResString(errTypeOfObjectFailed)

```

End Function

## ConnDtlCommon.bas

```

Attribute VB_Name = "ConnDtlCommon"
' FILE:      ConnDtlCommon.bas
'            Microsoft TPC-H Kit Ver. 1.00
'            Copyright Microsoft, 1999
'            All Rights Reserved
'
'
' PURPOSE:   Contains functionality common across StepMaster and
'            SMRunOnly, pertaining to connections
'            Specifically, functions to load connections in an array
'            and so on.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

' Used to indicate the source module name when errors
' are raised by this module
Private Const mstrModuleName As String = "ConnDtlCommon."

Public Sub LoadRSInConnDtlArray(rstConns As Recordset, cConns As
cConnDtls)

    Dim cNewConnDtl As cConnDtl

    On Error GoTo LoadRSInConnDtlArrayErr

```

```

If rstConns.RecordCount = 0 Then
    Exit Sub
End If

rstConns.MoveFirst
While Not rstConns.EOF

    Set cNewConnDtl = New cConnDtl

    ' Initialize ConnDtl values
    ' Call a procedure to raise an error if mandatory fields are
null.
    cNewConnDtl.ConnNameId = ErrorOnNullField(rstConns,
FLD_ID_CONN_NAME)
    cNewConnDtl.WorkspaceId = ErrorOnNullField(rstConns,
FLD_ID_WORKSPACE)
    cNewConnDtl.ConnName = CStr(ErrorOnNullField(rstConns,
FLD_CONN_DTL_CONNECTION_NAME))
    cNewConnDtl.ConnectionString = CheckForNullField(rstConns,
FLD_CONN_DTL_CONNECTION_STRING)
    cNewConnDtl.ConnType = CheckForNullField(rstConns,
FLD_CONN_DTL_CONNECTION_TYPE)

    cConns.Load cNewConnDtl

    Set cNewConnDtl = Nothing
    rstConns.MoveNext
Wend

Exit Sub

LoadRSInConnDtlArrayErr:
    LogErrors Errors
    gstrSource = mstrModuleName & "LoadRSInConnDtlArray"
    On Error GoTo 0
    Err.Raise vbObjectError + errLoadRsInArrayFailed, gstrSource, _
        LoadResString(errLoadRsInArrayFailed)
End Sub

```

## ConnectionCommon.bas

```

Attribute VB_Name = "ConnectionCommon"
' FILE:      ConnectionCommon.bas
'            Microsoft TPC-H Kit Ver. 1.00
'            Copyright Microsoft, 1999
'            All Rights Reserved
'
' PURPOSE:   Contains functionality common across StepMaster and
'            SMRunOnly, pertaining to connection strings
'            Specifically, functions to load connections strings
'            in an array and so on.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

```

```

' Used to indicate the source module name when errors
' are raised by this module
Private Const mstrModuleName As String = "ConnectionCommon."

Public Sub LoadRecordsetInConnectionArray(rstConns As Recordset, cConns
As cConnections)

    Dim cNewConnection As cConnection

    On Error GoTo LoadRecordsetInConnectionArrayErr

    If rstConns.RecordCount = 0 Then
        Exit Sub
    End If

    rstConns.MoveFirst
    While Not rstConns.EOF

        Set cNewConnection = New cConnection

        ' Initialize Connection values
        ' Call a procedure to raise an error if mandatory fields are
null.
        cNewConnection.ConnectionId = ErrorOnNullField(rstConns,
"connection_id")
        cNewConnection.WorkspaceId = CStr(ErrorOnNullField(rstConns,
FLD_ID_WORKSPACE))
        cNewConnection.ConnectionName = CStr(ErrorOnNullField(rstConns,
"connection_name"))
        cNewConnection.ConnectionValue = CheckForNullField(rstConns,
"connection_value")
        cNewConnection.Description = CheckForNullField(rstConns,
"description")

        cNewConnection.NoCountDisplay = CheckForNullField(rstConns,
"no_count_display")
        cNewConnection.NoExecute = CheckForNullField(rstConns,
"no_execute")
        cNewConnection.ParseQueryOnly = CheckForNullField(rstConns,
"parse_query_only")
        cNewConnection.QuotedIdentifiers = CheckForNullField(rstConns,
"ANSI_quoted_identifiers")
        cNewConnection.AnsiNulls = CheckForNullField(rstConns,
"ANSI_nulls")
        cNewConnection.ShowQueryPlan = CheckForNullField(rstConns,
"show_query_plan")
        cNewConnection.ShowStatsTime = CheckForNullField(rstConns,
"show_stats_time")
        cNewConnection.ShowStatsIO = CheckForNullField(rstConns,
"show_stats_io")
        cNewConnection.ParseOdbcMsg = CheckForNullField(rstConns,
"parse_odbc_msg_prefixes")
        cNewConnection.RowCount = CheckForNullField(rstConns,
"row_count")

```

```

        cNewConnection.TsqlBatchSeparator = CheckForNullField(rstConns,
"tsql_batch_separator")
        cNewConnection.QueryTimeout = CheckForNullField(rstConns,
"query_time_out")
        cNewConnection.ServerLanguage = CheckForNullField(rstConns,
"server_language")
        cNewConnection.CharacterTranslation = CheckForNullField(rstConns,
"character_translation")
        cNewConnection.RegionalSettings = CheckForNullField(rstConns,
"regional_settings")

        cConns.Load cNewConnection

        Set cNewConnection = Nothing
        rstConns.MoveNext
    Wend

Exit Sub

LoadRecordsetInConnectionArrayErr:
    LogErrors Errors
    gstrSource = mstrModuleName & "LoadRecordsetInConnectionArray"
    On Error GoTo 0
    Err.Raise vbObjectError + errLoadRsInArrayFailed, gstrSource, _
        LoadResString(errLoadRsInArrayFailed)
End Sub

```

## cParameter.cls

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cParameter"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:      cParameter.cls
'            Microsoft TPC-H Kit Ver. 1.00
'            Copyright Microsoft, 1999
'            All Rights Reserved
'
' PURPOSE:   Encapsulates the properties and methods of a parameter.
'            Contains functions to insert, update and delete
'            workspace_parameters records from the database.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit
Option Base 0

' Local variable(s) to hold property value(s)
Private mlngWorkspaceId As Long
Private mlngParameterId As Long
Private mstrParameterName As String

```

```

Private mstrParameterValue As String
Private mstrDescription As String
Private mintParameterType As Integer
Private mdbStepMaster As Database
Private mintOperation As Operation
Private mlngPosition As Long

' Used to indicate the source module name when errors
' are raised by this class
Private mstrSource As String
Private Const mstrModuleName As String = "cParameter."

' The cSequence class is used to generate unique parameter identifiers
Private mParameterSeq As cSequence

' The StringSM class is used to carry out string operations
Private mFieldValue As cStringSM

' Parameter types
Public Enum ParameterType
    gintParameterGeneric = 0
    gintParameterConnect
    gintParameterApplication
    gintParameterBuiltIn
End Enum

Private Sub AssignParameters(qyExec As DAO.QueryDef)
' Assigns values to the parameters in the querydef object
' The parameter names are cryptic to make them different
' from the field names. When the parameter names are
' the same as the field names, parameters in the where
' clause do not get created.

Dim prmParam As DAO.Parameter

On Error GoTo AssignParametersErr

For Each prmParam In qyExec.Parameters
    Select Case prmParam.Name
        Case "[w_id]"
            prmParam.Value = mlngWorkspaceId

        Case "[p_id]"
            prmParam.Value = mlngParameterId

        Case "[p_name]"
            prmParam.Value = mstrParameterName

        Case "[p_value]"
            prmParam.Value = mstrParameterValue

        Case "[desc]"
            prmParam.Value = mstrDescription

        Case "[p_type]"

```



```

        prmParam.Value = mintParameterType

    Case Else
        ' Write the parameter name that is faulty
        WriteError errInvalidParameter, mstrSource, _
            prmParam.Name
        On Error GoTo 0
        Err.Raise errInvalidParameter, mstrModuleName &
"AssignParameters", _
            LoadResString(errInvalidParameter)
    End Select
Next prmParam

'   qyExec.Parameters("w_id").Value = mlngWorkspaceId
'   qyExec.Parameters("p_id").Value = mlngParameterId
'   qyExec.Parameters("p_name").Value = mstrParameterName
'   qyExec.Parameters("p_value").Value = mstrParameterValue
'
Exit Sub

AssignParametersErr:

    mstrSource = mstrModuleName & "AssignParameters"
    Call LogErrors(Errors)
    On Error GoTo 0
    Err.Raise vbObjectError + errAssignParametersFailed, _
        mstrSource, LoadResString(errAssignParametersFailed)

End Sub

Public Property Let Position(ByVal RHS As Long)

    mlngPosition = RHS

End Property

Public Property Get Position() As Long

    Position = mlngPosition

End Property

Public Function Clone() As cParameter

    ' Creates a copy of a given parameter

    Dim cCloneParam As cParameter

    On Error GoTo CloneErr
    mstrSource = mstrModuleName & "Clone"

    Set cCloneParam = New cParameter

    ' Copy all the parameter properties to the newly
    ' created parameter

```

```

    Set cCloneParam.NodeDB = mdbStepMaster
    cCloneParam.WorkspaceId = mlngWorkspaceId
    cCloneParam.ParameterId = mlngParameterId
    cCloneParam.ParameterName = mstrParameterName
    cCloneParam.ParameterValue = mstrParameterValue
    cCloneParam.Description = mstrDescription
    cCloneParam.ParameterType = mintParameterType
    cCloneParam.IndOperation = mintOperation
    cCloneParam.Position = mlngPosition

    ' And set the return value to the newly created parameter
    Set Clone = cCloneParam
    Set cCloneParam = Nothing

Exit Function

CloneErr:
    LogErrors Errors
    mstrSource = mstrModuleName & "Clone"
    On Error GoTo 0
    Err.Raise vbObjectError + errCloneFailed, _
        mstrSource, LoadResString(errCloneFailed)

End Function

Public Property Set NodeDB(vdata As Database)

    Set mdbStepMaster = vdata

End Property

Public Property Get NodeDB() As Database

    Set NodeDB = mdbStepMaster

End Property

Private Sub CheckDupParameterName()
    ' Check if the parameter name already exists in the workspace

    Dim rstParameter As Recordset
    Dim strSql As String
    Dim qy As DAO.QueryDef

    On Error GoTo CheckDupParameterNameErr
    mstrSource = mstrModuleName & "CheckDupParameterName"

    ' Create a recordset object to retrieve the count of all parameters
    ' for the workspace with the same name
    strSql = "Select count(*) as parameter_count " & _
        " from workspace_parameters " & _
        " where workspace_id = [w_id]" & _
        " and parameter_name = [p_name]" & _
        " and parameter_id <> [p_id]"

    Set qy = mdbStepMaster.CreateQueryDef(gstrEmptyString, strSql)
    Call AssignParameters(qy)

```

```

Set rstParameter = qy.OpenRecordset(dbOpenForwardOnly)

If rstParameter![parameter_count] > 0 Then
    rstParameter.Close
    qy.Close
    ShowError errDuplicateParameterName
    On Error GoTo 0
    Err.Raise vbObjectError + errDuplicateParameterName, _
        mstrSource, LoadResString(errDuplicateParameterName)
End If

rstParameter.Close
qy.Close

Exit Sub

CheckDupParameterNameErr:
LogErrors Errors
mstrSource = mstrModuleName & "CheckDupParameterName"
On Error GoTo 0
Err.Raise vbObjectError + errCheckDupParameterNameFailed, _
    mstrSource, LoadResString(errCheckDupParameterNameFailed)

End Sub
Private Sub CheckDB()
    ' Check if the database object has been initialized

    If mdbStepMaster Is Nothing Then
        On Error GoTo 0
        Err.Raise vbObjectError + errInvalidDB, _
            mstrModuleName & "CheckDB", LoadResString(errInvalidDB)
    End If

End Sub
Public Property Let ParameterValue(vdata As String)

    mstrParameterValue = vdata

End Property
Public Property Let Description(vdata As String)

    mstrDescription = vdata

End Property
Public Property Let ParameterType(vdata As ParameterType)

    mintParameterType = vdata

End Property

Public Property Let ParameterName(vdata As String)

    If vdata = gstrEmptyString Then

        ShowError errParameterNameMandatory
        On Error GoTo 0

        ' Propogate this error back to the caller
        Err.Raise vbObjectError + errParameterNameMandatory, _
            mstrSource, LoadResString(errParameterNameMandatory)
    Else
        mstrParameterName = vdata
    End If

End Property

Public Property Let ParameterId(vdata As Long)
    mlngParameterId = vdata
End Property

Public Property Let IndOperation(ByVal vdata As Operation)

    ' The valid operations are define in the cOperations
    ' class. Check if the operation is valid
    Select Case vdata
        Case QueryOp, InsertOp, UpdateOp, DeleteOp
            mintOperation = vdata

        Case Else
            On Error GoTo 0
            Err.Raise vbObjectError + errInvalidOperation, _
                mstrSource, LoadResString(errInvalidOperation)
    End Select

End Property

Public Sub Validate()
    ' Each distinct object will have a Validate method which
    ' will check if the class properties are valid. This method
    ' will be used to check interdependant properties that
    ' cannot be validated by the let procedures.
    ' It should be called by the add and modify methods of the class

    On Error GoTo ValidateErr

    ' Check if the db object is valid
    Call CheckDB

    ' Call procedure to raise an error if the parameter name
    ' already exists in the workspace -
    ' if there are duplicates, we don't know what value for the
    ' parameter to use at runtime
    Call CheckDupParameterName

Exit Sub

ValidateErr:

mstrSource = mstrModuleName & "Validate"
Call LogErrors(Errors)
On Error GoTo 0
Err.Raise vbObjectError + errValidateFailed, _
    mstrSource, LoadResString(errValidateFailed)

```

```

End Sub
Public Property Let WorkspaceId(vdata As Long)

    mlngWorkspaceId = vdata

End Property

Public Sub Add()

    Dim strInsert As String
    Dim qy As DAO.QueryDef

    On Error GoTo AddErr

    ' Validate the record before trying to insert the record
    Call Validate

    ' Create a temporary querydef object
    strInsert = "insert into workspace_parameters " & _
        "( workspace_id, parameter_id, " & _
        " parameter_name, parameter_value, " & _
        " description, parameter_type ) " & _
        " values ( [w_id], [p_id], [p_name], [p_value], [desc],
[p_type] ) "
    Set qy = mdbaStepMaster.CreateQueryDef(gstrEmptyString, strInsert)

    ' Call a procedure to assign the parameter values
    Call AssignParameters(qy)

    qy.Execute dbFailOnError
    qy.Close

    '
    strInsert = "insert into workspace_parameters " & _
    '
    '      "( workspace_id, parameter_id, " & _
    '      " parameter_name, parameter_value ) " & _
    '      " values ( " & _
    '      Str(mlngWorkspaceId) & ", " & Str(mlngParameterId) & _
    '      ", " & mFieldValve.MakeStringFieldValid(mstrParameterName)
    & _
    '      ", " & mFieldValve.MakeStringFieldValid(mstrParameterValue)
    & " ) "
    '
    mdbaStepMaster.Execute strInsert, dbFailOnError + dbSQLPassThrough

    Exit Sub

AddErr:

    mstrSource = mstrModuleName & "Add"
    Call LogErrors(Errors)
    On Error GoTo 0
    Err.Raise vbObjectError + errParameterInsertFailed, _
        mstrSource, LoadResString(errParameterInsertFailed)

End Sub
Public Sub Delete()

```

```

Dim strDelete As String
Dim qy As DAO.QueryDef

On Error GoTo DeleteErr

' Check if the db object is valid
Call CheckDB

strDelete = "delete from workspace_parameters " & _
    " where parameter_id = [p_id]"
Set qy = mdbaStepMaster.CreateQueryDef(gstrEmptyString, strDelete)

Call AssignParameters(qy)
qy.Execute dbFailOnError

qy.Close

Exit Sub

DeleteErr:
LogErrors Errors
mstrSource = mstrModuleName & "Delete"
On Error GoTo 0
Err.Raise vbObjectError + errDeleteParameterFailed, _
    mstrSource, _
    LoadResString(errDeleteParameterFailed)

End Sub

Public Sub Modify()

    Dim strUpdate As String
    Dim qy As QueryDef

    On Error GoTo ModifyErr

    ' Validate the updated values before trying to modify the db
    Call Validate

    ' Create a temporary querydef object with the modify string
    strUpdate = "update workspace_parameters " & _
        " set workspace_id = [w_id], " & _
        " parameter_name = [p_name], " & _
        " parameter_value = [p_value], " & _
        " description = [desc], " & _
        " parameter_type = [p_type] " & _
        " where parameter_id = [p_id]"
    Set qy = mdbaStepMaster.CreateQueryDef(gstrEmptyString, strUpdate)

    ' Call a procedure to assign the parameter values to the
    ' querydef object
    Call AssignParameters(qy)
    qy.Execute dbFailOnError

    qy.Close

```

```

'     mdfsStepMaster.Execute strUpdate, dbFailOnError
'
Exit Sub

ModifyErr:

mstrSource = mstrModuleName & "Modify"
Call LogErrors(Errors)
On Error GoTo 0
Err.Raise vbObjectError + errParameterUpdateFailed, _
    mstrSource, LoadResString(errParameterUpdateFailed)

End Sub
Public Property Get ParameterName() As String

    ParameterName = mstrParameterName

End Property

Public Property Get ParameterId() As Long

    ParameterId = lngParameterId

End Property
Public Property Get NextIdentifier() As Long

    Dim lngNextId As Long

    On Error GoTo NextIdentifierErr

    ' First check if the database object is valid
    Call CheckDB

    ' Retrieve the next identifier using the sequence class
    Set mParameterSeq = New cSequence
    Set mParameterSeq.IdDatabase = mdfsStepMaster
    mParameterSeq.IdentifierColumn = FLD_ID_PARAMETER
    lngNextId = mParameterSeq.Identifier
    Set mParameterSeq = Nothing

    NextIdentifier = lngNextId
Exit Property

NextIdentifierErr:
LogErrors Errors
mstrSource = mstrModuleName & "NextIdentifier"
On Error GoTo 0
Err.Raise vbObjectError + errIdGetFailed, _
    mstrSource, LoadResString(errIdGetFailed)

End Property
Public Property Get IndOperation() As Operation

    IndOperation = mintOperation

End Property

```

```

Public Property Get WorkspaceId() As Long

    WorkspaceId = lngWorkspaceId

End Property

Public Property Get ParameterValue() As String

    ParameterValue = mstrParameterValue

End Property
Public Property Get Description() As String

    Description = mstrDescription

End Property
Public Property Get ParameterType() As ParameterType

    ParameterType = mintParameterType

End Property

Private Sub Class_Initialize()

    Set mFieldValue = New cStringSM

    ' Initialize the operation indicator variable to Query
    ' It will be modified later by the collection class when
    ' inserts, updates or deletes are performed
    mintOperation = QueryOp

End Sub

Private Sub Class_Terminate()

    Set mdfsStepMaster = Nothing
    Set mFieldValue = Nothing

End Sub

```

### **cRunCollt.cls**

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cRunColIt"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:      cRunColIt.cls
'           Microsoft TPC-H Kit Ver. 1.00
'           Copyright Microsoft, 1999

```

```

'           All Rights Reserved
'
'
' PURPOSE:   This module implements a stack of Iterator nodes.
'           Ensures that only cRunItNode objects are stored in the
stack.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

' Used to indicate the source module name when errors
' are raised by this class
Private Const mstrModuleName As String = "cRunColIt."
Private mstrSource As String

Private mcIterators As cStack
Public Sub Clear()

    mcIterators.Clear

End Sub

Private Sub Class_Initialize()

    Set mcIterators = New cStack

End Sub

Private Sub Class_Terminate()

    Set mcIterators = Nothing

End Sub

Public Function Value(strItName As String) As String

    Dim lngIndex As Long

    For lngIndex = 0 To mcIterators.Count - 1
        If mcIterators(lngIndex).IteratorName = strItName Then
            Value = mcIterators(lngIndex).Value
            Exit For
        End If
    Next lngIndex

End Function

Public Property Get Item(ByVal Position As Long) As cRunItNode
Attribute Item.VB_UserMemId = 0

    Set Item = mcIterators(Position)

End Property

```

```

Public Function Count() As Long

    Count = mcIterators.Count

End Function

Public Function Pop() As cRunItNode

    Set Pop = mcIterators.Pop

End Function

Public Sub Push(objToPush As cRunItNode)

    Call mcIterators.Push(objToPush)

End Sub

```

### **cRunInst.cls**

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
    Persistable = 0 'NotPersistable
    DataBindingBehavior = 0 'vbNone
    DataSourceBehavior = 0 'vbNone
    MTSTransactionMode = 0 'NotAnMTSObject
END
Attribute VB_Name = "cRunInst"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:           cRunColIt.cls
'                 Microsoft TPC-H Kit Ver. 1.00
'                 Copyright Microsoft, 1999
'                 All Rights Reserved
'
' PURPOSE:       This module controls the run processing. It runs a
'                 branch
'                 at a time and raises events when each step completes
'                 execution.
' Contact:       Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

' Used to indicate the source module name when errors
' are raised by this class
Private Const mstrModuleName As String = "cRunInst."
Private mstrSource As String

' Local variable(s) to hold property value(s)
Private mstrRootKey As String
Public WspId As Long

```

```

Private mcParameters As cArrParameters
Private mcRunSteps As cArrSteps
Private mcRunConstraints As cArrConstraints
Public RunConnections As cConnections
Public RunConnDtIs As cConnDtIs
Private mcvntWspPreCons As Variant
Private mcvntWspPostCons As Variant
Private mcNavSteps As cStepTree

Private mcInstances As cInstances
Private mcFreeSteps As cVectorLng
Private mcFailures As cFailedSteps
Private mblnAsk As Boolean ' Set to True when the a step with
continuation criteria=Ask fails
Private mblnAbort As Boolean ' Set to True when the run is aborted
Private msAbortDtIs As String
Private mbarrFree() As Byte
Private WithEvents mcTermSteps As cTermSteps
Attribute mcTermSteps.VB_VarHelpID = -1
Public RunId As Long
Public CreateInputFiles As Boolean

Private Enum WspLogEvents
    mintRunStart
    mintRunComplete
    mintStepStart
    mintStepComplete
End Enum

Private mcWspLog As cFileSM

Private mstrCurBranchRoot As String
Private mcDummyRootInstance As cInstance

' Key for the dummy root instance - Should be a key that is invalid for
an actual step record
Private Const mstrDummyRootKey As String = "D"

' Public events to notify the calling function of the
' start and end time for each step
Public Event RunStart(dtmStartTime As Currency, strWspLog As String)
Public Event RunComplete(dtmEndTime As Currency)
Public Event StepStart(cStepRecord As cStep, dtmStartTime As Currency, _
    lngInstanceId As Long, lParentInstanceId As Long, sPath As
String, _
    sIts As String, sItValue As String)
Public Event StepComplete(cStepRecord As cStep, dtmEndTime As Currency,
lngInstanceId As Long, lElapsed As Long)
Public Event ProcessStart(cStepRecord As cStep, strCommand As String, _
    dtmStartTime As Currency, lngInstanceId As Long,
lParentInstanceId As Long, _
    sItValue As String)
Public Event ProcessComplete(cStepRecord As cStep, dtmEndTime As
Currency, lngInstanceId As Long, lElapsed As Long)

' The class that will execute each step - we trap the events

```

```

' that are raised by it when a step starts/completes
' execution
Private WithEvents cExecStep1 As cRunStep
Attribute cExecStep1.VB_VarHelpID = -1
Private WithEvents cExecStep2 As cRunStep
Attribute cExecStep2.VB_VarHelpID = -1
Private WithEvents cExecStep3 As cRunStep
Attribute cExecStep3.VB_VarHelpID = -1
Private WithEvents cExecStep4 As cRunStep
Attribute cExecStep4.VB_VarHelpID = -1
Private WithEvents cExecStep5 As cRunStep
Attribute cExecStep5.VB_VarHelpID = -1
Private WithEvents cExecStep6 As cRunStep
Attribute cExecStep6.VB_VarHelpID = -1
Private WithEvents cExecStep7 As cRunStep
Attribute cExecStep7.VB_VarHelpID = -1
Private WithEvents cExecStep8 As cRunStep
Attribute cExecStep8.VB_VarHelpID = -1
Private WithEvents cExecStep9 As cRunStep
Attribute cExecStep9.VB_VarHelpID = -1

Private WithEvents cExecStep10 As cRunStep
Attribute cExecStep10.VB_VarHelpID = -1
Private WithEvents cExecStep11 As cRunStep
Attribute cExecStep11.VB_VarHelpID = -1
Private WithEvents cExecStep12 As cRunStep
Attribute cExecStep12.VB_VarHelpID = -1
Private WithEvents cExecStep13 As cRunStep
Attribute cExecStep13.VB_VarHelpID = -1
Private WithEvents cExecStep14 As cRunStep
Attribute cExecStep14.VB_VarHelpID = -1
Private WithEvents cExecStep15 As cRunStep
Attribute cExecStep15.VB_VarHelpID = -1
Private WithEvents cExecStep16 As cRunStep
Attribute cExecStep16.VB_VarHelpID = -1
Private WithEvents cExecStep17 As cRunStep
Attribute cExecStep17.VB_VarHelpID = -1
Private WithEvents cExecStep18 As cRunStep
Attribute cExecStep18.VB_VarHelpID = -1
Private WithEvents cExecStep19 As cRunStep
Attribute cExecStep19.VB_VarHelpID = -1

Private WithEvents cExecStep20 As cRunStep
Attribute cExecStep20.VB_VarHelpID = -1
Private WithEvents cExecStep21 As cRunStep
Attribute cExecStep21.VB_VarHelpID = -1
Private WithEvents cExecStep22 As cRunStep
Attribute cExecStep22.VB_VarHelpID = -1
Private WithEvents cExecStep23 As cRunStep
Attribute cExecStep23.VB_VarHelpID = -1
Private WithEvents cExecStep24 As cRunStep
Attribute cExecStep24.VB_VarHelpID = -1
Private WithEvents cExecStep25 As cRunStep
Attribute cExecStep25.VB_VarHelpID = -1
Private WithEvents cExecStep26 As cRunStep
Attribute cExecStep26.VB_VarHelpID = -1

```



```

Private WithEvents cExecStep80 As cRunStep
Attribute cExecStep80.VB_VarHelpID = -1
Private WithEvents cExecStep81 As cRunStep
Attribute cExecStep81.VB_VarHelpID = -1
Private WithEvents cExecStep82 As cRunStep
Attribute cExecStep82.VB_VarHelpID = -1
Private WithEvents cExecStep83 As cRunStep
Attribute cExecStep83.VB_VarHelpID = -1
Private WithEvents cExecStep84 As cRunStep
Attribute cExecStep84.VB_VarHelpID = -1
Private WithEvents cExecStep85 As cRunStep
Attribute cExecStep85.VB_VarHelpID = -1
Private WithEvents cExecStep86 As cRunStep
Attribute cExecStep86.VB_VarHelpID = -1
Private WithEvents cExecStep87 As cRunStep
Attribute cExecStep87.VB_VarHelpID = -1
Private WithEvents cExecStep88 As cRunStep
Attribute cExecStep88.VB_VarHelpID = -1
Private WithEvents cExecStep89 As cRunStep
Attribute cExecStep89.VB_VarHelpID = -1

Private WithEvents cExecStep90 As cRunStep
Attribute cExecStep90.VB_VarHelpID = -1
Private WithEvents cExecStep91 As cRunStep
Attribute cExecStep91.VB_VarHelpID = -1
Private WithEvents cExecStep92 As cRunStep
Attribute cExecStep92.VB_VarHelpID = -1
Private WithEvents cExecStep93 As cRunStep
Attribute cExecStep93.VB_VarHelpID = -1
Private WithEvents cExecStep94 As cRunStep
Attribute cExecStep94.VB_VarHelpID = -1
Private WithEvents cExecStep95 As cRunStep
Attribute cExecStep95.VB_VarHelpID = -1
Private WithEvents cExecStep96 As cRunStep
Attribute cExecStep96.VB_VarHelpID = -1
Private WithEvents cExecStep97 As cRunStep
Attribute cExecStep97.VB_VarHelpID = -1
Private WithEvents cExecStep98 As cRunStep
Attribute cExecStep98.VB_VarHelpID = -1
Private WithEvents cExecStep99 As cRunStep
Attribute cExecStep99.VB_VarHelpID = -1

Private Const msIt As String = " Iterator: "
Private Const msItValue As String = " Value: "
Public Sub Abort()

```

```

    On Error GoTo AbortErr

```

```

    ' Make sure that we don't execute any more steps
    Call StopRun

```

```

    If cExecStep1 Is Nothing And cExecStep2 Is Nothing And cExecStep3 Is
Nothing And cExecStep4 Is Nothing And cExecStep5 Is Nothing And
cExecStep6 Is Nothing And cExecStep7 Is Nothing And cExecStep8 Is
Nothing And cExecStep9 Is Nothing And _

```

```

cExecStep10 Is Nothing And cExecStep11 Is Nothing And cExecStep12
Is Nothing And cExecStep13 Is Nothing And cExecStep14 Is Nothing And
cExecStep15 Is Nothing And cExecStep16 Is Nothing And cExecStep17 Is
Nothing And cExecStep18 Is Nothing And cExecStep19 Is Nothing And _
cExecStep20 Is Nothing And cExecStep21 Is Nothing And cExecStep22
Is Nothing And cExecStep23 Is Nothing And cExecStep24 Is Nothing And
cExecStep25 Is Nothing And cExecStep26 Is Nothing And cExecStep27 Is
Nothing And cExecStep28 Is Nothing And cExecStep29 Is Nothing And _
cExecStep30 Is Nothing And cExecStep31 Is Nothing And cExecStep32
Is Nothing And cExecStep33 Is Nothing And cExecStep34 Is Nothing And
cExecStep35 Is Nothing And cExecStep36 Is Nothing And cExecStep37 Is
Nothing And cExecStep38 Is Nothing And cExecStep39 Is Nothing And _
cExecStep40 Is Nothing And cExecStep41 Is Nothing And cExecStep42
Is Nothing And cExecStep43 Is Nothing And cExecStep44 Is Nothing And
cExecStep45 Is Nothing And cExecStep46 Is Nothing And cExecStep47 Is
Nothing And cExecStep48 Is Nothing And cExecStep49 Is Nothing And _
cExecStep50 Is Nothing And cExecStep51 Is Nothing And cExecStep52
Is Nothing And cExecStep53 Is Nothing And cExecStep54 Is Nothing And
cExecStep55 Is Nothing And cExecStep56 Is Nothing And cExecStep57 Is
Nothing And cExecStep58 Is Nothing And cExecStep59 Is Nothing And _
cExecStep60 Is Nothing And cExecStep61 Is Nothing And cExecStep62
Is Nothing And cExecStep63 Is Nothing And cExecStep64 Is Nothing And
cExecStep65 Is Nothing And cExecStep66 Is Nothing And cExecStep67 Is
Nothing And cExecStep68 Is Nothing And cExecStep69 Is Nothing And _
cExecStep70 Is Nothing And cExecStep71 Is Nothing And cExecStep72
Is Nothing And cExecStep73 Is Nothing And cExecStep74 Is Nothing And
cExecStep75 Is Nothing And cExecStep76 Is Nothing And cExecStep77 Is
Nothing And cExecStep78 Is Nothing And cExecStep79 Is Nothing And _
cExecStep80 Is Nothing And cExecStep81 Is Nothing And cExecStep82
Is Nothing And cExecStep83 Is Nothing And cExecStep84 Is Nothing And
cExecStep85 Is Nothing And cExecStep86 Is Nothing And cExecStep87 Is
Nothing And cExecStep88 Is Nothing And cExecStep89 Is Nothing And _
cExecStep90 Is Nothing And cExecStep91 Is Nothing And cExecStep92
Is Nothing And cExecStep93 Is Nothing And cExecStep94 Is Nothing And
cExecStep95 Is Nothing And cExecStep96 Is Nothing And cExecStep97 Is
Nothing And cExecStep98 Is Nothing And cExecStep99 Is Nothing Then
    ' Then...
    WriteToWspLog (mintRunComplete)
    RaiseEvent RunComplete(Determine64BitTime())
Else
    ' Abort each of the steps that is currently executing.
    If Not cExecStep1 Is Nothing Then
        cExecStep1.Abort
    End If

    If Not cExecStep2 Is Nothing Then
        cExecStep2.Abort
    End If

    If Not cExecStep3 Is Nothing Then
        cExecStep3.Abort
    End If

    If Not cExecStep4 Is Nothing Then
        cExecStep4.Abort
    End If

```



```

If Not cExecStep5 Is Nothing Then
  cExecStep5.Abort
End If

If Not cExecStep6 Is Nothing Then
  cExecStep6.Abort
End If

If Not cExecStep7 Is Nothing Then
  cExecStep7.Abort
End If

If Not cExecStep8 Is Nothing Then
  cExecStep8.Abort
End If

If Not cExecStep9 Is Nothing Then
  cExecStep9.Abort
End If

If Not cExecStep10 Is Nothing Then
  cExecStep10.Abort
End If

If Not cExecStep11 Is Nothing Then
  cExecStep11.Abort
End If

If Not cExecStep12 Is Nothing Then
  cExecStep12.Abort
End If

If Not cExecStep13 Is Nothing Then
  cExecStep13.Abort
End If

If Not cExecStep14 Is Nothing Then
  cExecStep14.Abort
End If

If Not cExecStep15 Is Nothing Then
  cExecStep15.Abort
End If

If Not cExecStep16 Is Nothing Then
  cExecStep16.Abort
End If

If Not cExecStep17 Is Nothing Then
  cExecStep17.Abort
End If

If Not cExecStep18 Is Nothing Then
  cExecStep18.Abort
End If

```

```

If Not cExecStep19 Is Nothing Then
  cExecStep19.Abort
End If

If Not cExecStep20 Is Nothing Then
  cExecStep20.Abort
End If

If Not cExecStep21 Is Nothing Then
  cExecStep21.Abort
End If

If Not cExecStep22 Is Nothing Then
  cExecStep22.Abort
End If

If Not cExecStep23 Is Nothing Then
  cExecStep23.Abort
End If

If Not cExecStep24 Is Nothing Then
  cExecStep24.Abort
End If

If Not cExecStep25 Is Nothing Then
  cExecStep25.Abort
End If

If Not cExecStep26 Is Nothing Then
  cExecStep26.Abort
End If

If Not cExecStep27 Is Nothing Then
  cExecStep27.Abort
End If

If Not cExecStep28 Is Nothing Then
  cExecStep28.Abort
End If

If Not cExecStep29 Is Nothing Then
  cExecStep29.Abort
End If

' ===== 30 - 39 =====
If Not cExecStep30 Is Nothing Then
  cExecStep30.Abort
End If

If Not cExecStep31 Is Nothing Then
  cExecStep31.Abort
End If

If Not cExecStep32 Is Nothing Then
  cExecStep32.Abort
End If

```

```

End If

If Not cExecStep33 Is Nothing Then
    cExecStep33.Abort
End If

If Not cExecStep34 Is Nothing Then
    cExecStep34.Abort
End If

If Not cExecStep35 Is Nothing Then
    cExecStep35.Abort
End If

If Not cExecStep36 Is Nothing Then
    cExecStep36.Abort
End If

If Not cExecStep37 Is Nothing Then
    cExecStep37.Abort
End If

If Not cExecStep38 Is Nothing Then
    cExecStep38.Abort
End If

If Not cExecStep39 Is Nothing Then
    cExecStep39.Abort
End If

' ===== 40 - 49 =====
If Not cExecStep40 Is Nothing Then
    cExecStep40.Abort
End If

If Not cExecStep41 Is Nothing Then
    cExecStep41.Abort
End If

If Not cExecStep42 Is Nothing Then
    cExecStep42.Abort
End If

If Not cExecStep43 Is Nothing Then
    cExecStep43.Abort
End If

If Not cExecStep44 Is Nothing Then
    cExecStep44.Abort
End If

If Not cExecStep45 Is Nothing Then
    cExecStep45.Abort
End If

If Not cExecStep46 Is Nothing Then

```

```

    cExecStep46.Abort
End If

If Not cExecStep47 Is Nothing Then
    cExecStep47.Abort
End If

If Not cExecStep48 Is Nothing Then
    cExecStep48.Abort
End If

If Not cExecStep49 Is Nothing Then
    cExecStep49.Abort
End If

' ===== 50 - 59 =====
If Not cExecStep50 Is Nothing Then
    cExecStep50.Abort
End If

If Not cExecStep51 Is Nothing Then
    cExecStep51.Abort
End If

If Not cExecStep52 Is Nothing Then
    cExecStep52.Abort
End If

If Not cExecStep53 Is Nothing Then
    cExecStep53.Abort
End If

If Not cExecStep54 Is Nothing Then
    cExecStep54.Abort
End If

If Not cExecStep55 Is Nothing Then
    cExecStep55.Abort
End If

If Not cExecStep56 Is Nothing Then
    cExecStep56.Abort
End If

If Not cExecStep57 Is Nothing Then
    cExecStep57.Abort
End If

If Not cExecStep58 Is Nothing Then
    cExecStep58.Abort
End If

If Not cExecStep59 Is Nothing Then
    cExecStep59.Abort
End If

```

```

' ===== 60 - 69 =====
If Not cExecStep60 Is Nothing Then
    cExecStep60.Abort
End If

If Not cExecStep61 Is Nothing Then
    cExecStep61.Abort
End If

If Not cExecStep62 Is Nothing Then
    cExecStep62.Abort
End If

If Not cExecStep63 Is Nothing Then
    cExecStep63.Abort
End If

If Not cExecStep64 Is Nothing Then
    cExecStep64.Abort
End If

If Not cExecStep65 Is Nothing Then
    cExecStep65.Abort
End If

If Not cExecStep66 Is Nothing Then
    cExecStep66.Abort
End If

If Not cExecStep67 Is Nothing Then
    cExecStep67.Abort
End If

If Not cExecStep68 Is Nothing Then
    cExecStep68.Abort
End If

If Not cExecStep69 Is Nothing Then
    cExecStep69.Abort
End If

' ===== 70 - 79 =====
If Not cExecStep70 Is Nothing Then
    cExecStep70.Abort
End If

If Not cExecStep71 Is Nothing Then
    cExecStep71.Abort
End If

If Not cExecStep72 Is Nothing Then
    cExecStep72.Abort
End If

If Not cExecStep73 Is Nothing Then
    cExecStep73.Abort

```

```

End If

If Not cExecStep74 Is Nothing Then
    cExecStep74.Abort
End If

If Not cExecStep75 Is Nothing Then
    cExecStep75.Abort
End If

If Not cExecStep76 Is Nothing Then
    cExecStep76.Abort
End If

If Not cExecStep77 Is Nothing Then
    cExecStep77.Abort
End If

If Not cExecStep78 Is Nothing Then
    cExecStep78.Abort
End If

If Not cExecStep79 Is Nothing Then
    cExecStep79.Abort
End If

' ===== 80 - 89 =====
If Not cExecStep80 Is Nothing Then
    cExecStep80.Abort
End If

If Not cExecStep81 Is Nothing Then
    cExecStep81.Abort
End If

If Not cExecStep82 Is Nothing Then
    cExecStep82.Abort
End If

If Not cExecStep83 Is Nothing Then
    cExecStep83.Abort
End If

If Not cExecStep84 Is Nothing Then
    cExecStep84.Abort
End If

If Not cExecStep85 Is Nothing Then
    cExecStep85.Abort
End If

If Not cExecStep86 Is Nothing Then
    cExecStep86.Abort
End If

If Not cExecStep87 Is Nothing Then

```

```

        cExecStep87.Abort
    End If

    If Not cExecStep88 Is Nothing Then
        cExecStep88.Abort
    End If

    If Not cExecStep89 Is Nothing Then
        cExecStep89.Abort
    End If

    ' ===== 90 - 99 =====
    If Not cExecStep90 Is Nothing Then
        cExecStep90.Abort
    End If

    If Not cExecStep91 Is Nothing Then
        cExecStep91.Abort
    End If

    If Not cExecStep92 Is Nothing Then
        cExecStep92.Abort
    End If

    If Not cExecStep93 Is Nothing Then
        cExecStep93.Abort
    End If

    If Not cExecStep94 Is Nothing Then
        cExecStep94.Abort
    End If

    If Not cExecStep95 Is Nothing Then
        cExecStep95.Abort
    End If

    If Not cExecStep96 Is Nothing Then
        cExecStep96.Abort
    End If

    If Not cExecStep97 Is Nothing Then
        cExecStep97.Abort
    End If

    If Not cExecStep98 Is Nothing Then
        cExecStep98.Abort
    End If

    If Not cExecStep99 Is Nothing Then
        cExecStep99.Abort
    End If

End If

Exit Sub

```

```

AbortErr:
    Call LogErrors(Errors)
    On Error GoTo 0
    ShowError errAbortFailed
    ' Try to abort the remaining steps, if any
    Resume Next

End Sub

Public Sub AbortSiblings(cTermInstance As cInstance)

    On Error GoTo AbortSiblingsErr

    ' Abort each of the steps that is currently executing.
    If Not cExecStep1 Is Nothing Then
        If cExecStep1.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep1.Abort
        End If
    End If

    If Not cExecStep2 Is Nothing Then
        If cExecStep2.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep2.Abort
        End If
    End If

    If Not cExecStep3 Is Nothing Then
        If cExecStep3.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep3.Abort
        End If
    End If

    If Not cExecStep4 Is Nothing Then
        If cExecStep4.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep4.Abort
        End If
    End If

    If Not cExecStep5 Is Nothing Then
        If cExecStep5.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep5.Abort
        End If
    End If

    If Not cExecStep6 Is Nothing Then
        If cExecStep6.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep6.Abort
        End If
    End If

    If Not cExecStep7 Is Nothing Then

```

```

        If cExecStep7.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep7.Abort
        End If
    End If

    If Not cExecStep8 Is Nothing Then
        If cExecStep8.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep8.Abort
        End If
    End If

    If Not cExecStep9 Is Nothing Then
        If cExecStep9.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep9.Abort
        End If
    End If

    If Not cExecStep10 Is Nothing Then
        If cExecStep10.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep10.Abort
        End If
    End If

    If Not cExecStep11 Is Nothing Then
        If cExecStep11.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep11.Abort
        End If
    End If

    If Not cExecStep12 Is Nothing Then
        If cExecStep12.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep12.Abort
        End If
    End If

    If Not cExecStep13 Is Nothing Then
        If cExecStep13.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep13.Abort
        End If
    End If

    If Not cExecStep14 Is Nothing Then
        If cExecStep14.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep14.Abort
        End If
    End If

    If Not cExecStep15 Is Nothing Then

```

```

        If cExecStep15.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep15.Abort
        End If
    End If

    If Not cExecStep16 Is Nothing Then
        If cExecStep16.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep16.Abort
        End If
    End If

    If Not cExecStep17 Is Nothing Then
        If cExecStep17.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep17.Abort
        End If
    End If

    If Not cExecStep18 Is Nothing Then
        If cExecStep18.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep18.Abort
        End If
    End If

    If Not cExecStep19 Is Nothing Then
        If cExecStep19.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep19.Abort
        End If
    End If

    If Not cExecStep20 Is Nothing Then
        If cExecStep20.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep20.Abort
        End If
    End If

    If Not cExecStep21 Is Nothing Then
        If cExecStep21.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep21.Abort
        End If
    End If

    If Not cExecStep22 Is Nothing Then
        If cExecStep22.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep22.Abort
        End If
    End If

    If Not cExecStep23 Is Nothing Then

```

```

        If cExecStep23.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep23.Abort
        End If
    End If

    If Not cExecStep24 Is Nothing Then
        If cExecStep24.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep24.Abort
        End If
    End If

    If Not cExecStep25 Is Nothing Then
        If cExecStep25.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep25.Abort
        End If
    End If

    If Not cExecStep26 Is Nothing Then
        If cExecStep26.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep26.Abort
        End If
    End If

    If Not cExecStep27 Is Nothing Then
        If cExecStep27.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep27.Abort
        End If
    End If

    If Not cExecStep28 Is Nothing Then
        If cExecStep28.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep28.Abort
        End If
    End If

    If Not cExecStep29 Is Nothing Then
        If cExecStep29.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep29.Abort
        End If
    End If

    ' ===== 30 =====
    If Not cExecStep30 Is Nothing Then
        If cExecStep30.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep30.Abort
        End If
    End If

```

```

        If Not cExecStep31 Is Nothing Then
            If cExecStep31.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
                cExecStep31.Abort
            End If
        End If

        If Not cExecStep32 Is Nothing Then
            If cExecStep32.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
                cExecStep32.Abort
            End If
        End If

        If Not cExecStep33 Is Nothing Then
            If cExecStep33.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
                cExecStep33.Abort
            End If
        End If

        If Not cExecStep34 Is Nothing Then
            If cExecStep34.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
                cExecStep34.Abort
            End If
        End If

        If Not cExecStep35 Is Nothing Then
            If cExecStep35.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
                cExecStep35.Abort
            End If
        End If

        If Not cExecStep36 Is Nothing Then
            If cExecStep36.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
                cExecStep36.Abort
            End If
        End If

        If Not cExecStep37 Is Nothing Then
            If cExecStep37.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
                cExecStep37.Abort
            End If
        End If

        If Not cExecStep38 Is Nothing Then
            If cExecStep38.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
                cExecStep38.Abort
            End If
        End If

```

```

If Not cExecStep39 Is Nothing Then
    If cExecStep39.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep39.Abort
    End If
End If

' ===== 40 =====
If Not cExecStep40 Is Nothing Then
    If cExecStep40.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep40.Abort
    End If
End If

If Not cExecStep41 Is Nothing Then
    If cExecStep41.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep41.Abort
    End If
End If

If Not cExecStep42 Is Nothing Then
    If cExecStep42.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep42.Abort
    End If
End If

If Not cExecStep43 Is Nothing Then
    If cExecStep43.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep43.Abort
    End If
End If

If Not cExecStep44 Is Nothing Then
    If cExecStep44.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep44.Abort
    End If
End If

If Not cExecStep45 Is Nothing Then
    If cExecStep45.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep45.Abort
    End If
End If

If Not cExecStep46 Is Nothing Then
    If cExecStep46.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep46.Abort
    End If
End If

```

```

If Not cExecStep47 Is Nothing Then
    If cExecStep47.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep47.Abort
    End If
End If

If Not cExecStep48 Is Nothing Then
    If cExecStep48.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep48.Abort
    End If
End If

If Not cExecStep49 Is Nothing Then
    If cExecStep49.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep49.Abort
    End If
End If

' ===== 50 =====
If Not cExecStep50 Is Nothing Then
    If cExecStep50.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep50.Abort
    End If
End If

If Not cExecStep51 Is Nothing Then
    If cExecStep51.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep51.Abort
    End If
End If

If Not cExecStep52 Is Nothing Then
    If cExecStep52.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep52.Abort
    End If
End If

If Not cExecStep53 Is Nothing Then
    If cExecStep53.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep53.Abort
    End If
End If

If Not cExecStep54 Is Nothing Then
    If cExecStep54.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep54.Abort
    End If
End If

```

```

End If

If Not cExecStep55 Is Nothing Then
  If cExecStep55.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
    cExecStep55.Abort
  End If
End If

If Not cExecStep56 Is Nothing Then
  If cExecStep56.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
    cExecStep56.Abort
  End If
End If

If Not cExecStep57 Is Nothing Then
  If cExecStep57.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
    cExecStep57.Abort
  End If
End If

If Not cExecStep58 Is Nothing Then
  If cExecStep58.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
    cExecStep58.Abort
  End If
End If

If Not cExecStep59 Is Nothing Then
  If cExecStep59.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
    cExecStep59.Abort
  End If
End If

' ===== 60 =====
If Not cExecStep60 Is Nothing Then
  If cExecStep60.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
    cExecStep60.Abort
  End If
End If

If Not cExecStep61 Is Nothing Then
  If cExecStep61.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
    cExecStep61.Abort
  End If
End If

If Not cExecStep62 Is Nothing Then
  If cExecStep62.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
    cExecStep62.Abort

```

```

End If

End If

If Not cExecStep63 Is Nothing Then
  If cExecStep63.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
    cExecStep63.Abort
  End If
End If

If Not cExecStep64 Is Nothing Then
  If cExecStep64.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
    cExecStep64.Abort
  End If
End If

If Not cExecStep65 Is Nothing Then
  If cExecStep65.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
    cExecStep65.Abort
  End If
End If

If Not cExecStep66 Is Nothing Then
  If cExecStep66.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
    cExecStep66.Abort
  End If
End If

If Not cExecStep67 Is Nothing Then
  If cExecStep67.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
    cExecStep67.Abort
  End If
End If

If Not cExecStep68 Is Nothing Then
  If cExecStep68.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
    cExecStep68.Abort
  End If
End If

If Not cExecStep69 Is Nothing Then
  If cExecStep69.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
    cExecStep69.Abort
  End If
End If

' ===== 70 =====
If Not cExecStep70 Is Nothing Then
  If cExecStep70.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then

```



```

        cExecStep70.Abort
    End If
End If

If Not cExecStep71 Is Nothing Then
    If cExecStep71.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep71.Abort
    End If
End If

If Not cExecStep72 Is Nothing Then
    If cExecStep72.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep72.Abort
    End If
End If

If Not cExecStep73 Is Nothing Then
    If cExecStep73.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep73.Abort
    End If
End If

If Not cExecStep74 Is Nothing Then
    If cExecStep74.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep74.Abort
    End If
End If

If Not cExecStep75 Is Nothing Then
    If cExecStep75.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep75.Abort
    End If
End If

If Not cExecStep76 Is Nothing Then
    If cExecStep76.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep76.Abort
    End If
End If

If Not cExecStep77 Is Nothing Then
    If cExecStep77.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep77.Abort
    End If
End If

If Not cExecStep78 Is Nothing Then
    If cExecStep78.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then

```

```

        cExecStep78.Abort
    End If
End If

If Not cExecStep79 Is Nothing Then
    If cExecStep79.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep79.Abort
    End If
End If

' ===== 80 =====
If Not cExecStep80 Is Nothing Then
    If cExecStep80.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep80.Abort
    End If
End If

If Not cExecStep81 Is Nothing Then
    If cExecStep81.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep81.Abort
    End If
End If

If Not cExecStep82 Is Nothing Then
    If cExecStep82.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep82.Abort
    End If
End If

If Not cExecStep83 Is Nothing Then
    If cExecStep83.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep83.Abort
    End If
End If

If Not cExecStep84 Is Nothing Then
    If cExecStep84.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep84.Abort
    End If
End If

If Not cExecStep85 Is Nothing Then
    If cExecStep85.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
        cExecStep85.Abort
    End If
End If

If Not cExecStep86 Is Nothing Then

```

```

        If cExecStep86.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep86.Abort
        End If
    End If

    If Not cExecStep87 Is Nothing Then
        If cExecStep87.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep87.Abort
        End If
    End If

    If Not cExecStep88 Is Nothing Then
        If cExecStep88.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep88.Abort
        End If
    End If

    If Not cExecStep89 Is Nothing Then
        If cExecStep89.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep89.Abort
        End If
    End If

    ' ===== 90 =====
    If Not cExecStep90 Is Nothing Then
        If cExecStep90.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep90.Abort
        End If
    End If

    If Not cExecStep91 Is Nothing Then
        If cExecStep91.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep91.Abort
        End If
    End If

    If Not cExecStep92 Is Nothing Then
        If cExecStep92.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep92.Abort
        End If
    End If

    If Not cExecStep93 Is Nothing Then
        If cExecStep93.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
            cExecStep93.Abort
        End If
    End If

```

```

        If Not cExecStep94 Is Nothing Then
            If cExecStep94.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
                cExecStep94.Abort
            End If
        End If

        If Not cExecStep95 Is Nothing Then
            If cExecStep95.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
                cExecStep95.Abort
            End If
        End If

        If Not cExecStep96 Is Nothing Then
            If cExecStep96.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
                cExecStep96.Abort
            End If
        End If

        If Not cExecStep97 Is Nothing Then
            If cExecStep97.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
                cExecStep97.Abort
            End If
        End If

        If Not cExecStep98 Is Nothing Then
            If cExecStep98.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
                cExecStep98.Abort
            End If
        End If

        If Not cExecStep99 Is Nothing Then
            If cExecStep99.ExecuteStep.ParentStepId =
cTermInstance.Step.ParentStepId Then
                cExecStep99.Abort
            End If
        End If

        Exit Sub

    AbortSiblingsErr:
        Call LogErrors(Errors)
        On Error GoTo 0
        ShowError errAbortFailed
        ' Try to abort the remaining steps, if any
        Resume Next

    End Sub
    Private Sub ExecutionFailed(cTermStep As cRunStep)
        ' Called when execution of a step fails for any reason - ensure that
        execution
        ' continues

```

```

On Error GoTo ExecutionFailedErr

Call AddFreeProcess(cTermStep.Index)

Call RunBranch(mstrCurBranchRoot)

Exit Sub

ExecutionFailedErr:
' Log the error code raised by Visual Basic - do not raise an error
here!
Call LogErrors(Errors)

End Sub
Private Sub FreeExecStep(lngIndex As Long)
' Frees an instance of a cExecuteSM object depending on the index
On Error GoTo FreeExecStepErr

Select Case lngIndex + 1
Case 1
Set cExecStep1 = Nothing
Case 2
Set cExecStep2 = Nothing
Case 3
Set cExecStep3 = Nothing
Case 4
Set cExecStep4 = Nothing
Case 5
Set cExecStep5 = Nothing
Case 6
Set cExecStep6 = Nothing
Case 7
Set cExecStep7 = Nothing
Case 8
Set cExecStep8 = Nothing
Case 9
Set cExecStep9 = Nothing
Case 10
Set cExecStep10 = Nothing
Case 11
Set cExecStep11 = Nothing
Case 12
Set cExecStep12 = Nothing
Case 13
Set cExecStep13 = Nothing
Case 14
Set cExecStep14 = Nothing
Case 15
Set cExecStep15 = Nothing
Case 16
Set cExecStep16 = Nothing
Case 17
Set cExecStep17 = Nothing
Case 18
Set cExecStep18 = Nothing

```

```

Case 19
Set cExecStep19 = Nothing
Case 20
Set cExecStep20 = Nothing
Case 21
Set cExecStep21 = Nothing
Case 22
Set cExecStep22 = Nothing
Case 23
Set cExecStep23 = Nothing
Case 24
Set cExecStep24 = Nothing
Case 25
Set cExecStep25 = Nothing
Case 26
Set cExecStep26 = Nothing
Case 27
Set cExecStep27 = Nothing
Case 28
Set cExecStep28 = Nothing
Case 29
Set cExecStep29 = Nothing
Case 30
Set cExecStep30 = Nothing
Case 31
Set cExecStep31 = Nothing
Case 32
Set cExecStep32 = Nothing
Case 33
Set cExecStep33 = Nothing
Case 34
Set cExecStep34 = Nothing
Case 35
Set cExecStep35 = Nothing
Case 36
Set cExecStep36 = Nothing
Case 37
Set cExecStep37 = Nothing
Case 38
Set cExecStep38 = Nothing
Case 39
Set cExecStep39 = Nothing
Case 40
Set cExecStep40 = Nothing
Case 41
Set cExecStep41 = Nothing
Case 42
Set cExecStep42 = Nothing
Case 43
Set cExecStep43 = Nothing
Case 44
Set cExecStep44 = Nothing
Case 45
Set cExecStep45 = Nothing
Case 46
Set cExecStep46 = Nothing

```

```
Case 47
  Set cExecStep47 = Nothing
Case 48
  Set cExecStep48 = Nothing
Case 49
  Set cExecStep49 = Nothing
Case 50
  Set cExecStep50 = Nothing
Case 51
  Set cExecStep51 = Nothing
Case 52
  Set cExecStep52 = Nothing
Case 53
  Set cExecStep53 = Nothing
Case 54
  Set cExecStep54 = Nothing
Case 55
  Set cExecStep55 = Nothing
Case 56
  Set cExecStep56 = Nothing
Case 57
  Set cExecStep57 = Nothing
Case 58
  Set cExecStep58 = Nothing
Case 59
  Set cExecStep59 = Nothing
Case 60
  Set cExecStep60 = Nothing
Case 61
  Set cExecStep61 = Nothing
Case 62
  Set cExecStep62 = Nothing
Case 63
  Set cExecStep63 = Nothing
Case 64
  Set cExecStep64 = Nothing
Case 65
  Set cExecStep65 = Nothing
Case 66
  Set cExecStep66 = Nothing
Case 67
  Set cExecStep67 = Nothing
Case 68
  Set cExecStep68 = Nothing
Case 69
  Set cExecStep69 = Nothing
Case 70
  Set cExecStep70 = Nothing
Case 71
  Set cExecStep71 = Nothing
Case 72
  Set cExecStep72 = Nothing
Case 73
  Set cExecStep73 = Nothing
Case 74
  Set cExecStep74 = Nothing
```

```
Case 75
  Set cExecStep75 = Nothing
Case 76
  Set cExecStep76 = Nothing
Case 77
  Set cExecStep77 = Nothing
Case 78
  Set cExecStep78 = Nothing
Case 79
  Set cExecStep79 = Nothing
Case 80
  Set cExecStep80 = Nothing
Case 81
  Set cExecStep81 = Nothing
Case 82
  Set cExecStep82 = Nothing
Case 83
  Set cExecStep83 = Nothing
Case 84
  Set cExecStep84 = Nothing
Case 85
  Set cExecStep85 = Nothing
Case 86
  Set cExecStep86 = Nothing
Case 87
  Set cExecStep87 = Nothing
Case 88
  Set cExecStep88 = Nothing
Case 89
  Set cExecStep89 = Nothing
Case 90
  Set cExecStep90 = Nothing
Case 91
  Set cExecStep91 = Nothing
Case 92
  Set cExecStep92 = Nothing
Case 93
  Set cExecStep93 = Nothing
Case 94
  Set cExecStep94 = Nothing
Case 95
  Set cExecStep95 = Nothing
Case 96
  Set cExecStep96 = Nothing
Case 97
  Set cExecStep97 = Nothing
Case 98
  Set cExecStep98 = Nothing
Case 99
  Set cExecStep99 = Nothing
Case Else
  BugAssert False, "FreeExecStep: Invalid index value!"
End Select

Exit Sub
```

```

FreeExecStepErr:
  ' Log the error code raised by Visual Basic
  Call LogErrors(Errors)

End Sub
Private Sub ProcessAskFailures()
  ' This procedure is called when a step with a continuation criteria
  = Ask has failed.
  ' Wait for all running processes to complete before displaying an
  Abort/Retry/Fail
  ' message to the user. We process every Ask step that has failed and
  use a simple
  ' algorithm to determine what to do next.
  ' 1. An abort response to any failure results in an immediate abort
  of the run
  ' 2. A continue means the run continues - this failure is popped off
  the failure list.
  ' 3. A retry means that the execution details for the instance are
  cleared and the
  ' step is re-executed.
  Dim lIndex As Long
  Dim cStepRec As cStep
  Dim cNextInst As cInstance
  Dim cFailureRec As cFailedStep

  On Error GoTo ProcessAskFailuresErr

  ' Display a popup message for all steps that have failed with a
  continuation
  ' criteria of Ask
  For lIndex = mcFailures.Count - 1 To 0 Step -1

    Set cFailureRec = mcFailures(lIndex)

    If cFailureRec.ContCriteria = gintOnFailureAsk Then
      Set cStepRec = mcRunSteps.QueryStep(cFailureRec.StepId)
      ' Ask the user whether to abort/retry/continue
      #If RUN_ONLY Then
        cFailureRec.AskResponse = ShowMessageBox(0, _
          "Step '" & GetStepNodeText(cStepRec) & "' failed.
" & _
          "Select Abort to abort run and Ignore to
continue." & _
          "Select Retry to re-execute the failed step.", _
          "Step Failure", _
          MB_ABORTRETRYIGNORE + MB_APPLMODAL +
MB_ICONEXCLAMATION)
      #Else
        cFailureRec.AskResponse = ShowMessageBox(frmRunning.hWnd,
-
          "Step '" & GetStepNodeText(cStepRec) & "' failed.
" & _
          "Select Abort to abort run and Ignore to
continue." & _
          "Select Retry to re-execute the failed step.", _
          "Step Failure", _

```

```

MB_ABORTRETRYIGNORE + MB_APPLMODAL +
MB_ICONEXCLAMATION)
#End If

' Process an abort response immediately
If cFailureRec.AskResponse = IDABORT Then
  mblnAbort = True
  Set cNextInst =
mcInstances.QueryInstance(cFailureRec.InstanceId)
  Call RunPendingSiblings(cNextInst, cFailureRec.EndTime)
  Exit For
End If
End If

Next lIndex

' Process all failed steps for which we have Ignore and Retry
responses.
If Not mblnAbort Then
  ' Navigate in reverse order since we'll be deleting items from
  the collection
  For lIndex = mcFailures.Count - 1 To 0 Step -1
    If mcFailures(lIndex).ContCriteria = gintOnFailureAsk Then
      mblnAsk = False
      Set cFailureRec = mcFailures.Delete(lIndex)

      Select Case cFailureRec.AskResponse
        Case IDABORT
          BugAssert True

        Case IDRETRY
          ' Delete all instances for the failed step and
re-try
          ' Returns a parent instance reference
          Set cNextInst = ProcessRetryStep(cFailureRec)
          Call RunPendingStepInBranch(mstrCurBranchRoot,
cNextInst)

        Case IDIGNORE
          Set cNextInst =
mcInstances.QueryInstance(cFailureRec.InstanceId)
          Call RunPendingSiblings(cNextInst,
cFailureRec.EndTime)

      End Select
    End If
  Next lIndex
End If

Exit Sub

ProcessAskFailuresErr:
  ' Log the error code raised by Visual Basic
  Call LogErrors(Errors)
  Err.Raise vbObjectError + errExecuteBranchFailed, mstrModuleName, _
  LoadResString(errExecuteBranchFailed)

```

```

End Sub
Private Function ProcessRetryStep(cFailureRec As cFailedStep) As
cInstance
    ' This procedure is called when a step with a continuation criteria
= Ask has failed
    ' and the user wants to re-execute the step.
    ' We delete all existing instances for the step and reset the
iterator, if
    ' any on the parent instance - this way we ensure that the step will
be executed
    ' in the next pass.
    Dim lngIndex As Long
    Dim cParentInstance As cInstance
    Dim cSubStepRec As cSubStep
    Dim cStepRec As cStep

    On Error GoTo ProcessRetryStepErr

    ' Navigate in reverse order since we'll be deleting items from the
collection
    For lngIndex = mcInstances.Count - 1 To 0 Step -1

        If mcInstances(lngIndex).Step.StepId = cFailureRec.StepId Then
            Set cParentInstance =
mcInstances.QueryInstance(mcInstances(lngIndex).ParentInstanceId)
            Set cSubStepRec =
cParentInstance.QuerySubStep(cFailureRec.StepId)
            Set cStepRec = mcRunSteps.QueryStep(cFailureRec.StepId)

            ' Decrement the child count on the parent instance and reset
the
            ' step iterators on the sub-step record, if any -
            ' all the iterations of the step will be re-executed.
            cParentInstance.ChildDeleted cFailureRec.StepId
            cParentInstance.AllComplete = False
            cParentInstance.AllStarted = False

            cSubStepRec.InitializeIt cStepRec, mcParameters

            ' Now delete the current instance
            Set ProcessRetryStep = mcInstances.Delete(lngIndex)
        End If
    Next lngIndex

    Exit Function

ProcessRetryStepErr:
    ' Log the error code raised by Visual Basic
    Call LogErrors(Errors)
    Err.Raise vbObjectError + errExecuteBranchFailed, mstrModuleName, _
        LoadResString(errExecuteBranchFailed)

End Function

```

```

Private Sub RunNextStep(ByVal dtmCompleteTime As Currency, ByVal
lngIndex As Long, _
    ByVal InstanceId As Long, ByVal ExecutionStatus As
InstanceStatus)
    ' Checks if there are any steps remaining to be
    ' executed in the current branch. If so, it executes
    ' the step.
    Dim cTermInstance As cInstance
    Dim cFailure As cFailedStep

    On Error GoTo RunNextStepErr

    BugMessage "RunNextStep: cExecStep" & CStr(lngIndex + 1) & " has
completed."

    Call mcTermSteps.Delete
    Call FreeExecStep(lngIndex)

    ' Call a procedure to add the freed up object to the list
    Call AddFreeProcess(lngIndex)

    Set cTermInstance = mcInstances.QueryInstance(InstanceId)
    cTermInstance.Status = ExecutionStatus

    If ExecutionStatus = gintFailed Then
        If cTermInstance.Step.ContinuationCriteria =
gintOnFailureAbortSiblings Then
            Call AbortSiblings(cTermInstance)
        End If

        If Not mcFailures.StepFailed(cTermInstance.Step.StepId) Then
            Set cFailure = New cFailedStep
            cFailure.InstanceId = cTermInstance.InstanceId
            cFailure.StepId = cTermInstance.Step.StepId
            cFailure.ParentStepId = cTermInstance.Step.ParentStepId
            cFailure.ContCriteria =
cTermInstance.Step.ContinuationCriteria
            cFailure.EndTime = dtmCompleteTime
            mcFailures.Add cFailure
            Set cFailure = Nothing
        End If
    End If

    If ExecutionStatus = gintFailed And
cTermInstance.Step.ContinuationCriteria = gintOnFailureAbort Then
        If StringEmpty(msAbortDtls) Then
            ' Initialize the abort message
            msAbortDtls = "Step '" & GetStepNodeText(cTermInstance.Step)
& "' failed." & _
                "Aborting execution. Please check the error file for
details."
        End If
        Call Abort
    ElseIf ExecutionStatus = gintFailed And
cTermInstance.Step.ContinuationCriteria = gintOnFailureAsk Then
        mblnAsk = True
    End If

```

```

' If the step failed due to a Cancel operation (Abort), abort
the run
If mblnAbort Then
    Call RunPendingSiblings(cTermInstance, dtmCompleteTime)
End If
Else
    Call RunPendingSiblings(cTermInstance, dtmCompleteTime)
End If

If mblnAbort Then
    If Not AnyStepRunning(mcFreeSteps, mbarrFree) And Not
StringEmpty(msAbortDtls) Then
        ' Display an error only if the abort is due to a failure
        ' We had to abort since a step failed - since no other steps
are currently
        ' running, we can display a message to the user saying that
we had to abort
        #If RUN_ONLY Then
            Call ShowMessageBox(0, msAbortDtls, "Run Aborted", _
                MB_APPLMODAL + MB_OK + MB_ICONEXCLAMATION)
        #Else
            Call ShowMessageBox(frmRunning.hWnd, msAbortDtls, "Run
Aborted", _
                MB_APPLMODAL + MB_OK + MB_ICONEXCLAMATION)
        #End If
        MsgBox msAbortDtls, vbOKOnly, "Run Aborted"
    End If
ElseIf mblnAsk Then
    If Not AnyStepRunning(mcFreeSteps, mbarrFree) Then
        ' Ask the user whether to abort/retry/ignore failed steps
        Call ProcessAskFailures
    End If
End If

Exit Sub

RunNextStepErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
WriteError errExecuteBranchFailed, mstrSource
Call ResetForm(lngIndex)

End Sub
Public Sub StopRun()

    ' Setting the Abort flag to True will ensure that we
    ' don't execute any more steps
    mblnAbort = True

End Sub

Private Sub CreateDummyInstance(strRootKey As String)

    Dim cNewInstance As cInstance
    Dim cSubStepDtls As cStep

```

```

Dim lngSubStepId As Long

On Error GoTo CreateDummyInstanceErr

' Create a new instance of the step
' initialize substeps for the step
Set cNewInstance = New cInstance

' There can be multiple iterations of the top level nodes
' running at the same time, but only one branch at any
' time - so enforce a degree of parallelism of 1 on this
' node!
Set cNewInstance.Step = New cStep
cNewInstance.DegreeParallelism = 1
cNewInstance.Key = mstrDummyRootKey

cNewInstance.InstanceId = NewInstanceId
cNewInstance.ParentInstanceId = 0

lngSubStepId = MakeIdentifierValid(strRootKey)

Set cSubStepDtls = mcRunSteps.QueryStep(lngSubStepId)
If cSubStepDtls.EnabledFlag Then
    ' Create a child node for the step corresponding to
    ' the root node of the branch being currently executed,
    ' only if it has been enabled
    Call cNewInstance.CreateSubStep(cSubStepDtls, mcParameters)
End If

mcInstances.Add cNewInstance
Set cNewInstance.Iterators = DetermineIterators(cNewInstance)

' Set a reference to the newly created dummy instance
Set mcDummyRootInstance = cNewInstance

Set cNewInstance = Nothing

Exit Sub

CreateDummyInstanceErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
On Error GoTo 0
mstrSource = mstrModuleName & "CreateDummyInstance"
Err.Raise vbObjectError + errCreateInstanceFailed, _
    mstrSource, LoadResString(errCreateInstanceFailed)

End Sub
Private Function CreateInstance(cExecStep As cStep, _
    cParentInstance As cInstance) As cInstance
    ' Creates a new instance of the passed in step. Returns
    ' a reference to the newly created instance object.

    Dim cNewInstance As cInstance
    Dim nodChild As cStep
    Dim lngSubStepId As Long

```

```

On Error GoTo CreateInstanceErr

' Create a new instance of the step
' initialize substeps for the step
Set cNewInstance = New cInstance
Set cNewInstance.Step = cExecStep
cNewInstance.Key = MakeKeyValid(cExecStep.StepId,
cExecStep.StepType)
cNewInstance.ParentInstanceId = cParentInstance.InstanceId
cNewInstance.InstanceId = NewInstanceId
' Validate the degree of parallelism field before assigning it to
the instance -
' (the parameter value might have been set to an invalid value at
runtime)
Call ValidateParallelism(cExecStep.DegreeParallelism, _
cExecStep.WorkspaceId, ParamsInWsp:=mcParameters)
cNewInstance.DegreeParallelism =
SubstituteParameters(cExecStep.DegreeParallelism, _
cExecStep.WorkspaceId, WspParameters:=mcParameters)

If mcNavSteps.HasChild(StepKey:=cNewInstance.Key) Then
Set nodChild = mcNavSteps.ChildStep(StepKey:=cNewInstance.Key)
Do
If nodChild.EnabledFlag Then
' Create nodes for all it's substeps only
' if the substeps have been enabled
Call cNewInstance.CreateSubStep(nodChild, mcParameters)
End If

Set nodChild = mcNavSteps.NextStep(StepId:=nodChild.StepId)
Loop While (Not nodChild Is Nothing)
End If

mcInstances.Add cNewInstance
Set cNewInstance.Iterators = DetermineIterators(cNewInstance)

' Increment the number of executing steps on the parent
cParentInstance.ChildExecuted (cExecStep.StepId)

Set CreateInstance = cNewInstance

Exit Function

CreateInstanceErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
On Error GoTo 0
mstrSource = mstrModuleName & "CreateInstance"
Err.Raise vbObjectError + errCreateInstanceFailed, _
mstrSource, LoadResString(errCreateInstanceFailed)

End Function
Private Function DetermineIterators(cInstanceRec As cInstance) As
cRunColIt
' Returns a collection of all the iterator values for this

```

```

' instance - since an iterator that is defined at a
' particular level can be used in all it's substeps, we
' need to navigate the step tree all the way to the root

Dim cRunIts As cRunColIt
Dim cRunIt As cRunItNode
Dim cStepIt As cIterator
Dim cParentInst As cInstance
Dim cSubStepRec As cSubStep
Dim cSubStepDtls As cStep
Dim lngSubStepId As Long
Dim lngIndex As Long

On Error GoTo DetermineIteratorsErr

Set cRunIts = New cRunColIt

If cInstanceRec.ParentInstanceId > 0 Then
' The last iterator for an instance of a step is stored
' on it's parent! So navigate up before beginning the
' search for iterator values.
Set cParentInst =
mcInstances.QueryInstance(cInstanceRec.ParentInstanceId)

' Get the sub-step record for the current step
' on it's parent's instance!
lngSubStepId = cInstanceRec.Step.StepId
Set cSubStepRec = cParentInst.QuerySubStep(lngSubStepId)
Set cSubStepDtls = mcRunSteps.QueryStep(lngSubStepId)

' And determine the next iteration value for the
' substep in this instance
Set cStepIt = cSubStepRec.NewIteration(cSubStepDtls)

If Not cStepIt Is Nothing Then
' Add the iterator details to the collection since
' an iterator has been defined for the step
Set cRunIt = New cRunItNode
cRunIt.IteratorName = cSubStepDtls.IteratorName
cRunIt.Value = SubstituteParameters(cStepIt.Value,
cSubStepDtls.WorkspaceId, WspParameters:=mcParameters)
cRunIt.StepId = cSubStepRec.StepId
cRunIts.Push cRunIt
End If

' Since the parent instance has all the iterators upto
' that level, read them and push them on to the stack for
' this instance
For lngIndex = 0 To cParentInst.Iterators.Count - 1
Set cRunIt = cParentInst.Iterators(lngIndex)
cRunIts.Push cRunIt
Next lngIndex

End If

Set DetermineIterators = cRunIts

```



```

Exit Function

DetermineIteratorsErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
On Error GoTo 0
mstrSource = mstrModuleName & "DetermineIterators"
Err.Raise vbObjectError + errExecInstanceFailed, _
    mstrSource, LoadResString(errExecInstanceFailed)

End Function
Private Function DetermineConstraints(cInstanceRec As cInstance, _
    intConsType As ConstraintType) As Variant
' Returns a collection of all the constraints for this
' instance of the passed in type - all the constraints defined
' for the manager are executed first, followed by those defined
' for the step. If a step has an iterator defined for it, each
' constraint is executed only once.

Dim cParentInst As cInstance
Dim cTempInst As cInstance
Dim vntConstraints As Variant
Dim vntTempCons As Variant
Dim cColConstraints() As Variant
Dim lngConsCount As Long

On Error GoTo DetermineConstraintsErr

Set cTempInst = cInstanceRec
lngConsCount = 0

' Go all the way to the root
Do
    If cTempInst.ParentInstanceId > 0 Then
        Set cParentInst =
mcInstances.QueryInstance(cTempInst.ParentInstanceId)
    Else
        Set cParentInst = Nothing
    End If

' Check if the step has an iterator defined for it
If cTempInst.ValidForIteration(cParentInst, intConsType) Then
    vntTempCons = mcRunConstraints.ConstraintsForStep( _
        cTempInst.Step.StepId, cTempInst.Step.VersionNo, _
        intConsType, blnSort:=True, _
        blnGlobal:=False, blnGlobalConstraintsOnly:=False)

    If Not IsEmpty(vntTempCons) Then
        ReDim Preserve cColConstraints(lngConsCount)
        cColConstraints(lngConsCount) = vntTempCons
        lngConsCount = lngConsCount + 1
    End If
End If

Set cTempInst = cParentInst

```

```

Loop While Not cTempInst Is Nothing

If lngConsCount > 0 Then
    vntTempCons = OrderConstraints(cColConstraints, intConsType)
End If

DetermineConstraints = vntTempCons

Exit Function

DetermineConstraintsErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
On Error GoTo 0
mstrSource = mstrModuleName & "DetermineConstraints"
Err.Raise vbObjectError + errExecInstanceFailed, _
    mstrSource, LoadResString(errExecInstanceFailed)

End Function
Private Function GetInstanceToExecute(cParentNode As cInstance, _
    cSubStepRec As cSubStep, _
    cSubStepDtls As cStep) As cInstance

Dim cSubStepInst As cInstance

On Error GoTo GetInstanceToExecuteErr

BugAssert Not (cParentNode Is Nothing Or _
    cSubStepRec Is Nothing Or _
    cSubStepDtls Is Nothing), _
    "GetInstanceToExecute: Input invalid"

' Check if it has iterators
If cSubStepDtls.IteratorCount = 0 Then
' Check if the step has been executed
    If cSubStepRec.TasksRunning = 0 And cSubStepRec.TasksComplete =
0 And _
        Not
mcInstances.CompletedInstanceExists(cParentNode.InstanceId,
cSubStepDtls) Then
' The sub-step hasn't been executed yet.
' Create an instance for it and exit
        Set cSubStepInst = CreateInstance(cSubStepDtls, cParentNode)
    Else
        Set cSubStepInst = Nothing
    End If
Else
' Check if there are pending iterations for the sub-step
    If Not cSubStepRec.NextIteration(cSubStepDtls) Is Nothing Then
' Pending iterations exist - create an instance for the sub-
step and exit
        Set cSubStepInst = CreateInstance(cSubStepDtls, cParentNode)
    Else
' No more iterations - continue with the next substep
        Set cSubStepInst = Nothing
    End If

```

```

End If

Set GetInstanceToExecute = cSubStepInst
Exit Function

GetInstanceToExecuteErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
On Error GoTo 0
mstrSource = mstrModuleName & "GetInstanceToExecute"
Err.Raise vbObjectError + errNavInstancesFailed, _
    mstrSource, LoadResString(errNavInstancesFailed)

End Function

Public Function InstancesForStep(lngStepId As Long, ByRef StepStatus As
InstanceStatus) As cInstances
' Returns an array of all the instances for a step
Dim lngIndex As Long
Dim cTempInst As cInstance
Dim cStepInstances As cInstances
Dim cStepRec As cStep

On Error GoTo InstancesForStepErr

Set cStepInstances = New cInstances

For lngIndex = 0 To mcInstances.Count - 1
    Set cTempInst = mcInstances(lngIndex)

    If cTempInst.Step.StepId = lngStepId Then
        cStepInstances.Add cTempInst
    End If
Next lngIndex

If cStepInstances.Count = 0 Then
    Set cStepRec = mcRunSteps.QueryStep(lngStepId)
    If Not mcFailures.ExecuteSubStep(cStepRec.ParentStepId) Then
        StepStatus = gintAborted
    End If
    Set cStepRec = Nothing
End If

' Set the return value of the function to the array of
' constraints that has been built above
Set InstancesForStep = cStepInstances

Set cStepInstances = Nothing
Exit Function

InstancesForStepErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
On Error GoTo 0
mstrSource = mstrModuleName & "InstancesForStep"
Err.Raise vbObjectError + errNavInstancesFailed, mstrSource, _

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```

LoadResString(errNavInstancesFailed)

End Function
Private Sub RemoveFreeProcess(lngRunningProcess As Long)
' Removes the passed in element from the collection of
' free objects

' Confirm that the last element in the array is the one
' we need to delete
If mcFreeSteps(mcFreeSteps.Count - 1) = lngRunningProcess Then
    mcFreeSteps.Delete Position:=mcFreeSteps.Count - 1
Else
' Ask the class to find the element and delete it
    mcFreeSteps.Delete Item:=lngRunningProcess
End If
End Sub
Private Sub AddFreeProcess(lngTerminatedProcess As Long)
' Adds the passed in element to the collection of
' free objects

    mcFreeSteps.Add lngTerminatedProcess
End Sub
Private Sub ResetForm(Optional ByVal lngIndex As Long)

Dim lngTemp As Long

On Error GoTo ResetFormErr

' Check if there are any running instances to wait for
If mcFreeSteps.Count <> glngNumConcurrentProcesses Then

    For lngTemp = 0 To mcFreeSteps.Count - 1
        If mcFreeSteps(lngTemp) = lngIndex Then
            Exit For
        End If
    Next lngTemp

    If lngTemp <= mcFreeSteps.Count - 1 Then
        ' This process that just completed did not exist in the list
        of
        ' free processes
        Call AddFreeProcess(lngIndex)
    End If

    If Not AnyStepRunning(mcFreeSteps, mbarrFree) Then
        WriteToWspLog (mintRunComplete)
        ' All steps are complete
        RaiseEvent RunComplete(Determine64BitTime())
    End If
Else
    WriteToWspLog (mintRunComplete)
    RaiseEvent RunComplete(Determine64BitTime())
End If

```

```

Exit Sub

ResetFormErr:

End Sub
Private Function NewInstanceId() As Long
    ' Will return new instance id's - uses a static counter
    ' that it increments each time
    Static lngInstance As Long

    lngInstance = lngInstance + 1
    NewInstanceId = lngInstance
End Function

Private Function RunPendingStepInBranch(strCurBranchRoot As String, _
    Optional cExecInstance As cInstance = Nothing) As cInstance
    ' Runs a worker step in the branch being executed, if
    ' there are any pending execution
    ' This function is also called when a step has just completed
    ' execution - in which case the terminated instance is
    ' passed in as the optional parameter. When that happens,
    ' we first try to execute the siblings of the terminated
    ' step if any are pending execution.
    ' If the terminated instance has not been passed in, we
    ' start with the dummy root instance and navigate down,
    ' trying to find a pending worker step.

    Dim cExecSubStep As cStep
    Dim cParentInstance As cInstance
    Dim cNextInst As cInstance

    On Error GoTo RunPendingStepInBranchErr

    If Not cExecInstance Is Nothing Then
        ' Called when an instance has terminated
        ' When a worker step terminates, then we need to
        ' decrement the number of running steps on it's
        ' manager
        Set cParentInstance = _

mcInstances.QueryInstance(cExecInstance.ParentInstanceId)

    Else
        If StringEmpty(strCurBranchRoot) Or mcDummyRootInstance Is
Nothing Then
            ' Run complete - event raised by Run method
            Set RunPendingStepInBranch = Nothing
            Exit Function
        End If

        ' If there are no pending steps on the root instance,
        ' then there are no steps within the branch that need
        ' to be executed

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```

        If mcDummyRootInstance.AllComplete Or
mcDummyRootInstance.AllStarted Then
            Set RunPendingStepInBranch = Nothing
            Exit Function
        End If

        Set cParentInstance = mcDummyRootInstance
    End If

    Do
        Set cNextInst = GetSubStepToExecute(cParentInstance)
        If cNextInst Is Nothing Then
            ' There are no steps within the branch that can
            ' be executed - If we are at the dummy instance,
            ' this branch has completed executing
            If cParentInstance.Key = mstrDummyRootKey Then
                Set cNextInst = Nothing
                Exit Do
            Else
                ' Go to the parent instance and try to find
                ' some other sibling is pending execution
                Set cNextInst =
mcInstances.QueryInstance(cParentInstance.ParentInstanceId)

                If cParentInstance.SubSteps.Count = 0 Then
                    cNextInst.ChildTerminated
                End If
            End If
        End If

        BugAssert Not cNextInst Is Nothing
        Set cParentInstance = cNextInst

        Loop While cNextInst.Step.StepType <> gintWorkerStep

        If Not cNextInst Is Nothing Then
            Call ExecuteStep(cNextInst)
        End If

        Set RunPendingStepInBranch = cNextInst

    Exit Function

RunPendingStepInBranchErr:
    ' Log the error code raised by Visual Basic
    Call LogErrors(Errors)
    On Error GoTo 0
    Err.Raise vbObjectError + errNavInstancesFailed, _
        mstrModuleName & "RunPendingStepInBranch",
LoadResString(errNavInstancesFailed)

End Function
Private Function RunPendingSibling(cTermInstance As cInstance, _
    dtmCompleteTime As Currency) As cInstance
    ' This process is called when a step terminates. Tries to

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```

' run a sibling of the terminated step, if one is pending
' execution.

Dim cParentInstance As cInstance
Dim cNextInst As cInstance

On Error GoTo RunPendingSiblingErr

If StringEmpty(mstrCurBranchRoot) Or mcDummyRootInstance Is Nothing
Then
    ' Run complete - event raised by Run method
    Set RunPendingSibling = Nothing
    Exit Function
End If

BugAssert cTermInstance.ParentInstanceId > 0, "Orphaned instance in
array!"

' When a worker step terminates, then we need to
' decrement the number of running steps on it's
' manager
Set cParentInstance =
mcInstances.QueryInstance(cTermInstance.ParentInstanceId)

' Decrement the number of running processes on the
' parent by 1
Call cParentInstance.ChildTerminated(cTermInstance.Step.StepId)

' The first step that terminates has to be a worker
' If it is complete, update the completed steps on the
' parent by 1.
Call cParentInstance.ChildCompleted(cTermInstance.Step.StepId)
cParentInstance.AllStarted = False

Do
    Set cNextInst = GetSubStepToExecute(cParentInstance,
dtmCompleteTime)
    If cNextInst Is Nothing Then
        If cParentInstance.Key = mstrDummyRootKey Then
            Set cNextInst = Nothing
            Exit Do
        Else
            ' Go to the parent instance and try to find
            ' some other sibling is pending execution
            Set cNextInst =
mcInstances.QueryInstance(cParentInstance.ParentInstanceId)
            If cParentInstance.IsRunning Then
                cNextInst.AllStarted = True
            Else
                ' No more sub-steps to execute
                Call
cNextInst.ChildCompleted(cParentInstance.Step.StepId)
                Call
cNextInst.ChildTerminated(cParentInstance.Step.StepId)
                cNextInst.AllStarted = False
            End If
        End If
    End Do

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```

End If
End If

BugAssert Not cNextInst Is Nothing
Set cParentInstance = cNextInst

Loop While cNextInst.Step.StepType <> gintWorkerStep

If Not cNextInst Is Nothing Then
    Call ExecuteStep(cNextInst)
End If

Set RunPendingSibling = cNextInst

Exit Function

RunPendingSiblingErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
On Error GoTo 0
mstrSource = mstrModuleName & "RunPendingSibling"
Err.Raise vbObjectError + errNavInstancesFailed, mstrSource, _
LoadResString(errNavInstancesFailed)

End Function
Private Sub RunPendingSiblings(cTermInstance As cInstance, _
dtmCompleteTime As Currency)
' This process is called when a step terminates. Tries to
' run siblings of the terminated step, if they are pending
' execution.

Dim cExecInst As cInstance

On Error GoTo RunPendingSiblingsErr
BugMessage "In RunPendingSiblings"

' Call a procedure to run the sibling of the terminated
' step, if any. This procedure will also update the
' number of complete/running tasks on the manager steps.
Set cExecInst = RunPendingSibling(cTermInstance, dtmCompleteTime)

If Not cExecInst Is Nothing Then
    Do
        ' Execute any other pending steps in the branch.
        ' The step that has just terminated might be
        ' the last one that was executing in a sub-branch.
        ' That would mean that we can execute another
        ' sub-branch that might involve more than 1 step.
        ' Pass the just executed step as a parameter.
        Set cExecInst = RunPendingStepInBranch(mstrCurBranchRoot,
cExecInst)
    Loop While Not cExecInst Is Nothing
    Else
        If Not mcDummyRootInstance.IsRunning Then
            ' All steps have been executed in the branch - run
            ' a new branch

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        Call RunNewBranch
    Else
        ' There are no more steps to execute in the current
        ' branch but we have running processes.
    End If
End If

Exit Sub

RunPendingSiblingsErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
On Error GoTo 0
mstrSource = mstrModuleName & "RunPendingSiblings"
Err.Raise vbObjectError + errNavInstancesFailed, _
    mstrSource, LoadResString(errNavInstancesFailed)

End Sub

Private Sub NoSubStepsToExecute(cMgrInstance As cInstance, Optional
dtmCompleteTime As Currency = gdtmEmpty)
' Called when we cannot find any more substeps to run for
' manager step - set the allcomplete or allstarted
' properties to true

If cMgrInstance.IsRunning() Then
    cMgrInstance.AllStarted = True
Else
    cMgrInstance.AllComplete = True
    If dtmCompleteTime <> gdtmEmpty Then
        ' Update the end time on the manager step
        Call TimeCompleteUpdateForStep(cMgrInstance,
dtmCompleteTime)
    End If
End If

End Sub

Private Function GetSubStepToExecute(cParentNode As cInstance, _
Optional dtmCompleteTime As Currency = 0) As cInstance
' Returns the child of the passed in node that is to be
' executed next. Checks if we are in the middle of an instance
' being executed in which case it returns the pending
' instance. Creates a new instance if there are pending
' instances for a sub-step.

Dim lngIndex As Long
Dim cSubStepRec As cSubStep
Dim cSubStepDtls As cStep
Dim cSubStepInst As cInstance

On Error GoTo GetSubStepToExecuteErr

' There are a number of cases that need to be accounted
' for here.
' 1. While traversing through all enabled nodes for the

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```

' first time - instance records may not exist for the
' substeps.
' 2. Instance records exist, and there are processes
' that need to be executed for a sub-step
' 3. There are no more processes that need to be currently
' executed (till a process completes)
' 4. There are no more processes that need to be executed
' (All substeps have completed execution)

' This is the only point where we check the Abort flag -
' since this is the heart of the navigation routine that
' selects processes to execute. Also, when a step terminates
' selection of the next process goes through here.
If mblnAbort Then
    Set GetSubStepToExecute = Nothing
    cParentNode.Status = gintAborted
    Exit Function
End If

If mblnAsk Then
    Set GetSubStepToExecute = Nothing
    Exit Function
End If

If Not mcFailures.ExecuteSubStep(cParentNode.Step.StepId) Then
    Set GetSubStepToExecute = Nothing
    cParentNode.Status = gintAborted
    Exit Function
End If

' First check if there are pending steps for the parent!
If cParentNode.IsPending Then
    ' Loop through all the sub-steps for the parent node
    For lngIndex = 0 To cParentNode.SubSteps.Count - 1
        Set cSubStepRec = cParentNode.SubSteps(lngIndex)
        Set cSubStepDtls = mcRunSteps.QueryStep(cSubStepRec.StepId)
        If Not mcInstances.InstanceAborted(cSubStepRec) Then
            ' Check if the sub-step is a worker
            If cSubStepDtls.StepType = gintWorkerStep Then
                ' Find/create an instance to execute
                Set cSubStepInst = GetInstanceToExecute( _
                    cParentNode, cSubStepRec, cSubStepDtls)
                If Not cSubStepInst Is Nothing Then
                    Exit For
                Else
                    ' Continue w/ the next sub-step
                End If
            Else
                ' The sub-step is a manager step
                ' Check if there are any pending instances for
                ' the manager
                Set cSubStepInst =
mcInstances.QueryPendingInstance( _
                    cParentNode.InstanceId, cSubStepRec.StepId)
                If cSubStepInst Is Nothing Then
                    ' Find/create an instance to execute

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```

        Set cSubStepInst = GetInstanceToExecute( _
            cParentNode, cSubStepRec, cSubStepDtls)
        If Not cSubStepInst Is Nothing Then
            Exit For
        Else
            ' Continue w/ the next sub-step
        End If
    Else
        ' We have found a pending instance for the
        ' sub-step (manager) - exit the loop
        Exit For
    End If
End If
End If
Next lngIndex

If lngIndex > cParentNode.SubSteps.Count - 1 Or
cParentNode.SubSteps.Count = 0 Then
    ' If we could not find any sub-steps to execute,
    ' mark the parent node as complete/all started
    Call NoSubStepsToExecute(cParentNode, dtmCompleteTime)
    Set cSubStepInst = Nothing
End If
End If

Set GetSubStepToExecute = cSubStepInst
Exit Function

GetSubStepToExecuteErr:
    ' Log the error code raised by Visual Basic
    Call LogErrors(Errors)
    On Error GoTo 0
    mstrSource = mstrModuleName & "GetSubStepToExecute"
    Err.Raise vbObjectError + errNavInstancesFailed, mstrSource, _
        LoadResString(errNavInstancesFailed)

End Function

Private Sub TimeCompleteUpdateForStep(cMgrInstance As cInstance, ByVal
EndTime As Currency)

    ' Called when there are no more sub-steps to execute for
    ' the manager step. It updates the end time and status on
    ' the manager.
    Dim lElapsed As Long

    On Error GoTo TimeCompleteUpdateForStepErr

    If cMgrInstance.Key <> mstrDummyRootKey Then
        cMgrInstance.EndTime = EndTime
        cMgrInstance.Status = gintComplete
        lElapsed = (EndTime - cMgrInstance.StartTime) * 10000
        cMgrInstance.ElapsedTime = lElapsed
        RaiseEvent StepComplete(cMgrInstance.Step, EndTime,
cMgrInstance.InstanceId, lElapsed)
    End If

```

```

        Exit Sub

TimeCompleteUpdateForStepErr:
    ' Log the error code raised by Visual Basic
    Call LogErrors(Errors)
    WriteError errUpdateDisplayFailed, mstrModuleName &
"TimeCompleteUpdateForStep"

End Sub

Private Function GetFreeObject() As Long

    ' Check the array of free objects and retrieve the first one
    If mcFreeSteps.Count > 0 Then
        GetFreeObject = mcFreeSteps(mcFreeSteps.Count - 1)
    Else
        mstrSource = mstrModuleName & "GetFreeObject"
        ShowError errMaxProcessesExceeded
        On Error GoTo 0
        Err.Raise vbObjectError + errMaxProcessesExceeded, _
            mstrSource, _
            LoadResString(errMaxProcessesExceeded)
    End If

End Function

Private Function StepTerminated(cCompleteStep As cStep, ByVal
dtmCompleteTime As Currency, _
    ByVal lngIndex As Long, ByVal InstanceId As Long, ByVal
ExecutionStatus As InstanceStatus) As cStep
    ' This procedure is called whenever a step terminates.
    Dim cTermRec As cTermStep
    Dim cInstRec As cInstance
    Dim cStartInst As cInstance
    Dim lElapsed As Long
    Dim sLogLabel As String
    Dim LogLabels As New cVectorStr
    Dim iItIndex As Long

    On Error GoTo StepTerminatedErr

    Set cInstRec = mcInstances.QueryInstance(InstanceId)
    If dtmCompleteTime <> 0 And cInstRec.StartTime <> 0 Then
        ' Convert to milliseconds since that is the default precision
        lElapsed = (dtmCompleteTime - cInstRec.StartTime) * 10000
    Else
        lElapsed = 0
    End If

    Set cStartInst = cInstRec
    iItIndex = 0
    Do While cInstRec.Key <> mstrDummyRootKey
        sLogLabel = gstrSQ & cInstRec.Step.StepLabel & gstrSQ

        If iItIndex < cInstRec.Iterators.Count Then

```

```

        If cStartInst.Iterators(iItIndex).StepId =
cInstRec.Step.StepId Then
            sLogLabel = sLogLabel & msIt & gstrSQ &
cStartInst.Iterators(iItIndex).IteratorName & gstrSQ & _
                msItValue & gstrSQ &
cStartInst.Iterators(iItIndex).Value & gstrSQ
                iItIndex = iItIndex + 1
            End If
        End If

        If cInstRec.Key = cStartInst.Key Then
            ' Append the execution status
            sLogLabel = sLogLabel & " Status: " & gstrSQ &
gsExecutionStatus(ExecutionStatus) & gstrSQ
            If ExecutionStatus = gintFailed Then
                ' Append the continuation criteria for the step since it
failed
                sLogLabel = sLogLabel & " Continuation Criteria: " &
gstrSQ & gsContCriteria(cInstRec.Step.ContinuationCriteria) & gstrSQ
            End If
        End If
        LogLabels.Add sLogLabel

        Set cInstRec =
mcInstances.QueryInstance(cInstRec.ParentInstanceId)
        Loop

        Call WriteToWspLog(mintStepComplete, LogLabels, dtmCompleteTime)
        Set LogLabels = Nothing

        ' Adds the terminated step details to a queue.
        Set cTermRec = New cTermStep
        cTermRec.ExecutionStatus = ExecutionStatus
        cTermRec.Index = lngIndex
        cTermRec.InstanceId = InstanceId
        cTermRec.TimeComplete = dtmCompleteTime
        Call mcTermSteps.Add(cTermRec)
        Set cTermRec = Nothing

        RaiseEvent StepComplete(cCompleteStep, dtmCompleteTime, InstanceId,
lElapsed)

        Exit Function

StepTerminatedErr:
    ' Log the error code raised by Visual Basic
    Call LogErrors(Errors)
    WriteError errExecuteBranchFailed, mstrSource
    Call ResetForm(lngIndex)

End Function
Public Property Let RootKey(ByVal vdata As String)

    mstrRootKey = vdata

End Property

```

```

Public Property Get RootKey() As String
    RootKey = mstrRootKey
End Property

Private Function InitExecStep() As cRunStep
    ' Since arrays of objects cannot be declared as WithEvents,
    ' we use a limited number of objects and set a maximum
    ' on the number of steps that can run in parallel
    ' This is a wrapper that will create an instance of
    ' a cExecuteSM object depending on the index
    Dim lngIndex As Long

    On Error GoTo InitExecStepErr

    lngIndex = GetFreeObject

    Select Case lngIndex + 1
        Case 1
            Set cExecStep1 = New cRunStep
            Set InitExecStep = cExecStep1
        Case 2
            Set cExecStep2 = New cRunStep
            Set InitExecStep = cExecStep2
        Case 3
            Set cExecStep3 = New cRunStep
            Set InitExecStep = cExecStep3
        Case 4
            Set cExecStep4 = New cRunStep
            Set InitExecStep = cExecStep4
        Case 5
            Set cExecStep5 = New cRunStep
            Set InitExecStep = cExecStep5
        Case 6
            Set cExecStep6 = New cRunStep
            Set InitExecStep = cExecStep6
        Case 7
            Set cExecStep7 = New cRunStep
            Set InitExecStep = cExecStep7
        Case 8
            Set cExecStep8 = New cRunStep
            Set InitExecStep = cExecStep8
        Case 9
            Set cExecStep9 = New cRunStep
            Set InitExecStep = cExecStep9
        Case 10
            Set cExecStep10 = New cRunStep
            Set InitExecStep = cExecStep10
        Case 11
            Set cExecStep11 = New cRunStep
            Set InitExecStep = cExecStep11
        Case 12
            Set cExecStep12 = New cRunStep
            Set InitExecStep = cExecStep12
        Case 13
            Set cExecStep13 = New cRunStep

```

```

    Set InitExecStep = cExecStep13
Case 14
    Set cExecStep14 = New cRunStep
    Set InitExecStep = cExecStep14
Case 15
    Set cExecStep15 = New cRunStep
    Set InitExecStep = cExecStep15
Case 16
    Set cExecStep16 = New cRunStep
    Set InitExecStep = cExecStep16
Case 17
    Set cExecStep17 = New cRunStep
    Set InitExecStep = cExecStep17
Case 18
    Set cExecStep18 = New cRunStep
    Set InitExecStep = cExecStep18
Case 19
    Set cExecStep19 = New cRunStep
    Set InitExecStep = cExecStep19
Case 20
    Set cExecStep20 = New cRunStep
    Set InitExecStep = cExecStep20
Case 21
    Set cExecStep21 = New cRunStep
    Set InitExecStep = cExecStep21
Case 22
    Set cExecStep22 = New cRunStep
    Set InitExecStep = cExecStep22
Case 23
    Set cExecStep23 = New cRunStep
    Set InitExecStep = cExecStep23
Case 24
    Set cExecStep24 = New cRunStep
    Set InitExecStep = cExecStep24
Case 25
    Set cExecStep25 = New cRunStep
    Set InitExecStep = cExecStep25
Case 26
    Set cExecStep26 = New cRunStep
    Set InitExecStep = cExecStep26
Case 27
    Set cExecStep27 = New cRunStep
    Set InitExecStep = cExecStep27
Case 28
    Set cExecStep28 = New cRunStep
    Set InitExecStep = cExecStep28
Case 29
    Set cExecStep29 = New cRunStep
    Set InitExecStep = cExecStep29
Case 30
    Set cExecStep30 = New cRunStep
    Set InitExecStep = cExecStep30
Case 31
    Set cExecStep31 = New cRunStep
    Set InitExecStep = cExecStep31
Case 32

```

```

    Set cExecStep32 = New cRunStep
    Set InitExecStep = cExecStep32
Case 33
    Set cExecStep33 = New cRunStep
    Set InitExecStep = cExecStep33
Case 34
    Set cExecStep34 = New cRunStep
    Set InitExecStep = cExecStep34
Case 35
    Set cExecStep35 = New cRunStep
    Set InitExecStep = cExecStep35
Case 36
    Set cExecStep36 = New cRunStep
    Set InitExecStep = cExecStep36
Case 37
    Set cExecStep37 = New cRunStep
    Set InitExecStep = cExecStep37
Case 38
    Set cExecStep38 = New cRunStep
    Set InitExecStep = cExecStep38
Case 39
    Set cExecStep39 = New cRunStep
    Set InitExecStep = cExecStep39
Case 40
    Set cExecStep40 = New cRunStep
    Set InitExecStep = cExecStep40
Case 41
    Set cExecStep41 = New cRunStep
    Set InitExecStep = cExecStep41
Case 42
    Set cExecStep42 = New cRunStep
    Set InitExecStep = cExecStep42
Case 43
    Set cExecStep43 = New cRunStep
    Set InitExecStep = cExecStep43
Case 44
    Set cExecStep44 = New cRunStep
    Set InitExecStep = cExecStep44
Case 45
    Set cExecStep45 = New cRunStep
    Set InitExecStep = cExecStep45
Case 46
    Set cExecStep46 = New cRunStep
    Set InitExecStep = cExecStep46
Case 47
    Set cExecStep47 = New cRunStep
    Set InitExecStep = cExecStep47
Case 48
    Set cExecStep48 = New cRunStep
    Set InitExecStep = cExecStep48
Case 49
    Set cExecStep49 = New cRunStep
    Set InitExecStep = cExecStep49
Case 50
    Set cExecStep50 = New cRunStep
    Set InitExecStep = cExecStep50

```



```
Case 51
  Set cExecStep51 = New cRunStep
  Set InitExecStep = cExecStep51
Case 52
  Set cExecStep52 = New cRunStep
  Set InitExecStep = cExecStep52
Case 53
  Set cExecStep53 = New cRunStep
  Set InitExecStep = cExecStep53
Case 54
  Set cExecStep54 = New cRunStep
  Set InitExecStep = cExecStep54
Case 55
  Set cExecStep55 = New cRunStep
  Set InitExecStep = cExecStep55
Case 56
  Set cExecStep56 = New cRunStep
  Set InitExecStep = cExecStep56
Case 57
  Set cExecStep57 = New cRunStep
  Set InitExecStep = cExecStep57
Case 58
  Set cExecStep58 = New cRunStep
  Set InitExecStep = cExecStep58
Case 59
  Set cExecStep59 = New cRunStep
  Set InitExecStep = cExecStep59
Case 60
  Set cExecStep60 = New cRunStep
  Set InitExecStep = cExecStep60
Case 61
  Set cExecStep61 = New cRunStep
  Set InitExecStep = cExecStep61
Case 62
  Set cExecStep62 = New cRunStep
  Set InitExecStep = cExecStep62
Case 63
  Set cExecStep63 = New cRunStep
  Set InitExecStep = cExecStep63
Case 64
  Set cExecStep64 = New cRunStep
  Set InitExecStep = cExecStep64
Case 65
  Set cExecStep65 = New cRunStep
  Set InitExecStep = cExecStep65
Case 66
  Set cExecStep66 = New cRunStep
  Set InitExecStep = cExecStep66
Case 67
  Set cExecStep67 = New cRunStep
  Set InitExecStep = cExecStep67
Case 68
  Set cExecStep68 = New cRunStep
  Set InitExecStep = cExecStep68
Case 69
  Set cExecStep69 = New cRunStep
```

```
  Set InitExecStep = cExecStep69
Case 70
  Set cExecStep70 = New cRunStep
  Set InitExecStep = cExecStep70
Case 71
  Set cExecStep71 = New cRunStep
  Set InitExecStep = cExecStep71
Case 72
  Set cExecStep72 = New cRunStep
  Set InitExecStep = cExecStep72
Case 73
  Set cExecStep73 = New cRunStep
  Set InitExecStep = cExecStep73
Case 74
  Set cExecStep74 = New cRunStep
  Set InitExecStep = cExecStep74
Case 75
  Set cExecStep75 = New cRunStep
  Set InitExecStep = cExecStep75
Case 76
  Set cExecStep76 = New cRunStep
  Set InitExecStep = cExecStep76
Case 77
  Set cExecStep77 = New cRunStep
  Set InitExecStep = cExecStep77
Case 78
  Set cExecStep78 = New cRunStep
  Set InitExecStep = cExecStep78
Case 79
  Set cExecStep79 = New cRunStep
  Set InitExecStep = cExecStep79
Case 80
  Set cExecStep80 = New cRunStep
  Set InitExecStep = cExecStep80
Case 81
  Set cExecStep81 = New cRunStep
  Set InitExecStep = cExecStep81
Case 82
  Set cExecStep82 = New cRunStep
  Set InitExecStep = cExecStep82
Case 83
  Set cExecStep83 = New cRunStep
  Set InitExecStep = cExecStep83
Case 84
  Set cExecStep84 = New cRunStep
  Set InitExecStep = cExecStep84
Case 85
  Set cExecStep85 = New cRunStep
  Set InitExecStep = cExecStep85
Case 86
  Set cExecStep86 = New cRunStep
  Set InitExecStep = cExecStep86
Case 87
  Set cExecStep87 = New cRunStep
  Set InitExecStep = cExecStep87
Case 88
```

```

        Set cExecStep88 = New cRunStep
        Set InitExecStep = cExecStep88
    Case 89
        Set cExecStep89 = New cRunStep
        Set InitExecStep = cExecStep89
    Case 90
        Set cExecStep90 = New cRunStep
        Set InitExecStep = cExecStep90
    Case 91
        Set cExecStep91 = New cRunStep
        Set InitExecStep = cExecStep91
    Case 92
        Set cExecStep92 = New cRunStep
        Set InitExecStep = cExecStep92
    Case 93
        Set cExecStep93 = New cRunStep
        Set InitExecStep = cExecStep93
    Case 94
        Set cExecStep94 = New cRunStep
        Set InitExecStep = cExecStep94
    Case 95
        Set cExecStep95 = New cRunStep
        Set InitExecStep = cExecStep95
    Case 96
        Set cExecStep96 = New cRunStep
        Set InitExecStep = cExecStep96
    Case 97
        Set cExecStep97 = New cRunStep
        Set InitExecStep = cExecStep97
    Case 98
        Set cExecStep98 = New cRunStep
        Set InitExecStep = cExecStep98
    Case 99
        Set cExecStep99 = New cRunStep
        Set InitExecStep = cExecStep99
    Case Else
        Set InitExecStep = Nothing
    End Select

    BugMessage "Sending cExecStep" & (lngIndex + 1) & "!"

    If Not InitExecStep Is Nothing Then
        InitExecStep.Index = lngIndex

        ' Remove this element from the collection of free objects
        Call RemoveFreeProcess(lngIndex)
    End If

    Exit Function

InitExecStepErr:
    ' Log the error code raised by Visual Basic
    Call LogErrors(Errors)
    Set InitExecStep = Nothing

End Function

```

```

Public Sub Run()
    ' Calls procedures to build a list of all the steps that
    ' need to be executed and to execute them
    ' Determines whether the run has started/terminated and
    ' raises the Run Start and Complete events.
    Dim cTempStep As cStep

    On Error GoTo RunErr

    If StringEmpty(mstrRootKey) Then
        Call ShowError(errExecuteBranchFailed)
        On Error GoTo 0
        Err.Raise vbObjectError + errExecuteBranchFailed, mstrModuleName
    & "Run", -
        LoadResString(errExecuteBranchFailed)
    Else
        ' Execute the first branch
        WriteToWspLog (mintRunStart)
        RaiseEvent RunStart(Determine64BitTime(), mcWspLog.FileName)

        If mcNavSteps.HasChild(StepKey:=mstrRootKey) Then
            Set cTempStep = mcNavSteps.ChildStep(StepKey:=mstrRootKey)
            mstrCurBranchRoot = MakeKeyValid(cTempStep.StepId,
            cTempStep.StepType)

            Call CreateDummyInstance(mstrCurBranchRoot)

            ' Run all pending steps in the branch
            If Not RunBranch(mstrCurBranchRoot) Then
                ' Execute a new branch if there aren't any
                ' steps to run
                Call RunNewBranch
            End If
        Else
            WriteToWspLog (mintRunComplete)
            ' No children to execute - the run is complete
            RaiseEvent RunComplete(Determine64BitTime())
        End If
    End If

    Exit Sub

RunErr:
    ' Log the error code raised by Visual Basic
    Call LogErrors(Errors)
    Call ShowError(errExecuteBranchFailed, OptArgs:=mstrCurBranchRoot)
    Call ResetForm

End Sub

Private Sub RunNewBranch()
    ' We will build a tree of all instances that occur and
    ' the count of the sub-steps that are running will be
    ' stored at each node in the tree (maintained internally
    ' as an array). Since there can be multiple iterations
    ' of the top level nodes running at the same time, we
    ' create a dummy node at the root that keeps a record of

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```

' the instances of the top level node.

' Determines whether the run has started/terminated and
' raises the Run Start and Complete events.
Dim cNextStep As cStep
Dim bRunComplete As Boolean

On Error GoTo RunNewBranchErr

bRunComplete = False

Do
    If StringEmpty(mstrCurBranchRoot) Then
        Exit Do
        On Error GoTo 0
        Err.Raise vbObjectError + errExecuteBranchFailed,
mstrSource, _
        LoadResString(errExecuteBranchFailed)
    Else
        Set cNextStep =
mcNavSteps.NextStep(StepKey:=mstrCurBranchRoot)
        If cNextStep Is Nothing Then
            mstrCurBranchRoot = gstrEmptyString
            bRunComplete = True
            Exit Do
        Else
            ' Starting execution of a new branch - initialize the
            ' module-level variable
            mstrCurBranchRoot = MakeKeyValid(cNextStep.StepId,
cNextStep.StepType)
            Call CreateDummyInstance(mstrCurBranchRoot)
            End If
        End If
        Debug.Print "Running new branch: " & mstrCurBranchRoot

' Loop until we find a branch that has steps to execute
Loop While Not RunBranch(mstrCurBranchRoot)

If bRunComplete Then
    WriteToWspLog (mintRunComplete)
    ' Run is complete
    RaiseEvent RunComplete(Determine64BitTime())
End If

Exit Sub

RunNewBranchErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
Call ShowError(errExecuteBranchFailed, OptArgs:=mstrCurBranchRoot)
On Error GoTo 0
mstrSource = mstrModuleName & "RunNewBranch"
Err.Raise vbObjectError + errExecuteBranchFailed, mstrSource, _
    LoadResString(errExecuteBranchFailed)

End Sub

```

```

Private Function RunBranch(strRootNode As String) As Boolean
' This procedure is called to run all the necessary steps
' in a branch. It can also be called when a step terminates,
' in which case the terminated step is passed in as the
' optional parameter. When a step terminates, we need to
' either wait for some other steps to terminate before
' we execute more steps or run as many steps as necessary
' Returns True if there are steps currently executing
' in the branch, else returns False
Dim cRunning As cInstance

On Error GoTo RunBranchErr

If Not StringEmpty(strRootNode) Then
' Call a procedure to execute all the enabled steps
' in the branch - will return the step node that is
' being executed - nothing means 'No more steps to
' execute in the branch'.
Do
    Set cRunning = RunPendingStepInBranch(strRootNode, cRunning)

Loop While Not cRunning Is Nothing

RunBranch = mcDummyRootInstance.IsRunning
End If

Exit Function

RunBranchErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
On Error GoTo 0
mstrSource = mstrModuleName & "RunBranch"
Err.Raise vbObjectError + errExecuteBranchFailed, _
    mstrSource, LoadResString(errExecuteBranchFailed)

End Function

Private Sub TimeUpdateForProcess(StepRecord As cStep, _
    ByVal InstanceId As Long, _
    Optional ByVal StartTime As Currency = 0, _
    Optional ByVal EndTime As Currency = 0, _
    Optional ByVal ElapsedTime As Long = 0, _
    Optional Command As String)
' We do not maintain start and end timestamps for the constraint
' of a step. Hence we check if the process that just started/
' terminated is the worker step that is being executed. If so,
' we update the start/end time and status on the instance record.

Dim cInstanceRec As cInstance
Dim sItVal As String

On Error GoTo TimeUpdateForProcessErr

Set cInstanceRec = mcInstances.QueryInstance(InstanceId)

If StartTime = 0 Then

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        RaiseEvent ProcessComplete(StepRecord, EndTime, InstanceId,
ElapsedTime)
    Else
        sItVal = GetInstanceItValue(cInstanceRec)
        RaiseEvent ProcessStart(StepRecord, Command, StartTime,
InstanceId, _
            cInstanceRec.ParentInstanceId, sItVal)
    End If

    Call cInstanceRec.UpdateStartTime(StepRecord.StepId, StartTime,
EndTime, ElapsedTime)

Exit Sub

TimeUpdateForProcessErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
WriteError errUpdateDisplayFailed, mstrModuleName &
"TimeUpdateForProcess"

End Sub

Private Sub TimeStartUpdateForStep(StepRecord As cStep, _
    ByVal InstanceId As Long, _
    ByVal StartTime As Currency)

' Called when a step starts execution. Checks if this is the
' first enabled child of the manager step. If so, updates
' the start time and status on the manager.
' Also raises the Step Start event for the completed step.

Dim cStartInst As cInstance
Dim cInstanceRec As cInstance
Dim LogLabels As New cVectorStr
Dim iItIndex As Long
Dim sLogLabel As String
Dim sPath As String
Dim sIt As String
Dim sItVal As String

On Error GoTo TimeStartUpdateForStepErr

Set cStartInst = mcInstances.QueryInstance(InstanceId)

' Determine the step path and iterator values for the step and raise
a step start event
Set cInstanceRec = cStartInst
Do While cInstanceRec.Key <> mstrDummyRootKey
    If Not StringEmpty(sPath) Then
        sPath = sPath & gstrFileSeparator
    End If
    sPath = sPath & gstrSQ & cInstanceRec.Step.StepLabel & gstrSQ
    Set cInstanceRec =
mcInstances.QueryInstance(cInstanceRec.ParentInstanceId)
Loop

For iItIndex = cStartInst.Iterators.Count - 1 To 0 Step -1

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        If Not StringEmpty(sIt) Then
            sIt = sIt & gstrFileSeparator
        End If
        sIt = sIt & gstrSQ & cStartInst.Iterators(iItIndex).Value &
gstrSQ
    Next iItIndex

    sItVal = GetInstanceItValue(cStartInst)
    RaiseEvent StepStart(StepRecord, StartTime, InstanceId,
cStartInst.ParentInstanceId, _
        sPath, sIt, sItVal)

    iItIndex = 0
    Set cInstanceRec = cStartInst
    ' Raise a StepStart event for the manager step, if this is it's
first sub-step being executed
    Do While cInstanceRec.Key <> mstrDummyRootKey

        sLogLabel = gstrSQ & cInstanceRec.Step.StepLabel & gstrSQ
        If iItIndex < cStartInst.Iterators.Count Then
            If cStartInst.Iterators(iItIndex).StepId =
cInstanceRec.Step.StepId Then
                sLogLabel = sLogLabel & msIt & gstrSQ &
cStartInst.Iterators(iItIndex).IteratorName & gstrSQ & _
                    msItValue & gstrSQ &
cStartInst.Iterators(iItIndex).Value & gstrSQ
                iItIndex = iItIndex + 1
            End If
        End If
        LogLabels.Add sLogLabel

        If cInstanceRec.Key <> cStartInst.Key And cInstanceRec.StartTime
= 0 Then
            cInstanceRec.StartTime = StartTime
            cInstanceRec.Status = gintRunning
            sItVal = GetInstanceItValue(cInstanceRec)
            ' The step path and iterator values are not needed for
manager steps, since
            ' they are primarily used by the run status form
            RaiseEvent StepStart(cInstanceRec.Step, StartTime,
cInstanceRec.InstanceId, _
                cInstanceRec.ParentInstanceId, gstrEmptyString,
gstrEmptyString, _
                    sItVal)
        End If

        Set cInstanceRec =
mcInstances.QueryInstance(cInstanceRec.ParentInstanceId)
    Loop

    Call WriteToWspLog(mintStepStart, LogLabels, StartTime)
    Set LogLabels = Nothing

Exit Sub

TimeStartUpdateForStepErr:

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```

' Log the error code raised by Visual Basic
Call LogErrors(Errors)
WriteError errUpdateDisplayFailed, mstrModuleName &
"TimeStartUpdateForStep"

End Sub
Private Sub WriteToWspLog(iLogEvent As WspLogEvents, Optional StepDtls
As cVectorStr, _
Optional dtStamp As Currency = gdtmEmpty)

' Writes to the workspace log that is generated for the run. The
last three
' parameters are valid only for Step Start and Step Complete events.
Static bError As Boolean
Dim sLabel As String
Dim lIndex As Long
Dim bHdr As Boolean
Dim cTempConn As cConnection

On Error GoTo WriteToWspLogErr

Select Case iLogEvent
Case mintRunStart
Set mcWspLog = New cFileSM
mcWspLog.FileName = GetDefaultDir(WspId, mcParameters) &
gstrFileSeparator & _
Trim(Str(RunId)) & gstrFileSeparator & "SMLog-" &
Format(Now, FMT_WSP_LOG_FILE) & gstrLogFileSuffix
mcWspLog.WriteLine (JulianDateToString(Determine64BitTime())
& " Start Run: " & vbTab & gstrSQ &
GetWorkspaceDetails(WorkspaceId:=WspId)) & gstrSQ

' Write all current parameter values to the log
bHdr = False
For lIndex = 0 To mcParameters.ParameterCount - 1
If mcParameters(lIndex).ParameterType <>
gintParameterApplication Then
If Not bHdr Then
mcWspLog.WriteField
JulianDateToString(Determine64BitTime()) & " Parameters: "
bHdr = True
Else
mcWspLog.WriteField vbTab & vbTab & vbTab
End If
mcWspLog.WriteLine vbTab & gstrSQ &
mcParameters(lIndex).ParameterName & gstrSQ & vbTab & vbTab & gstrSQ &
mcParameters(lIndex).ParameterValue & gstrSQ
End If
Next lIndex

' Write all connection properties to the log
For lIndex = 0 To RunConnections.Count - 1
Set cTempConn = RunConnections(lIndex)
If lIndex = 0 Then
mcWspLog.WriteField
JulianDateToString(Determine64BitTime()) & " Connections: "

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Else
mcWspLog.WriteField vbTab & vbTab & vbTab
End If
mcWspLog.WriteLine vbTab & gstrSQ &
cTempConn.ConnectionName & gstrSQ & _
vbTab & vbTab & gstrSQ &
cTempConn.ConnectionValue & gstrSQ & _
vbTab & "No Count: " & gstrSQ &
cTempConn.NoCountDisplay & gstrSQ & gstrBlank & _
"No Execute: " & gstrSQ & cTempConn.NoExecute &
gstrSQ & gstrBlank & _
"Parse Query Only: " & gstrSQ &
cTempConn.ParseQueryOnly & gstrSQ & gstrBlank & _
"Quoted Identifiers: " & gstrSQ &
cTempConn.QuotedIdentifiers & gstrSQ & gstrBlank & _
"ANSI Nulls: " & gstrSQ & cTempConn.AnsiNulls &
gstrSQ & gstrBlank & _
"Show Query Plan: " & gstrSQ &
cTempConn.ShowQueryPlan & gstrSQ & gstrBlank & _
"Show Stats Time: " & gstrSQ &
cTempConn.ShowStatsTime & gstrSQ & gstrBlank & _
"Show Stats IO: " & gstrSQ &
cTempConn.ShowStatsIO & gstrSQ & gstrBlank & _
"Row Count" & gstrSQ & cTempConn.RowCount &
gstrSQ & gstrBlank & _
"Query Timeout" & gstrSQ &
cTempConn.QueryTimeout & gstrSQ
Next lIndex

Case mintRunComplete
BugAssert Not mcWspLog Is Nothing
mcWspLog.WriteLine (JulianDateToString(Determine64BitTime())
& " Comp. Run: " & vbTab & gstrSQ &
GetWorkspaceDetails(WorkspaceId:=WspId)) & gstrSQ
Set mcWspLog = Nothing

Case mintStepStart
For lIndex = StepDtls.Count - 1 To 0 Step -1
sLabel = StepDtls(lIndex)
If lIndex = StepDtls.Count - 1 Then
mcWspLog.WriteLine JulianDateToString(dtStamp) & "
Start Step: " & vbTab & sLabel
Else
mcWspLog.WriteLine vbTab & vbTab & vbTab & vbTab &
sLabel
End If
Next lIndex

Case mintStepComplete
For lIndex = StepDtls.Count - 1 To 0 Step -1
sLabel = StepDtls(lIndex)
If lIndex = StepDtls.Count - 1 Then
mcWspLog.WriteLine JulianDateToString(dtStamp) & "
Comp. Step: " & vbTab & sLabel
Else

```

```

        mcWspLog.WriteLine vbTab & vbTab & vbTab & vbTab &
sLabel
        End If
    Next lIndex

End Select

Exit Sub

WriteToWspLogErr:
    If Not bError Then
        bError = True
    End If

End Sub

'Private Sub WriteToWspLog(iLogEvent As WspLogEvents, Optional StepDtls
As cVectorStr, _
'    Optional dtStamp As Date = gdtmEmpty)
'
'    This function uses the LogWriter dll - memory corruption problems
'    since the vb exe
'    and the vc Execute Dll both use the same dll to write.
'    ' Writes to the workspace log that is generated for the run. The
'    last three
'    ' parameters are valid only for StepStart and StepComplete events.
'    Static bError As Boolean
'    Static sFile As String
'    Dim sLabel As String
'    Dim lIndex As Long
'    Dim bHdr As Boolean
'
'    On Error GoTo WriteToWspLogErr
'
'    Select Case iLogEvent
'        Case mintRunStart
'            Set mcWspLog = New LOGWRITERLib.SMLog
'            sFile = App.Path & "\" & "SMLog-" & Format(Now,
FMT_WSP_LOG_FILE) & gstrLogFileSuffix
'            mcWspLog.FileName = sFile
'            mcWspLog.Init
'            mcWspLog.WriteLine (Format(Now, FMT_WSP_LOG_DATE) & " Start
Run: " & vbTab & gstrSQ & GetWorkspaceDetails(WorkspaceId:=WspId)) &
gstrSQ
'
'            ' Write all current parameter values to the log
'            bHdr = False
'            For lIndex = 0 To mcParameters.ParameterCount - 1
'                If mcParameters(lIndex).ParameterType <>
gintParameterApplication Then
'                    If Not bHdr Then
'                        mcWspLog.WriteLine Format(Now,
FMT_WSP_LOG_DATE) & " Parameters: " & vbTab & gstrSQ &
mcParameters(lIndex).ParameterName & gstrSQ & vbTab & vbTab & gstrSQ &
mcParameters(lIndex).ParameterValue & gstrSQ
'                            bHdr = True
'                        Else

```

```

'                            'mcWspLog.WriteLine vbTab & vbTab & vbTab &
vbTab & gstrSQ & mcParameters(lIndex).ParameterName & gstrSQ & vbTab &
vbTab & gstrSQ & mcParameters(lIndex).ParameterValue & gstrSQ
'                                End If
'                            End If
'                        Next lIndex
'
'                    Case mintRunComplete
'                        BugAssert Not mcWspLog Is Nothing
'                        mcWspLog.WriteLine (Format(Now, FMT_WSP_LOG_DATE) & " Comp.
Run: " & vbTab & gstrSQ & GetWorkspaceDetails(WorkspaceId:=WspId)) &
gstrSQ
'                            Set mcWspLog = Nothing
'
'                    Case mintStepStart
'                        For lIndex = StepDtls.Count - 1 To 0 Step -1
'                            sLabel = StepDtls(lIndex)
'                            If lIndex = StepDtls.Count - 1 Then
'                                mcWspLog.WriteLine Format(dtStamp,
FMT_WSP_LOG_DATE) & " Start Step: " & vbTab & sLabel
'                                    Else
'                                        mcWspLog.WriteLine vbTab & vbTab & vbTab & vbTab &
sLabel
'                                            End If
'                                        Next lIndex
'
'                                    Case mintStepComplete
'                                        For lIndex = StepDtls.Count - 1 To 0 Step -1
'                                            sLabel = StepDtls(lIndex)
'                                            If lIndex = StepDtls.Count - 1 Then
'                                                mcWspLog.WriteLine Format(dtStamp,
FMT_WSP_LOG_DATE) & " Comp. Step: " & vbTab & sLabel
'                                                    Else
'                                                        mcWspLog.WriteLine vbTab & vbTab & vbTab & vbTab &
sLabel
'                                                            End If
'                                                        Next lIndex
'
'                                                    End Select
'
'                                                Exit Sub
'
'                                            WriteToWspLogErr:
'                                                If Not bError Then
'                                                    bError = True
'                                                End If
'                                            End Sub
'
'                                        Public Property Get WspPreExecution() As Variant
'                                            WspPreExecution = mcvntWspPreCons
'                                        End Property
'                                        Public Property Let WspPreExecution(ByVal vdata As Variant)
'                                            mcvntWspPreCons = vdata
'                                        End Property

```

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Public Property Get WspPostExecute() As Variant
    WspPostExecute = mcvntWspPostCons
End Property
Public Property Let WspPostExecute(ByVal vdata As Variant)
    mcvntWspPostCons = vdata
End Property

Private Sub ExecuteStep(cCurStep As cInstance)
    ' Initializes a cRunStep object with all the properties
    ' corresponding to the step to be executed and calls it's
    ' execute method to execute the step

    Dim cExecStep As cRunStep

    On Error GoTo ExecuteStepErr
    mstrSource = mstrModuleName & "ExecuteStep"

    ' Confirm that the step is a worker
    If cCurStep.Step.StepType <> gintWorkerStep Then
        On Error GoTo 0
        Err.Raise vbObjectError + errExecInstanceFailed, mstrSource, _
            LoadResString(errExecInstanceFailed)
    End If

    Set cExecStep = InitExecStep()
    ' Exceeded the number of processes that we can run simultaneously
    If cExecStep Is Nothing Then
        ' Raise an error
        On Error GoTo 0
        Err.Raise vbObjectError + errProgramError, mstrSource, _
            LoadResString(errProgramError)
    End If

    ' Initialize the instance id - not needed for step execution
    ' but necessary to identify later which instance completed
    cExecStep.InstanceId = cCurStep.InstanceId

    Set cExecStep.ExecuteStep = cCurStep.Step
    Set cExecStep.Iterators = cCurStep.Iterators
    Set cExecStep.Globals = mcRunSteps
    Set cExecStep.WspParameters = mcParameters
    Set cExecStep.WspConnections = RunConnections
    Set cExecStep.WspConnDtls = RunConnDtls

    ' Initialize all the pre and post-execution constraints that
    ' have been defined globally for the workspace
    cExecStep.WspPreCons = mcvntWspPreCons
    cExecStep.WspPostCons = mcvntWspPostCons

    ' Initialize all the pre and post-execution constraints for
    ' the step being executed
    cExecStep.PreCons = DetermineConstraints(cCurStep, gintPreStep)
    cExecStep.PostCons = DetermineConstraints(cCurStep, gintPostStep)

    cExecStep.RunId = RunId
    cExecStep.CreateInputFiles = CreateInputFiles

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    ' Call the execute method to execute the step
    cExecStep.Execute

    Set cExecStep = Nothing

    Exit Sub

ExecuteStepErr:
    ' Log the error code raised by Visual Basic
    Call LogErrors(Errors)
    On Error GoTo 0
    Call ExecutionFailed(cExecStep)

End Sub

Public Property Set Steps(cRunSteps As cArrSteps)

    Set mcRunSteps = cRunSteps
    Set mcNavSteps.StepRecords = cRunSteps

End Property
Public Property Set Parameters(cParameters As cArrParameters)
    ' A reference to the parameter array - we use it to
    ' substitute parameter values in the step text

    Set mcParameters = cParameters

End Property
Public Property Get Steps() As cArrSteps

    Set Steps = mcRunSteps

End Property
Public Property Get Constraints() As cArrConstraints

    Set Constraints = mcRunConstraints

End Property
Public Property Set Constraints(vdata As cArrConstraints)

    Set mcRunConstraints = vdata

End Property

Private Sub cExecStep1_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep1_ProcessStart(cStepRecord As cStep, _

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        strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep1_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId As Long)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep1.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep1_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep9_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep9_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep9_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId As Long)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep9.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep9_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

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        Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep10_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep10_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep10_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId As Long)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep10.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep10_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep11_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep11_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

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Private Sub cExecStep11_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
    InstanceStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep11.Index,
    InstanceId, Status)

End Sub

Private Sub cExecStep11_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep12_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep12_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
    Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep12_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
    InstanceStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep12.Index,
    InstanceId, Status)

End Sub

Private Sub cExecStep12_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep13_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep13_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
    Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep13_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
    InstanceStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep13.Index,
    InstanceId, Status)

End Sub

Private Sub cExecStep13_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep14_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep14_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
    Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep14_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
    InstanceStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep14.Index,
    InstanceId, Status)

End Sub

```

```

Private Sub cExecStep14_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub
Private Sub cExecStep15_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep15_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
    Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep15_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
    InstanceStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep15.Index,
    InstanceId, Status)
End Sub

Private Sub cExecStep15_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub
Private Sub cExecStep16_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep16_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
    Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep16_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
    InstanceStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep16.Index,
    InstanceId, Status)
End Sub
Private Sub cExecStep16_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

```

```

End Sub
Private Sub cExecStep16_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
    InstanceStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep16.Index,
    InstanceId, Status)
End Sub

Private Sub cExecStep16_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub
Private Sub cExecStep17_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep17_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
    Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep17_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
    InstanceStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep17.Index,
    InstanceId, Status)
End Sub

Private Sub cExecStep17_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep18_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

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    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep18_ProcessStart(cStepRecord As cStep, _
strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep18_StepComplete(cStepRecord As cStep, _
dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId As Long)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep18.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep18_StepStart(cStepRecord As cStep, _
dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep19_ProcessComplete(cStepRecord As cStep, _
dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep19_ProcessStart(cStepRecord As cStep, _
strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep19_StepComplete(cStepRecord As cStep, _
dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId As Long)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep19.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep19_StepStart(cStepRecord As cStep, _
dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

```

```

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep19.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep19_StepStart(cStepRecord As cStep, _
dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep20_ProcessComplete(cStepRecord As cStep, _
dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep20_ProcessStart(cStepRecord As cStep, _
strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep20_StepComplete(cStepRecord As cStep, _
dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId As Long)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep20.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep20_StepStart(cStepRecord As cStep, _
dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep21_ProcessComplete(cStepRecord As cStep, _
dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep21_ProcessStart(cStepRecord As cStep, _
strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

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```

        Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep21_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId As Long)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep21.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep21_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep22_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep22_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep22_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId As Long)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep22.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep22_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep23_ProcessComplete(cStepRecord As cStep, _

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    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep23_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep23_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId As Long)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep23.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep23_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep24_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep24_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep24_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId As Long)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep24.Index,
InstanceId, Status)

```

```

End Sub

Private Sub cExecStep24_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep25_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep25_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
    Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep25_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
    InstanceStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep25.Index,
    InstanceId, Status)

End Sub

Private Sub cExecStep25_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep26_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep26_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
    Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    StartTime:=dtmStartTime, Command:=strCommand)

End Sub

```

```

End Sub

Private Sub cExecStep26_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
    InstanceStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep26.Index,
    InstanceId, Status)

End Sub

Private Sub cExecStep26_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep27_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep27_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
    Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep27_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
    InstanceStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep27.Index,
    InstanceId, Status)

End Sub

Private Sub cExecStep27_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep28_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

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    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep28_ProcessStart(cStepRecord As cStep, _
strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep28_StepComplete(cStepRecord As cStep, _
dtmEndTime As Currency, InstanceId As Long, Status As
InstanceStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep28.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep28_StepStart(cStepRecord As cStep, _
dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep29_ProcessComplete(cStepRecord As cStep, _
dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep29_ProcessStart(cStepRecord As cStep, _
strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep29_StepComplete(cStepRecord As cStep, _
dtmEndTime As Currency, InstanceId As Long, Status As
InstanceStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep29.Index,
InstanceId, Status)
End Sub

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Private Sub cExecStep29_StepStart(cStepRecord As cStep, _
dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep30_ProcessComplete(cStepRecord As cStep, _
dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep30_ProcessStart(cStepRecord As cStep, _
strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep30_StepComplete(cStepRecord As cStep, _
dtmEndTime As Currency, InstanceId As Long, Status As
InstanceStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep30.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep30_StepStart(cStepRecord As cStep, _
dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep31_ProcessComplete(cStepRecord As cStep, _
dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep31_ProcessStart(cStepRecord As cStep, _
strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

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Private Sub cExecStep31_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep31.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep31_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep32_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep32_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep32_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep32.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep32_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep33_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

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End Sub

Private Sub cExecStep33_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep33_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep33.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep33_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep34_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep34_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep34_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep34.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep34_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

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    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep35_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep35_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep35_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep35.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep35_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep36_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep36_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep36_StepComplete(cStepRecord As cStep, _

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    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep36.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep36_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep37_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep37_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep37_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep37.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep37_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep38_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

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Private Sub cExecStep38_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep38_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId As Long)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep38.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep38_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep39_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep39_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep39_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId As Long)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep39.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep39_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

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End Sub

Private Sub cExecStep40_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep40_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep40_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId As Long)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep40.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep40_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep41_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep41_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep41_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId As Long)

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    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep41.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep41_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep42_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep42_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep42_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep42.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep42_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep43_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep43_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

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    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep43_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep43.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep43_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep44_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep44_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep44_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep44.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep44_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep45_ProcessComplete(cStepRecord As cStep, _

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        dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep45_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep45_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep45.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep45_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep46_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep46_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep46_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep46.Index,
InstanceId, Status)

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End Sub

Private Sub cExecStep46_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep47_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep47_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep47_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep47.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep47_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep48_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep48_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

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End Sub

Private Sub cExecStep48_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep48.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep48_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep49_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep49_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep49_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep49.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep49_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep50_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep50_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep50_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep50.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep50_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep51_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep51_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep51_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep51.Index,
InstanceId, Status)

End Sub

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Private Sub cExecStep51_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep52_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep52_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep52_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep52.Index,
    InstanceId, Status)

End Sub

Private Sub cExecStep52_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep53_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep53_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    StartTime:=dtmStartTime, Command:=strCommand)

End Sub

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Private Sub cExecStep53_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep53.Index,
    InstanceId, Status)

End Sub

Private Sub cExecStep53_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep54_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep54_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep54_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep54.Index,
    InstanceId, Status)

End Sub

Private Sub cExecStep54_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep55_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

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End Sub
Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

Private Sub cExecStep55_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)
    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep55_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId)
    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep55.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep55_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)
    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep56_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)
    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep56_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)
    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep56_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId)
    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep56.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep56_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)
    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep57_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)
    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep57_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)
    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep57_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId)
    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep57.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep57_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)
    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep58_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)
    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep58_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)
    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep58_StepComplete(cStepRecord As cStep, _

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        dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep58.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep58_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep59_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep59_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep59_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep59.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep59_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep60_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

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Private Sub cExecStep60_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep60_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep60.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep60_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep61_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep61_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep61_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep61.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep61_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

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End Sub

Private Sub cExecStep62_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep62_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep62_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep62.Index,
    InstanceId, Status)

End Sub

Private Sub cExecStep62_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep63_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep63_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep63_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep63.Index,
    InstanceId, Status)

End Sub

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    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep63.Index,
    InstanceId, Status)

End Sub

Private Sub cExecStep63_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep64_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep64_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep64_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep64.Index,
    InstanceId, Status)

End Sub

Private Sub cExecStep64_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep65_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep65_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

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        Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep65_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId As Long)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep65.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep65_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep66_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep66_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep66_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId As Long)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep66.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep66_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep67_ProcessComplete(cStepRecord As cStep, _

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    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep67_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep67_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId As Long)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep67.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep67_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep68_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep68_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep68_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId As Long)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep68.Index,
InstanceId, Status)

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End Sub

Private Sub cExecStep68_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep69_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep69_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
    Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep69_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
    InstanceStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep69.Index,
    InstanceId, Status)

End Sub

Private Sub cExecStep69_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep70_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep70_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
    Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    StartTime:=dtmStartTime, Command:=strCommand)

End Sub

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End Sub

Private Sub cExecStep70_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
    InstanceStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep70.Index,
    InstanceId, Status)

End Sub

Private Sub cExecStep70_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep71_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep71_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
    Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep71_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
    InstanceStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep71.Index,
    InstanceId, Status)

End Sub

Private Sub cExecStep71_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep72_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

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    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep72_ProcessStart(cStepRecord As cStep, _
strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep72_StepComplete(cStepRecord As cStep, _
dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep72.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep72_StepStart(cStepRecord As cStep, _
dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep73_ProcessComplete(cStepRecord As cStep, _
dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep73_ProcessStart(cStepRecord As cStep, _
strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep73_StepComplete(cStepRecord As cStep, _
dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep73.Index,
InstanceId, Status)

End Sub

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Private Sub cExecStep73_StepStart(cStepRecord As cStep, _
dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep74_ProcessComplete(cStepRecord As cStep, _
dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep74_ProcessStart(cStepRecord As cStep, _
strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep74_StepComplete(cStepRecord As cStep, _
dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep74.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep74_StepStart(cStepRecord As cStep, _
dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep75_ProcessComplete(cStepRecord As cStep, _
dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep75_ProcessStart(cStepRecord As cStep, _
strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

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Private Sub cExecStep75_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep75.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep75_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep76_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep76_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep76_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep76.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep76_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep77_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

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End Sub

Private Sub cExecStep77_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep77_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep77.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep77_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep78_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep78_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep78_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep78.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep78_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

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    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep79_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep79_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep79_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep79.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep79_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep80_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep80_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep80_StepComplete(cStepRecord As cStep, _

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    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep80.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep80_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep81_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep81_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep81_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep81.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep81_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep82_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

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Private Sub cExecStep82_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep82_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId As Long)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep82.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep82_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep83_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep83_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep83_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId As Long)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep83.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep83_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

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End Sub

Private Sub cExecStep84_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep84_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep84_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId As Long)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep84.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep84_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep85_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep85_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep85_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId As Long)

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    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep85.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep85_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep86_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep86_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep86_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep86.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep86_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep87_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep87_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep87_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep87.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep87_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep88_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep88_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep88_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep88.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep88_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep89_ProcessComplete(cStepRecord As cStep, _

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    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep87_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep87.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep87_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep88_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep88_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep88_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep88.Index,
InstanceId, Status)
End Sub

Private Sub cExecStep88_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep89_ProcessComplete(cStepRecord As cStep, _

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        dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep89_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep89_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep89.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep89_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep90_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep90_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep90_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep90.Index,
InstanceId, Status)

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End Sub

Private Sub cExecStep90_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep91_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep91_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep91_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep91.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep91_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep92_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep92_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

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End Sub

Private Sub cExecStep92_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep92.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep92_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep93_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep93_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep93_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep93.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep93_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep94_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep94_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep94_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep94.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep94_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep95_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep95_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep95_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep95.Index,
InstanceId, Status)

End Sub

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End Sub

Private Sub cExecStep99_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep99_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep99.Index,
InstanceId, Status)

End Sub

Private Sub cExecStep99_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep2_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep2_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep2_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep2.Index, _
InstanceId, Status)

End Sub

Private Sub cExecStep2_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep3_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep3_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep3_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep3.Index, _
InstanceId, Status)

End Sub

Private Sub cExecStep3_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep4_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep4_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

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End Sub

Private Sub cExecStep4_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep4.Index, _
        InstanceId, Status)

End Sub

Private Sub cExecStep4_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep5_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep5_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep5_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep5.Index, _
        InstanceId, Status)

End Sub

Private Sub cExecStep5_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep6_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

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    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep6_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep6_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep6.Index, _
        InstanceId, Status)

End Sub

Private Sub cExecStep6_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)

End Sub

Private Sub cExecStep7_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
EndTime:=dtmEndTime, ElapsedTime:=lElapsed)

End Sub

Private Sub cExecStep7_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
StartTime:=dtmStartTime, Command:=strCommand)

End Sub

Private Sub cExecStep7_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceIdStatus)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep7.Index, _
        InstanceId, Status)

End Sub

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Private Sub cExecStep7_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub cExecStep8_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    EndTime:=dtmEndTime, ElapsedTime:=lElapsed)
End Sub

Private Sub cExecStep8_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long)

    Call TimeUpdateForProcess(cStepRecord, lngInstanceId,
    StartTime:=dtmStartTime, Command:=strCommand)
End Sub

Private Sub cExecStep8_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceId)

    Call StepTerminated(cStepRecord, dtmEndTime, cExecStep8.Index, _
    InstanceId, Status)
End Sub

Private Sub cExecStep8_StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)

    Call TimeStartUpdateForStep(cStepRecord, InstanceId, dtmStartTime)
End Sub

Private Sub Class_Initialize()

    Dim lngCount As Long
    Dim lngTemp As Long

    On Error GoTo InitializeErr

    Set mcFreeSteps = New cVectorLng
    ' Initialize the array of free objects with all elements
    ' for now
    For lngCount = 0 To glngNumConcurrentProcesses - 1 Step 1
        mcFreeSteps.Add lngCount
    Next lngCount

    ' Initialize a byte array with the number of free processes. It will
    ' be used later to determine if any step is running

```

```

' Each element in the array can represent 8 steps, 1 for each bit
ReDim mbarrFree(glngNumConcurrentProcesses \ gintBitsPerByte)

' Initialize each element in the byte array w/ all 1's
' (upto glngNumConcurrentProcesses)
For lngCount = LBound(mbarrFree) To UBound(mbarrFree) Step 1
    lngTemp = IIf( _
        glngNumConcurrentProcesses - (gintBitsPerByte *
lngCount) > gintBitsPerByte, _
        gintBitsPerByte, _
        glngNumConcurrentProcesses - (gintBitsPerByte *
lngCount))

    mbarrFree(lngCount) = (2 ^ lngTemp) - 1
Next lngCount

Set mcInstances = New cInstances
Set mcFailures = New cFailedSteps
Set mcNavSteps = New cStepTree
Set mcTermSteps = New cTermSteps

' Initialize the Abort flag to False
mblnAbort = False
mblnAsk = False

Exit Sub

InitializeErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
On Error GoTo 0
Err.Raise vbObjectError + errInitializeFailed, mstrModuleName &
"Initialize", _
    LoadResString(errInitializeFailed)

End Sub
Private Sub Class_Terminate()

    On Error GoTo Class_TerminateErr

    mcFreeSteps.Clear
    Set mcFreeSteps = Nothing
    ReDim mbarrFree(0)

    mcInstances.Clear
    Set mcInstances = Nothing

    Set mcFailures = Nothing
    Set mcNavSteps = Nothing
    Set mcTermSteps = Nothing

    Exit Sub

Class_TerminateErr:
    Call LogErrors(Errors)

```

```

End Sub

Private Sub mcTermSteps_TermStepExists(cStepDetails As cTermStep)

    Call RunNextStep(cStepDetails.TimeComplete, cStepDetails.Index, _
        cStepDetails.InstanceId, cStepDetails.ExecutionStatus)

End Sub

```

## **cRunItDetails.cls**

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1    'True
END
Attribute VB_Name = "cRunItDetails"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:      cRunItDetails.cls
'            Microsoft TPC-H Kit Ver. 1.00
'            Copyright Microsoft, 1999
'            All Rights Reserved
'
' PURPOSE:   This module encapsulates the properties of iterator
values
'            that are used by the step being executed at runtime.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'

```

Option Explicit

```

' Used to indicate the source module name when errors
' are raised by this class
Private Const mstrModuleName As String = "cRunItDetails."
Private mstrSource As String

```

```

Private mstrIteratorName As String
Private mintType As ValueType
Private mlngSequence As Long
Private mlngFrom As Long
Private mlngTo As Long
Private mlngStep As Long
Private mstrValue As String

```

```

Public Property Get RangeTo() As Long

```

```

    RangeTo = mlngTo

```

```

End Property

```

```

Public Property Let RangeTo(ByVal vdata As Long)

```

```

    mlngTo = vdata

```

```

End Property

```

```

Public Property Get RangeFrom() As Long

```

```

    RangeFrom = mlngFrom

```

```

End Property

```

```

Public Property Get Sequence() As Long

```

```

    Sequence = mlngSequence

```

```

End Property

```

```

Public Property Get RangeStep() As Long

```

```

    RangeStep = mlngStep

```

```

End Property

```

```

Public Property Let RangeStep(vdata As Long)

```

```

    mlngStep = vdata

```

```

End Property

```

```

Public Property Let RangeFrom(ByVal vdata As Long)

```

```

    mlngFrom = vdata

```

```

End Property

```

```

Public Property Let Sequence(ByVal vdata As Long)

```

```

    mlngSequence = vdata

```

```

End Property

```

```

Public Property Get IteratorType() As ValueType

```

```

    IteratorType = mintType

```

```

End Property

```

```

Public Property Let IteratorType(ByVal vdata As ValueType)

```

```

    On Error GoTo TypeErr
    mstrSource = mstrModuleName & "Type"

```

```

' These constants have been defined in the enumeration,
' Type, which is exposed
Select Case vdata
    Case gintFrom, gintTo, gintStep, gintValue
        mintType = vdata

```

```

    Case Else
        On Error GoTo 0
        Err.Raise vbObjectError + errTypeInvalid, _
            mstrSource, LoadResString(errTypeInvalid)
End Select

```

```

Exit Property

TypeErr:
LogErrors Errors
mstrSource = mstrModuleName & "Type"
On Error GoTo 0
Err.Raise vbObjectError + errTypeInvalid, _
    mstrSource, LoadResString(errTypeInvalid)

End Property
Private Sub IsList()

    If mintType <> gintValue Then
        On Error GoTo 0
        Err.Raise vbObjectError + errInvalidProperty, mstrSource, _
            LoadResString(errInvalidProperty)
    End If

End Sub
Private Sub IsRange()

    If mintType = gintValue Then
        On Error GoTo 0
        Err.Raise vbObjectError + errInvalidProperty, mstrSource, _
            LoadResString(errInvalidProperty)
    End If

End Sub

Public Property Get Value() As String

    Value = mstrValue

End Property
Public Property Let Value(vdata As String)

    mstrValue = vdata

End Property

Public Property Get IteratorName() As String

    IteratorName = mstrIteratorName

End Property
Public Property Let IteratorName(ByVal vdata As String)

    mstrIteratorName = vdata

End Property

```

### **cRunItNode.cls**

VERSION 1.0 CLASS

```

BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cRunItNode"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' An iterator class containing the properties that are used
' by the stpe being executed.
' These iterators might actually come from steps that are at
' a higher level than the step actually being executed (viz.
' direct ascendants of the step at any level).

Option Explicit

Public IteratorName As String
Public Value As String
Public StepId As Long

```

### **cRunOnly.cls**

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cRunOnly"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
Option Explicit

Public Event Done()
Private WithEvents mcRunWsp As cRunWorkspace
Attribute mcRunWsp.VB_VarHelpID = -1

Public WspName As String
Public WorkspaceId As Long
Public WspLog As String

Public Sub RunWsp()

    On Error GoTo RunWspErr

    Set mcRunWsp = New cRunWorkspace
    Set mcRunWsp.LoadDb = dbsAttTool
    mcRunWsp.WorkspaceId = WorkspaceId
    mcRunWsp.CreateInputFiles = True
    mcRunWsp.RunWorkspace

Exit Sub

RunWspErr:
' Log the VB error code
LogErrors Errors

```

```

End Sub

Private Sub mcRunWsp_RunComplete(dtmEndTime As Currency)

    MsgBox "Completed executing workspace: " & gstrSQ & WspName & gstrSQ
    & " at " & _
        JulianDateToString(dtmEndTime) & "." & vbCrLf & vbCrLf & _
        "The log file for the run is: " & gstrSQ & WspLog & gstrSQ &
    "."
    RaiseEvent Done

End Sub

Private Sub mcRunWsp_RunStart(dtmStartTime As Currency, strWspLog As
String, lRunId As Long)
    WspLog = strWspLog
End Sub

```

## cRunStep.cls

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cRunStep"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:      cRunStep.cls
'            Microsoft TPC-H Kit Ver. 1.00
'            Copyright Microsoft, 1999
'            All Rights Reserved
'
' PURPOSE:   This class executes the step that is assigned to the
'            ExecuteStep property. It executes the pre-execution
constraints
'            in sequence and then the step itself. At the end it
executes
'            the post-execution constraints. Since these steps should
always
'            be executed in sequence, each step is only fired on the
'            completion of the previous step.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

' Used to indicate the source module name when errors
' are raised by this class
Private Const mstrModuleName As String = "cRunStep."
Private mstrSource As String

' Local variable(s) to hold property value(s)

```

```

Private mcStep As cStep
Private mcGlobals As cArrSteps
Private mcvntWspPreCons As Variant
Private mcvntWspPostCons As Variant
Private mcvntPreCons As Variant
Private mcvntPostCons As Variant
Private mcIterators As cRunColIt
Private mlngInstanceId As Long ' Identifier for the current instance
Private mlngIndex As Long ' Index value for the current instance
Private mstrCommand As String ' The command string
Private msRunStepDtl As String ' Step text/file name that will go into
the run_step_details table
Private mblnAbort As Boolean ' Set to True when the user aborts the
run
Private msOutputFile As String
Private msErrorFile As String
Private miStatus As InstanceStatus
Private mcVBErr As cVBErrorsSM
Public WspParameters As cArrParameters
Public WspConnections As cConnections
Public WspConnDtls As cConnDtls

Private WithEvents mcTermProcess As cTermProcess
Attribute mcTermProcess.VB_VarHelpID = -1
Public RunId As Long
Public CreateInputFiles As Boolean
Private msOutputDir As String

' Object that will execute the step
Private WithEvents mcExecObj As EXECUTEDLLLib.Execute
Attribute mcExecObj.VB_VarHelpID = -1

' Holds the step that is currently being executed (constraint or
' worker step)
Private mcExecStep As cStep

Private Const msCompareExe As String = "\diff.exe"

Private Enum NextNodeType
    mintWspPreConstraint = 1
    mintPreConstraint
    mintStep
    mintWspPostConstraint
    mintPostConstraint
End Enum

' Public events to notify the calling function of the
' start and end time for each step
Public Event StepStart(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long)
Public Event StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, InstanceId As Long, Status As
InstanceStatus)
Public Event ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, _
    InstanceId As Long)

```



```

Public Event ProcessComplete(cStepRecord As cStep, _
    dtmStartTime As Currency, InstanceId As Long, lElapsed As Long)

Private Function AppendDiffErrors(sDiffFile As String)
    ' The file containing the errors generated by the diff utility is
    passed in
    ' These errors are appended to the error file for the step

    Dim sTemp As String
    Dim InputFile As Integer

    If Not StringEmpty(sDiffFile) Then

        InputFile = FreeFile
        Open sDiffFile For Input Access Read As InputFile

        Do While Not EOF(InputFile)          ' Loop until end of file.
            Line Input #InputFile, sTemp    ' Read line into variable.
            mcVBErr.LogMessage sTemp
        Loop

        Close InputFile
    End If

End Function

Private Sub CreateStepTextFile()
    ' Creates a file containing the step text being executed
    On Error GoTo CreateStepTextFileErr

    Dim sInputFile As String

    If mcExecStep.ExecutionMechanism = gintExecuteShell Then
        sInputFile = GetOutputFile(gsCmdFileSuffix)
    Else
        sInputFile = GetOutputFile(gsSqlFileSuffix)
    End If

    ' Generate a file containing the step text being executed
    If Not StringEmpty(mcExecStep.StepTextFile) Or
    mcExecStep.ExecutionMechanism = gintExecuteShell Then
        FileCopy mstrCommand, sInputFile
    Else
        Call WriteCommandToFile(mstrCommand, sInputFile)
    End If

    Exit Sub

CreateStepTextFileErr:

    mcVBErr.LogVBErrors

End Sub

Private Function GetOutputFile(strFileExt As String) As String
    ' This function generates the output file name for the step
    currently being executed

```

```

    ' The value of the built-in parameter 'DefaultDir' is appended with
    the run identifier
    ' for the file location
    ' The step label is used for the file name and a combination of all
    iterator values
    ' for the step is used to make the output files unique for each
    instance
    Dim sFile As String
    Dim sIt As String
    Dim lIt As Long

    On Error GoTo GetOutputFileErr

    sFile = SubstituteParametersIfPossible(mcExecStep.StepLabel)

    sFile = TranslateStepLabel(sFile)

    If mcExecStep Is mcStep Then
        ' Use iterators that have been defined for the worker or any of
        it's managers
        ' to make the error/log file unique for this instance
        For lIt = mcIterators.Count - 1 To 0 Step -1
            sIt = sIt & gsExtSeparator & mcIterators(lIt).Value
        Next lIt
    End If
    sIt = sIt & strFileExt

    ' Ensure that the length of the complete path does not exceed 255
    characters
    If Len(msOutputDir) + Len(sFile) + Len(sIt) > MAX_PATH Then
        sFile = Mid(sFile, 1, MAX_PATH - Len(sIt) - Len(msOutputDir))
    End If
    GetOutputFile = msOutputDir & sFile & sIt
    Exit Function

GetOutputFileErr:

    ' Does not make sense to log error to the error file yet. Write to
    the project
    ' log and return the step label as default
    GetOutputFile = mcExecStep.StepLabel & gsExtSeparator & strFileExt

End Function

Private Sub HandleExecutionError()

    On Error GoTo HandleExecutionError

    ' Log the error code raised by Visual Basic
    miStatus = gintFailed
    mcVBErr.LogVBErrors
    Call mcVBErr.WriteError(errrExecuteStepFailed, _
        OptArgs:="Continuation criteria for the step is: " &
        gsContCriteria(mcStep.ContinuationCriteria))

```

```

HandleExecutionError:
    ' Logging failed - return
End Sub

Public Property Get Index() As Long
    Index = mlngIndex
End Property
Public Property Let Index(ByVal vdata As Long)
    mlngIndex = vdata
End Property
Private Function InitializeExecStatus() As InstanceStatus
    Dim sCompareFile As String

    On Error GoTo InitializeExecStatusErr

    InitializeExecStatus = mcExecObj.StepStatus

    If InitializeExecStatus = gintComplete Then
        If Not StringEmpty(mcExecStep.FailureDetails) Then
            ' Compare output to determine whether the step failed
            sCompareFile = GetShortName(SubstituteParameters( _
                mcExecStep.FailureDetails, mcExecStep.WorkspaceId,
                mcIterators, _
                WspParameters))
            InitializeExecStatus = IIf(CompareOutput(sCompareFile,
                msOutputFile), gintComplete, gintFailed)
        End If
    End If

    Exit Function

InitializeExecStatusErr:
    mcVBErr.LogVBErrors
    ' Call LogErrors(Errors)
    InitializeExecStatus = mcExecObj.StepStatus
End Function
Private Function CompareOutput(sCompareFile As String, sOutputFile As
String) As Boolean

    Dim sCmpOutput As String
    Dim sDiffOutput As String

    On Error GoTo CompareOutputErr

    ' Create temporary files to store the file compare output and
    ' the errors generated by the compare function
    sCmpOutput = CreateTempFile()
    sDiffOutput = CreateTempFile()

    ' Run the compare utility and redirect it's output and errors
    SyncShell ("cmd /c " & _
        GetShortName(App.Path & msCompareExe) & gstrBlank & _
        sCompareFile & gstrBlank & sOutputFile & _
        " > " & sCmpOutput & " 2> " & sDiffOutput)

    If FileLen(sDiffOutput) > 0 Then
        ' The compare generated errors - append error msgs to the error
file
        Call AppendDiffErrors(sDiffOutput)
        CompareOutput = False
    Else
        CompareOutput = (FileLen(sCmpOutput) = 0)
    End If

    If Not CompareOutput Then
        mcVBErr.WriteError errDiffFailed
    End If

    ' Delete the temporary files used to store the output of the compare
and
    ' the errors generated by the compare
    Kill sDiffOutput
    Kill sCmpOutput

    Exit Function

CompareOutputErr:
    mcVBErr.LogVBErrors
    CompareOutput = False
End Function
Public Property Get InstanceId() As Long

    InstanceId = mlngInstanceId
End Property
Public Property Let InstanceId(ByVal vdata As Long)

    mlngInstanceId = vdata
End Property
Private Function ExecuteConstraint(vntConstraints As Variant, _
ByRef intLoopIndex As Integer) As Boolean

    ' Returns True if there is a constraint in the passed in
    ' array that remains to be executed

    If IsArray(vntConstraints) And Not IsEmpty(vntConstraints) Then
        ExecuteConstraint = (LBound(vntConstraints) <= intLoopIndex) And
(intLoopIndex <= UBound(vntConstraints))
    Else
        ExecuteConstraint = False
    End If

```

```

End Function
Private Function NextStep() As cStep

' Determines which is the next step to be executed - it could
' be either a pre-execution step, the worker step itself
' or a post-execution step

Dim cConsRec As cConstraint
Dim cNextStepRec As cStep
Dim vntStepConstraints As Variant

' Static variable to remember exactly where we are in the
' processing
Static intIndex As Integer
Static intNextStepType As NextNodeType

On Error GoTo NextStepErr

If mblnAbort = True Then
' The user has aborted the run - do not run any more
' processes for the step
Set NextStep = Nothing
Exit Function
End If

If intNextStepType = 0 Then
' First time through this function - set the Index and
' node type to initial values
intNextStepType = mintWspPreConstraint
intIndex = 0
RaiseEvent StepStart(mcStep, Determine64BitTime(),
mlngInstanceId)
End If

Do
Select Case intNextStepType
Case mintWspPreConstraint
vntStepConstraints = mcvntWspPreCons

Case mintPreConstraint
vntStepConstraints = mcvntPreCons

Case mintStep
' CONS:
If mcStep.StepType = gintWorkerStep Then
Set cNextStepRec = mcStep
End If

Case mintWspPostConstraint
vntStepConstraints = mcvntWspPostCons

Case mintPostConstraint
vntStepConstraints = mcvntPostCons

End Select

```

```

If intNextStepType <> mintStep Then
' Check if there is a constraint to be executed
If ExecuteConstraint(vntStepConstraints, intIndex) Then
' Get the corresponding step record to be executed
' Query the global step record for the current
' constraint
Set cConsRec = vntStepConstraints(intIndex)

Set cNextStepRec =
mcGlobals.QueryStep(cConsRec.GlobalStepId)
intIndex = intIndex + 1
Else
If intNextStepType = mintPostConstraint Then
' No more stuff to be executed for the step
' Raise a Done event
Set cNextStepRec = Nothing

' Set the next step type to an invalid value
intNextStepType = -1
Else
Call NextType(intNextStepType, intIndex)
End If
End If
Else
' Increment the step type so we look at the post-
' execution steps the next time through
Call NextType(intNextStepType, intIndex)
End If

Loop Until (Not cNextStepRec Is Nothing) Or _
intNextStepType = -1

Set NextStep = cNextStepRec

Exit Function

NextStepErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
On Error GoTo 0
mstrSource = mstrModuleName & "NextStep"
Err.Raise vbObjectError + errNextStepFailed, mstrSource, _
LoadResString(errNextStepFailed)

End Function
Public Sub Execute()
' This procedure is the method that executes the step that
' is assigned to the ExecuteStep property. It call a procedure
' to determine the next step to be executed.
' Then it initializes all the properties of the cExecuteSM object
' and calls it's run method to execute it.
Dim cConn As cConnection
Dim cRunConnDtl As cConnDtl

On Error GoTo ExecuteErr

```

```

' If this procedure is called after a step has completed,
' we would have to check if we created any temporary files
' while executing that step
If Not mcExecStep Is Nothing Then
    If Not StringEmpty(mcExecStep.StepTextFile) Or
mcExecStep.ExecutionMechanism = gintExecuteShell Then
        ' Remove the temporary file that we created while
        ' running this command
        Kill mstrCommand
    End If

    Call StepCompleted

    ' The VB errors class stores a reference to the Execute class
since it uses
    ' a method of the class to write errors to the error log. Hence,
    ' release all references to the Execute object before destroying
it.
    Set mcVbErr.ErrorFile = Nothing
    Set mcExecObj = Nothing

    ' Delete empty output and error files (generated by shell
commands)
    ' (Can be done only after cleaning up cExecObj)
    Call DeleteEmptyOutputFiles
Else
    ' First time through - initialize the location of output files
    msOutputDir = GetDefaultDir(mcStep.WorkspaceId, WspParameters)
    msOutputDir = msOutputDir & gstrFileSeparator & Trim(Str(RunId))
& gstrFileSeparator
    ' Dummy file since the function expects a file name
    MakePathValid (msOutputDir & "a.txt")
End If

' Call a procedure to determine the next step to be executed
' - could be a constraint or the step itself
' Initialize a module-level variable to the step being
' executed
Set mcExecStep = NextStep
If mcExecStep Is Nothing Then
    RaiseEvent StepComplete(mcStep, Determine64BitTime(),
mlngInstanceId, miStatus)
    ' No more stuff to execute
    Exit Sub
End If

Dim sStartDir As String

Set mcExecObj = New EXECUTEDLLLib.Execute

' The VB errors class uses the WriteError method of the Execute
class to write
' all VB errors to the error file for the step (this prevents a
clash when the
' VB errors and Execution errors have to be written to the same log).
Hence, store

```

```

' a reference to the Execute object in mcVbErr
msErrorFile = GetOutputFile(gsErrorFileSuffix)
mcExecObj.ErrorFile = msErrorFile
Call DeleteFile(msErrorFile, bCheckIfEmpty:=False)
Set mcVbErr.ErrorFile = mcExecObj

If mcExecStep.ExecutionMechanism = gintExecuteShell Then
    sStartDir = Trim$(GetShortName(SubstituteParameters(
        mcExecStep.StartDir, mcExecStep.WorkspaceId,
mcIterators, WspParameters:=WspParameters)))
    ' Dummy connection object
    Set cConn = New cConnection
    Set cRunConnDtl = New cConnDtl
Else
    ' Find the connection string value and substitute parameter
values in it
    Set cRunConnDtl =
WspConnDtls.GetConnectionDtl(mcExecStep.WorkspaceId,
mcExecStep.StartDir)
    Set cConn = WspConnections.GetConnection(mcExecStep.WorkspaceId,
cRunConnDtl.ConnectionString)
    sStartDir = Trim$(SubstituteParameters(cConn.ConnectionValue,
        mcExecStep.WorkspaceId, mcIterators,
WspParameters:=WspParameters))
    End If

    msOutputFile = GetOutputFile(gsOutputFileSuffix)
    Call DeleteFile(msOutputFile, bCheckIfEmpty:=False)
    mcExecObj.OutputFile = msOutputFile
    ' mcExecObj.LogFile = GetShortName(SubstituteParameters(
    '
        mcExecStep.LogFile, mcExecStep.WorkspaceId, mcIterators,
WspParameters:=WspParameters))
    If mcExecStep.ExecutionMechanism = gintExecuteODBC And _
        cRunConnDtl.ConnType = ConnTypeDynamic Then
        Call mcExecObj.DoExecute(BuildCommandString(), sStartDir,
mcExecStep.ExecutionMechanism,
            cConn.NoCountDisplay, cConn.NoExecute,
cConn.ParseQueryOnly, cConn.QuotedIdentifiers,
            cConn.AnsiNulls, cConn.ShowQueryPlan,
cConn.ShowStatsTime, cConn.ShowStatsIO,
            cConn.RowCount, cConn.QueryTimeout, gstrEmptyString)
    Else
        Call mcExecObj.DoExecute(BuildCommandString(), sStartDir,
mcExecStep.ExecutionMechanism,
            cConn.NoCountDisplay, cConn.NoExecute,
cConn.ParseQueryOnly, cConn.QuotedIdentifiers,
            cConn.AnsiNulls, cConn.ShowQueryPlan,
cConn.ShowStatsTime, cConn.ShowStatsIO,
            cConn.RowCount, cConn.QueryTimeout, mcExecStep.StartDir)
    End If

    Exit Sub

ExecuteErr:
    Call HandleExecutionError

```

```

' We can assume that if we are in this function, a StepStart event
has been triggered already.
RaiseEvent StepComplete(mcStep, Determine64BitTime(), mlngInstanceId,
miStatus)

End Sub
Private Function BuildCommandString() As String
' Process text to be executed - either from the text
' field or read it from a file.
' This function will always return the command text for ODBC
commands
' and a file name for Shell commands
Dim sFile As String
Dim sCommand As String
Dim sTemp As String

On Error GoTo BuildCommandStringErr

If Not StringEmpty(mcExecStep.StepTextFile) Then
' Substitute parameter values and environment variables
' in the filename
msRunStepDtl = SubstituteParameters(mcExecStep.StepTextFile, _
mcExecStep.WorkspaceId, mcIterators,
WspParameters:=WspParameters)

sFile = GetShortName(msRunStepDtl)

mstrCommand = SubstituteParametersInText(sFile,
mcExecStep.WorkspaceId)

If mcExecStep.ExecutionMechanism = gintExecuteODBC Then
' Read the contents of the file and pass it to ODBC
BuildCommandString = ReadCommandFromFile(mstrCommand)
Else
BuildCommandString = mstrCommand
End If
Else
' Substitute parameter values and environment variables
' in the step text
msRunStepDtl = SubstituteParameters(mcExecStep.StepText, _
mcExecStep.WorkspaceId, mcIterators,
WspParameters:=WspParameters)
mstrCommand = msRunStepDtl

If mcExecStep.ExecutionMechanism = gintExecuteShell Then
' Write the command to a temp file (enables us to execute
multiple
' commands via the command interpreter)
mstrCommand = WriteCommandToFile(msRunStepDtl)
BuildCommandString = mstrCommand
Else
BuildCommandString = SQLFixup(msRunStepDtl)
End If
End If

If CreateInputFiles Then

```

```

Call CreateStepTextFile
End If

Exit Function

BuildCommandStringErr:
' Log the error code raised by the Execute procedure
' Call LogErrors(Errors)
mcVBErr.LogVBErrors

On Error GoTo 0
mstrSource = mstrModuleName & "Execute"
Err.Raise vbObjectError + errExecuteStepFailed, mstrSource, _
LoadResString(errExecuteStepFailed) & mstrCommand

End Function
Public Sub Abort()

On Error GoTo AbortErr

' Setting the Abort flag to True will ensure that we
' don't execute any more processes for this step
mblnAbort = True

If Not mcExecObj Is Nothing Then
mcExecObj.Abort
Else
' We are not in the middle of execution yet
End If

Exit Sub

AbortErr:
Call LogErrors(Errors)
On Error GoTo 0
Err.Raise vbObjectError + errProgramError, _
mstrModuleName & "Abort", _
LoadResString(errProgramError)

End Sub
Private Sub NextType(ByRef StepType As NextNodeType, _
ByRef Position As Integer)

StepType = StepType + 1
Position = 0

End Sub
Private Sub StepCompleted()

On Error GoTo StepCompletedErr

If Not mcExecStep Is Nothing Then
If mcExecStep Is mcStep Then
miStatus = InitializeExecStatus
If miStatus = gintFailed Then

```

```

        ' Create input files if the step failed execution and
one hasn't been created already
        If Not CreateInputFiles Then CreateStepTextFile
        Call mcVBErr.WriteError(errExecuteStepFailed, _
            OptArgs:="Continuation criteria for the step is:
" & gsContCriteria(mcStep.ContinuationCriteria))
        End If
    End If
End If

Exit Sub

```

```

StepCompletedErr:
' Log the error code raised by Visual Basic
miStatus = gintFailed
mcVBErr.LogVBErrors
Call mcVBErr.WriteError(errExecuteStepFailed, _
    OptArgs:="Continuation criteria for the step is: " &
gsContCriteria(mcStep.ContinuationCriteria))

```

```

End Sub
Private Sub DeleteEmptyOutputFiles()

```

```

    On Error GoTo DeleteEmptyOutputFilesErr

    ' Delete empty output and error files
    If Not mcExecStep Is Nothing Then
        Call DeleteFile(msErrorFile, bCheckIfEmpty:=True)
        Call DeleteFile(msOutputFile, bCheckIfEmpty:=True)
    End If

    Exit Sub

```

```

DeleteEmptyOutputFilesErr:
' Not a critical error - continue

```

```

End Sub
Private Function ReadCommandFromFile(strFileName As String) As String

```

```

    ' Returns the contents of the passed in file

    Dim sCommand As String
    Dim sTemp As String
    Dim InputFile As Integer

    On Error GoTo ReadCommandFromFileErr

    If Not StringEmpty(strFileName) Then

        InputFile = FreeFile
        Open strFileName For Input Access Read As InputFile

        Line Input #InputFile, sCommand ' Read line into variable.

        Do While Not EOF(InputFile) ' Loop until end of file.
            Line Input #InputFile, sTemp ' Read line into variable.

```

```

        sCommand = sCommand & vbCrLf & sTemp
    Loop

```

```

        Close InputFile
    End If

    ReadCommandFromFile = sCommand

    Exit Function

```

```

ReadCommandFromFileErr:

```

```

    ' Log the error code raised by Visual Basic
    Call LogErrors(Errors)
    mstrSource = mstrModuleName & "ReadCommandFromFile"
    On Error GoTo 0
    Err.Raise vbObjectError + errSubValuesFailed, _
        gstrSource, _
        LoadResString(errSubValuesFailed)

```

```

End Function
Private Function SubstituteParametersIfPossible(strLabel As String)

```

```

    On Error GoTo SubstituteParametersIfPossibleErr

    SubstituteParametersIfPossible = SubstituteParameters(strLabel, _
        mcExecStep.WorkspaceId, mcIterators,
WspParameters:=WspParameters)
    Exit Function

```

```

SubstituteParametersIfPossibleErr:
    SubstituteParametersIfPossible = strLabel

```

```

End Function
Private Function SubstituteParametersInText(strFileName As String, _
    lngWorkspace As Long) As String

```

```

    ' Reads each line in the passed in file, substitutes parameter
    ' values in the line and writes out the modified line to a
    ' temporary file that we create. The temporary file will be
    ' removed once the step completes execution.
    ' Returns the name of the newly created temporary file.

```

```

    Dim strTempFile As String
    Dim strTemp As String
    Dim strOutput As String
    Dim InputFile As Integer
    Dim OutputFile As Integer

```

```

    On Error GoTo SubstituteParametersInTextErr

```

```

    strTempFile = CreateTempFile()

    If Not StringEmpty(strFileName) Then

        InputFile = FreeFile

```

```

Open strFileName For Input Access Read As InputFile

OutputFile = FreeFile
Open strTempFile For Output Access Write As OutputFile

Do While Not EOF(InputFile) ' Loop until end of file.
    Line Input #InputFile, strTemp ' Read line into variable.
    strOutput = SubstituteParameters(strTemp, lngWorkspace,
mcIterators, WspParameters:=WspParameters)

    If mcExecStep.ExecutionMechanism = gintExecuteODBC Then
strOutput = SQLFixup(strOutput)

        Print #OutputFile, strOutput
        BugMessage strOutput
    Loop

End If

Close InputFile
Close OutputFile

SubstituteParametersInText = strTempFile

Exit Function

SubstituteParametersInTextErr:

' Log the error code raised by Visual Basic
' Call LogErrors(Errors)
mcVBErr.LogVBErrors
mstrSource = mstrModuleName & "SubstituteParametersInText"
On Error GoTo 0
Err.Raise vbObjectError + errSubValuesFailed, _
    gstrSource, _
    LoadResString(errSubValuesFailed)

End Function

Private Function WriteCommandToFile(sCommand As String, Optional sFile
As String = gstrEmptyString) As String

' Writes the command text to a temporary file
' Returns the name of the temporary file

Dim OutputFile As Integer

On Error GoTo WriteCommandToFileErr

If StringEmpty(sFile) Then
    sFile = CreateTempFile()
End If

OutputFile = FreeFile
Open sFile For Output Access Write As OutputFile

```

```

Print #OutputFile, sCommand

Close OutputFile

WriteCommandToFile = sFile

Exit Function

WriteCommandToFileErr:

' Log the error code raised by Visual Basic
Call LogErrors(Errors)
mstrSource = mstrModuleName & "WriteCommandToFile"
On Error GoTo 0
Err.Raise vbObjectError + errSubValuesFailed, _
    gstrSource, _
    LoadResString(errSubValuesFailed)

End Function

Public Property Get WspPreCons() As Variant
    WspPreCons = mcvntWspPreCons
End Property
Public Property Let WspPreCons(ByVal vdata As Variant)
    mcvntWspPreCons = vdata
End Property

Public Property Get WspPostCons() As Variant
    WspPostCons = mcvntWspPostCons
End Property
Public Property Let WspPostCons(ByVal vdata As Variant)
    mcvntWspPostCons = vdata
End Property

Public Property Get PreCons() As Variant
    PreCons = mcvntPreCons
End Property
Public Property Let PreCons(ByVal vdata As Variant)
    mcvntPreCons = vdata
End Property

Public Property Get PostCons() As Variant
    PostCons = mcvntPostCons
End Property
Public Property Let PostCons(ByVal vdata As Variant)
    mcvntPostCons = vdata
End Property

Public Property Set Globals(cRunSteps As cArrSteps)

    Set mcGlobals = cRunSteps

End Property
Public Property Set ExecuteStep(cRunStep As cStep)

```

```

        Set mcStep = cRunStep
    End Property
    Public Property Get Globals() As cArrSteps

        Set Globals = mcGlobals
    End Property
    Public Property Get ExecuteStep() As cStep

        Set ExecuteStep = mcStep
    End Property
    Public Property Set Iterators(vdata As cRunColIt)

        Set mcIterators = vdata
    End Property
    Private Sub Class_Initialize()

        ' Initialize the Abort flag to False
        mblnAbort = False
        Set mcVBErr = New cVBErrorsSM
        Set mcTermProcess = New cTermProcess
    End Sub

    Private Sub Class_Terminate()

        On Error GoTo Class_TerminateErr

        Set mcExecObj = Nothing
        Set mcVBErr = Nothing
        Set mcTermProcess = Nothing

        Exit Sub
    Class_TerminateErr:
        Call LogErrors(Errors)
    End Sub

    Private Sub mcExecObj_Start(ByVal StartTime As Currency)
        ' Raise an event indicating that the step has begun execution
        RaiseEvent ProcessStart(mcExecStep, msRunStepDtl, StartTime,
        mlngInstanceId)
    End Sub

    Private Sub mcExecObj_Complete(ByVal EndTime As Currency, ByVal Elapsed
    As Long)

        On Error GoTo mcExecObj_CompleteErr

        Debug.Print Elapsed
        RaiseEvent ProcessComplete(mcExecStep, EndTime, mlngInstanceId,
        Elapsed)

```

```

        mcTermProcess.ProcessTerminated

        Exit Sub
    mcExecObj_CompleteErr:
        Call LogErrors(Errors)
    End Sub

    Private Sub mcTermProcess_TermProcessExists()

        On Error GoTo TermProcessExistsErr

        ' Call a procedure to execute the next step, if any
        Call Execute

        Exit Sub
    TermProcessExistsErr:
        ' Log the error code raised by the Execute procedure
        Call LogErrors(Errors)
    End Sub

```

## cRunWorkspace.cls

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cRunWorkspace"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:      cRunWorkspace.cls
'            Microsoft TPC-H Kit Ver. 1.00
'            Copyright Microsoft, 1999
'            All Rights Reserved
'
' PURPOSE:   This class loads all the information necessary to
'            execute a workspace and calls cRunInst to execute the
'            workspace.
'            It also propagates Step start and complete and
'            Run start and complete events.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

' Used to indicate the source module name when errors
' are raised by this module
Private Const mstrModuleName As String = "cRunWorkspace."
Private mstrSource As String

Private mcRunSteps As cArrSteps

```



```

Private mcRunParams As cArrParameters
Private mcRunConstraints As cArrConstraints
Private mcRunConnections As cConnections
Private mcRunConnDtIs As cConnDtIs
Private mcvntWspPreCons As Variant
Private mcvntWspPostCons As Variant
Private mdbLoadDb As Database
Private mlngRunId As Long
Private mlngWorkspaceId As Long
Private mField As cStringSM
Public CreateInputFiles As Boolean

Private WithEvents mcRun As cRunInst
Attribute mcRun.VB_VarHelpID = -1

Public Event RunStart(dtmStartTime As Currency, strWspLog As String,
lRunId As Long)
Public Event RunComplete(dtmEndTime As Currency)
Public Event StepStart(cStepRecord As cStep, dtmStartTime As Currency,
lngInstanceId As Long, _
sPath As String, sIts As String)
Public Event StepComplete(cStepRecord As cStep, dtmEndTime As Currency,
lngInstanceId As Long)
Public Event ProcessStart(cStepRecord As cStep, strCommand As String, _
dtmStartTime As Currency, lngInstanceId As Long)
Public Event ProcessComplete(cStepRecord As cStep, dtmEndTime As
Currency, lngInstanceId As Long)
Public Function InstancesForStep(lngStepId As Long, iStatus As
InstanceStatus) As cInstances
' Returns an array of all the instances for a step

If mcRun Is Nothing Then
Set InstancesForStep = Nothing
Else
Set InstancesForStep = mcRun.InstancesForStep(lngStepId,
iStatus)
End If

End Function
Private Sub InsertRunDetail(cStepRecord As cStep, _
strCommand As String, dtmStartTime As Currency, _
lngInstanceId As Long, lParentInstanceId As Long, sItValue As
String)
' Inserts a new run detail record into the database

Dim strInsert As String
Dim qy As QueryDef

On Error GoTo InsertRunDetailErr
mstrSource = mstrModuleName & "InsertRunDetail"

strInsert = "insert into run_step_details " & _
"( run_id, step_id, version_no, instance_id,
parent_instance_id, " & _
" command, start_time, iterator_value ) " & _
" values ( "

```

```

#If USE_JET Then

strInsert = strInsert & " [r_id], [s_id], [ver_no], [i_id], [p_i_id],
" & _
" [com], [s_date], [it_val] )"

Set qy = mdbLoadDb.CreateQueryDef( _
gstrEmptyString, strInsert)

' Call a procedure to assign the Querydef parameters
Call AssignParameters(qy, StartTime:=dtmStartTime, _
StepId:=cStepRecord.StepId, _
Version:=cStepRecord.VersionNo, _
InstanceId:=lngInstanceId, _
Command:=strCommand)

qy.Execute dbFailOnError
qy.Close

#Else

strInsert = strInsert & Str(mlngRunId) _
& ", " & Str(cStepRecord.StepId) _
& ", " & mField.MakeStringFieldValid(cStepRecord.VersionNo) _
& ", " & Str(lngInstanceId) _
& ", " & Str(lParentInstanceId) _
& ", " & mField.MakeStringFieldValid(strCommand) _
& ", " & Str(dtmStartTime) _
& ", " & mField.MakeStringFieldValid(sItValue)

strInsert = strInsert & " ) "

mdbLoadDb.Execute strInsert, dbFailOnError

#End If

Exit Sub

InsertRunDetailErr:
LogErrors Errors
mstrSource = mstrModuleName & "InsertRunDetail"
On Error GoTo 0
Err.Raise vbObjectError + errUpdateRunDataFailed, _
mstrSource, _
LoadResString(errUpdateRunDataFailed)

End Sub
Private Sub UpdateRunDetail(cStepRecord As cStep, _
dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)
' Updates the run detail record in the database

Dim strUpdate As String
Dim qy As QueryDef

On Error GoTo UpdateRunDetailErr

```

```

strUpdate = "update run_step_details " & _
            " set end_time = [e_date], elapsed_time = [elapsed] " & _
            " where run_id = [r_id] " & _
            " and step_id = [s_id] " & _
            " and version_no = [ver_no] " & _
            " and instance_id = [i_id] "

Set qy = mdbaLoadDb.CreateQueryDef( _
    gstrEmptyString, strUpdate)

' Call a procedure to assign the Querydef parameters
Call AssignParameters(qy, EndTime:=dtmEndTime, _
    StepId:=cStepRecord.StepId, _
    Version:=cStepRecord.VersionNo, _
    InstanceId:=lngInstanceId, Elapsed:=lElapsed)

qy.Execute dbFailOnError
qy.Close

Exit Sub

UpdateRunDetailErr:
LogErrors Errors
mstrSource = mstrModuleName & "UpdateRunDetail"
On Error GoTo 0
Err.Raise vbObjectError + errUpdateRunDataFailed, _
    mstrSource, _
    LoadResString(errUpdateRunDataFailed)

End Sub

Private Function InsertRunHeader(dtmStartTime As Currency) As Long
' Inserts a new run header record into the database
' and returns the id for the run

Dim strInsert As String
Dim qy As QueryDef

On Error GoTo InsertRunHeaderErr

strInsert = "insert into run_header " & _
            "( run_id, workspace_id, start_time ) " & _
            " values ( " & _
            " [r_id], [w_id], [s_date] )"

Set qy = mdbaLoadDb.CreateQueryDef( _
    gstrEmptyString, strInsert)

' Call a procedure to execute the Querydef object
Call AssignParameters(qy, StartTime:=dtmStartTime)

qy.Execute dbFailOnError
qy.Close

InsertRunHeader = mlngRunId
Exit Function

InsertRunHeaderErr:
LogErrors Errors
mstrSource = mstrModuleName & "InsertRunHeader"
On Error GoTo 0
Err.Raise vbObjectError + errUpdateRunDataFailed, _
    mstrSource, _
    LoadResString(errUpdateRunDataFailed)

End Function

Private Sub InsertRunParameters(dtmStartTime As Currency)
' Inserts a new run header record into the database
' and returns the id for the run

Dim strInsert As String
Dim qy As QueryDef
Dim cParamRec As cParameter
Dim lngIndex As Long

On Error GoTo InsertRunParametersErr

strInsert = "insert into run_parameters " & _
            "( run_id, parameter_name, parameter_value ) " & _
            " values ( " & _
            " [r_id], [p_name], [p_value] )"

Set qy = mdbaLoadDb.CreateQueryDef( _
    gstrEmptyString, strInsert)
qy.Parameters("r_id").Value = mlngRunId

For lngIndex = 0 To mcRunParams.ParameterCount - 1
    Set cParamRec = mcRunParams(lngIndex)

    qy.Parameters("p_name").Value = cParamRec.ParameterName
    qy.Parameters("p_value").Value = cParamRec.ParameterValue
    qy.Execute dbFailOnError

Next lngIndex

qy.Close

Exit Sub

InsertRunParametersErr:
LogErrors Errors
mstrSource = mstrModuleName & "InsertRunParameters"
On Error GoTo 0
Err.Raise vbObjectError + errUpdateRunDataFailed, _
    mstrSource, _
    LoadResString(errUpdateRunDataFailed)

End Sub

Private Sub AssignParameters(qyExec As DAO.QueryDef, _
    Optional StartTime As Currency = 0, _
    Optional EndTime As Currency = 0, _
    Optional StepId As Long = 0, _

```

```

Optional Version As String = gstrEmptyString, _
Optional InstanceId As Long = 0, _
Optional ParentInstanceId As Long = 0, _
Optional Command As String = gstrEmptyString, _
Optional Elapsed As Long = 0, _
Optional ItValue As String = gstrEmptyString)
' Assigns values to the parameters in the querydef object

Dim prmParam As DAO.Parameter

On Error GoTo AssignParametersErr
mstrSource = mstrModuleName & "AssignParameters"

For Each prmParam In qyExec.Parameters
    Select Case prmParam.Name
        Case "[w_id]"
            prmParam.Value = mlngWorkspaceId

        Case "[r_id]"
            prmParam.Value = mlngRunId

        Case "[s_id]"
            BugAssert StepId <> 0
            prmParam.Value = StepId

        Case "[ver_no]"
            BugAssert Not StringEmpty(Version)
            prmParam.Value = Version

        Case "[i_id]"
            BugAssert InstanceId <> 0
            prmParam.Value = InstanceId

        Case "[p_i_id]"
            prmParam.Value = ParentInstanceId

        Case "[com]"
            BugAssert Not StringEmpty(Command)
            prmParam.Value = Command

        Case "[s_date]"
            BugAssert StartTime <> 0
            prmParam.Value = StartTime

        Case "[e_date]"
            BugAssert EndTime <> 0
            prmParam.Value = EndTime

        Case "[elapsed]"
            prmParam.Value = Elapsed

        Case "[it_val]"
            prmParam.Value = ItValue

        Case Else
            ' Write the parameter name that is faulty

```

```

WriteError errInvalidParameter, mstrSource, _
    prmParam.Name
On Error GoTo 0
Err.Raise errInvalidParameter, mstrSource, _
    LoadResString(errInvalidParameter)
End Select
Next prmParam

Exit Sub

AssignParametersErr:

mstrSource = mstrModuleName & "AssignParameters"
Call LogErrors(Errors)
On Error GoTo 0
Err.Raise vbObjectError + errAssignParametersFailed, _
    mstrSource, LoadResString(errAssignParametersFailed)

End Sub
Private Sub RunStartProcessing(dtmStartTime As Currency)

    On Error GoTo RunStartProcessingErr

    ' Insert the run header into the database
    Call InsertRunHeader(dtmStartTime)

    ' Insert the run parameters into the database
    Call InsertRunParameters(dtmStartTime)

Exit Sub

RunStartProcessingErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
mstrSource = mstrModuleName & "RunStartProcessing"
ShowError errUpdateRunDataFailed
WriteError errUpdateRunDataFailed, mstrSource

End Sub
Private Sub ProcessStartProcessing(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
Long, _
    lParentInstanceId As Long, sItValue As String)

    On Error GoTo ProcessStartProcessingErr

    ' Insert the run detail into the database
    Call InsertRunDetail(cStepRecord, strCommand, dtmStartTime,
lngInstanceId, _
    lParentInstanceId, sItValue)

Exit Sub

ProcessStartProcessingErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)

```

```

mstrSource = mstrModuleName & "ProcessStartProcessing"
ShowError errUpdateRunDataFailed
WriteError errUpdateRunDataFailed, mstrSource

End Sub
Private Sub StepStartProcessing(cStepRecord As cStep, dtmStartTime As
Currency, _
lngInstanceId As Long, lParentInstanceId As Long, sItValue As
String)

On Error GoTo StepStartProcessingErr

' Since ProcessStart events won't be triggered for manager steps
If cStepRecord.StepType = gintManagerStep Then
' Insert the run detail into the database
Call InsertRunDetail(cStepRecord, cStepRecord.StepLabel, _
dtmStartTime, lngInstanceId, lParentInstanceId, _
sItValue)
End If

Exit Sub

StepStartProcessingErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
mstrSource = mstrModuleName & "StepStartProcessing"
ShowError errUpdateRunDataFailed

End Sub
Private Sub ProcessCompleteProcessing(cStepRecord As cStep, _
dtmStartTime As Currency, lngInstanceId As Long, lElapsed As
Long)

On Error GoTo ProcessCompleteProcessingErr

' Insert the run detail into the database
Call UpdateRunDetail(cStepRecord, dtmStartTime, lngInstanceId,
lElapsed)

Exit Sub

ProcessCompleteProcessingErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
mstrSource = mstrModuleName & "ProcessCompleteProcessing"
ShowError errUpdateRunDataFailed

End Sub
Private Sub StepCompleteProcessing(cStepRecord As cStep, _
dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

On Error GoTo StepCompleteProcessingErr

' Since ProcessComplete events won't be triggered for manager steps
If cStepRecord.StepType = gintManagerStep Then
' Update the run detail in the database

```

```

Call UpdateRunDetail(cStepRecord, dtmEndTime, lngInstanceId,
lElapsed)
End If

Exit Sub

StepCompleteProcessingErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
ShowError errUpdateRunDataFailed

End Sub
Private Sub RunCompleteProcessing(dtmEndTime As Currency)

On Error GoTo RunCompleteProcessingErr

' Update the header record with the end time for the run
Call UpdateRunHeader(dtmEndTime)

Exit Sub

RunCompleteProcessingErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
ShowError errUpdateRunDataFailed

End Sub
Private Sub UpdateRunHeader(ByVal dtmEndTime As Currency)
' Updates the run header record with the end date

Dim strUpdate As String
Dim qy As QueryDef

On Error GoTo UpdateRunHeaderErr

strUpdate = "update run_header " & _
" set end_time = [e_date] " & _
" where run_id = [r_id] "

Set qy = mdbaLoadDb.CreateQueryDef( _
gstrEmptyString, strUpdate)

' Call a procedure to execute the Querydef object
Call AssignParameters(qy, EndTime:=dtmEndTime)

qy.Execute dbFailOnError
qy.Close

Exit Sub

UpdateRunHeaderErr:
LogErrors Errors
mstrSource = mstrModuleName & "UpdateRunHeader"
On Error GoTo 0
Err.Raise vbObjectError + errUpdateRunDataFailed, _

```

```

        mstrSource, _
        LoadResString(errUpdateRunDataFailed)
End Sub

Public Property Let WorkspaceId(ByVal vdata As Long)
    mlngWorkspaceId = vdata
End Property
Public Property Get WorkspaceId() As Long
    WorkspaceId = mlngWorkspaceId
End Property
Public Sub RunWorkspace ()

    Dim cRunSeq As cSequence

    On Error GoTo RunWorkspaceErr

    ' Call a procedure to load the module-level structures
    ' with all the step and parameter data for the run
    If LoadRunData = False Then
        ' Error handled by the function already
        Exit Sub
    End If

    ' Retrieve the next run identifier using the sequence class
    Set cRunSeq = New cSequence
    Set cRunSeq.IdDatabase = dbsAttTool
    cRunSeq.IdentifierColumn = "run_id"
    mlngRunId = cRunSeq.Identifier
    Set cRunSeq = Nothing

    Call mcRunParams.InitBuiltInsForRun (mlngWorkspaceId, mlngRunId)

    Set mcRun.Constraints = mcRunConstraints
    mcRun.WspPreExecution = mcvntWspPreCons
    mcRun.WspPostExecution = mcvntWspPostCons

    Set mcRun.Steps = mcRunSteps
    Set mcRun.Parameters = mcRunParams
    Set mcRun.RunConnections = mcRunConnections
    Set mcRun.RunConnDtls = mcRunConnDtls

    mcRun.WspId = mlngWorkspaceId
    mcRun.RootKey = LabelStep (mlngWorkspaceId)
    mcRun.RunId = mlngRunId
    mcRun.CreateInputFiles = CreateInputFiles

    mcRun.Run

    Exit Sub

RunWorkspaceErr:
    ' Log the error code raised by Visual Basic
    Call LogErrors(Errors)

End Sub

```

```

Public Property Get LoadDb() As Database

    Set LoadDb = mdfsLoadDb

End Property
Public Property Set LoadDb(vdata As Database)

    Set mdfsLoadDb = vdata

End Property
Private Function LoadRunData () As Boolean

    ' Loads the step, parameter and constraint arrays
    ' with all the data for the workspace. Returns False
    ' if a failure occurs

    Dim strWorkspaceName As String
    Dim recWspSteps As Recordset
    Dim qySteps As DAO.QueryDef
    Dim recWspParams As Recordset
    Dim qyParams As DAO.QueryDef
    Dim recWspConns As Recordset
    Dim qyConns As DAO.QueryDef
    Dim recWspConnDtls As Recordset
    Dim qyConnDtls As DAO.QueryDef

    On Error GoTo LoadRunDataErr

    Set mcRunSteps.StepDB = mdfsLoadDb
    Set mcRunParams.ParamDatabase = mdfsLoadDb
    Set mcRunConstraints.ConstraintDB = mdfsLoadDb
    Set mcRunConnections.ConnDb = mdfsLoadDb
    Set mcRunConnDtls.ConnDb = mdfsLoadDb

    ' Read all the step and parameter data for the workspace
    Call ReadWorkspaceData (mlngWorkspaceId, mcRunSteps, _
        mcRunConnDtls, _
        mcrunParams, mcRunConstraints, mcRunConnections,
        recWspSteps, qySteps, recWspParams, qyParams, recWspConns,
        qyConns, _
        recWspConnDtls, qyConnDtls)

    ' Load all the pre- and post-execution constraints that
    ' have been defined for the workspace
    mcvntWspPreCons = mcRunConstraints.ConstraintsForWsp( _
        mlngWorkspaceId, _
        gintPreStep, _
        blnSort:=True, _
        blnGlobalConstraintsOnly:=True)
    mcvntWspPostCons = mcRunConstraints.ConstraintsForWsp( _
        mlngWorkspaceId, _
        gintPostStep, _
        blnSort:=True, _
        blnGlobalConstraintsOnly:=True)

    On Error Resume Next

```

```

recWspSteps.Close
qySteps.Close
recWspParams.Close
qyParams.Close
recWspConns.Close
qyConns.Close

LoadRunData = True

Exit Function

LoadRunDataErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
ShowError errLoadRunDataFailed
LoadRunData = False

End Function
Public Sub StopRun()

    On Error GoTo StopRunErr

    If mcRun Is Nothing Then
        ' We haven't been the run yet, so do nothing
    Else
        mcRun.StopRun
    End If

    Exit Sub

StopRunErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
' Errors would have been displayed by the called process

End Sub
Public Sub AbortRun()

    On Error GoTo AbortRunErr

    If mcRun Is Nothing Then
        ' We haven't been the run yet, so do nothing
    Else
        mcRun.Abort
    End If

    Exit Sub

AbortRunErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
' Errors would have been displayed by the called process

End Sub

Private Sub Class_Initialize()

    ' Create instances of the step, parameter and constraint arrays
    Set mcRunSteps = New cArrSteps
    Set mcRunParams = New cArrParameters
    Set mcRunConstraints = New cArrConstraints
    Set mcRunConnections = New cConnections
    Set mcRunConnDtls = New cConnDtls
    Set mcRun = New cRunInst
    Set mField = New cStringSM

End Sub
Private Sub Class_Terminate()

    On Error GoTo UnLoadRunDataErr

    ' Clears the step, parameter and constraint arrays
    Set mcRunSteps = Nothing
    Set mcRunParams = Nothing
    Set mcRunConstraints = Nothing
    Set mcRunConnections = Nothing
    Set mcRunConnDtls = Nothing

    Set mcRun = Nothing
    Set mdfsLoadDb = Nothing
    Set mField = Nothing

    Exit Sub

UnLoadRunDataErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
' Not a critical error - continue
Resume Next

End Sub

Private Sub mcRun_ProcessComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    RaiseEvent ProcessComplete(cStepRecord, dtmEndTime, lngInstanceId)
    Call ProcessCompleteProcessing(cStepRecord, dtmEndTime,
    lngInstanceId, lElapsed)

End Sub

Private Sub mcRun_ProcessStart(cStepRecord As cStep, _
    strCommand As String, dtmStartTime As Currency, lngInstanceId As
    Long, _
    lParentInstanceId As Long, sItValue As String)

    RaiseEvent ProcessStart(cStepRecord, strCommand, dtmStartTime,
    lngInstanceId)
    Call ProcessStartProcessing(cStepRecord, strCommand, dtmStartTime,
    lngInstanceId, _
    lParentInstanceId, sItValue)

```

```

End Sub

Private Sub mcRun_RunComplete(dtmEndTime As Currency)

    Debug.Print "Run ended at: " & CStr(dtmEndTime)
    Call RunCompleteProcessing(dtmEndTime)

    RaiseEvent RunComplete(dtmEndTime)

End Sub
Private Sub mcRun_RunStart(dtmStartTime As Currency, strWspLog As
String)

    RaiseEvent RunStart(dtmStartTime, strWspLog, mlngRunId)
    Debug.Print "Run started at: " & CStr(dtmStartTime)

    Call RunStartProcessing(dtmStartTime)

End Sub
Private Sub mcRun_StepComplete(cStepRecord As cStep, _
    dtmEndTime As Currency, lngInstanceId As Long, lElapsed As Long)

    RaiseEvent StepComplete(cStepRecord, dtmEndTime, lngInstanceId)
    ' BugMessage "Step: " & cStepRecord.StepLabel & " has completed!"

    Call StepCompleteProcessing(cStepRecord, dtmEndTime, lngInstanceId,
lElapsed)

End Sub
Private Sub mcRun_StepStart(cStepRecord As cStep, dtmStartTime As
Currency, _
    lngInstanceId As Long, lParentInstanceId As Long, sPath As
String, sIts As String, sItValue As String)

    RaiseEvent StepStart(cStepRecord, dtmStartTime, lngInstanceId, sPath,
sIts)
    'bugmessage "Step: " & cStepRecord.StepLabel & " has started."

    Call StepStartProcessing(cStepRecord, dtmStartTime, lngInstanceId,
lParentInstanceId, sItValue)

End Sub

```

## cSequence.cls

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cSequence"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:      cSequence.cls
'           Microsoft TPC-H Kit Ver. 1.00

```

```

'           Copyright Microsoft, 1999
'           All Rights Reserved
'
'
' PURPOSE:   This class uses the att_identifiers table to generate
unique
'           identifiers.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

Private mlngIdentifier As Long
Private mstrIdentifierColumn As String
Private mrecIdentifiers As Recordset
Private mdbsDatabase As Database

Private Const mstrEmptyString = ""

' Used to indicate the source module name when errors
' are raised by this class
Private mstrSource As String
Private Const mstrModuleName As String = "cSequence."

Private Sub CreateIdRecord()
    ' Creates a record with all identifiers having an initial value of 1

    Dim sSql As String
    Dim pId As DAO.Parameter
    Dim qyId As DAO.QueryDef

    sSql = "insert into att_identifiers (" & _
        " workspace_id, parameter_id, step_id, " & _
        " constraint_id, run_id, connection_id " & _
        ", " & FLD_ID_CONN_NAME & _
        ") values (" & _
        "[w_id], [p_id], [s_id], [c_id], [r_id], [conn_id],
[conn_dtl_id] )"
    Set qyId = mdbsDatabase.CreateQueryDef(gstrEmptyString, sSql)
    For Each pId In qyId.Parameters
        pId.Value = glMinId
    Next pId
    qyId.Execute dbFailOnError
    qyId.Close

End Sub
Private Sub CreateIdRecordset()

    Dim strSql As String

    ' Initialize the recordset with all identifiers
    strSql = "select * from att_identifiers"
    Set mrecIdentifiers = mdbsDatabase.OpenRecordset(strSql,
dbOpenForwardOnly)

    If mrecIdentifiers.RecordCount = 0 Then
        CreateIdRecord
    End If

```

```

        Set mrecIdentifiers = mdbaDatabase.OpenRecordset(strSql,
dbOpenForwardOnly)
    End If

    BugAssert mrecIdentifiers.RecordCount <> 0

End Sub

Public Property Set IdDatabase(vdata As Database)

    Set mdbaDatabase = vdata

End Property

Public Property Let IdentifierColumn(vdata As String)

    Dim intIndex As Integer

    On Error GoTo IdentifierColumnErr

    ' Initialize the return value to an empty string
    mstrIdentifierColumn = mstrEmptyString
    Call CreateIdRecordset

    For intIndex = 0 To mrecIdentifiers.Fields.Count - 1

        If LCase(Trim(mrecIdentifiers.Fields(intIndex).Name)) = _
            LCase(Trim(vdata)) Then

            ' Valid column name
            mstrIdentifierColumn = vdata
            Exit Property
        End If

    Next intIndex

    BugAssert True, "Invalid column name!"

    Exit Property

IdentifierColumnErr:
    LogErrors Errors
    mstrSource = mstrModuleName & "IdentifierColumn"
    On Error GoTo 0
    Err.Raise vbObjectError + errIdentifierColumnFailed, _
        mstrSource, _
        LoadResString(errIdentifierColumnFailed)

End Property
Public Property Get Identifier() As Long
    Dim strSql As String

    On Error GoTo GetIdentifierErr

    BugAssert mstrIdentifierColumn <> mstrEmptyString

```

```

    ' Increment the identifier column by 1
    strSql = "update att_identifiers " & _
        " set " & mstrIdentifierColumn & _
        " = " & mstrIdentifierColumn & " + 1"
    mdbaDatabase.Execute strSql, dbFailOnError

    ' Refresh the recordset with identifier values
    Call CreateIdRecordset

    mlngIdentifier = mrecIdentifiers.Fields(mstrIdentifierColumn).Value

    Identifier = mlngIdentifier

    Exit Property

GetIdentifierErr:
    LogErrors Errors
    mstrSource = mstrModuleName & "Identifier"
    On Error GoTo 0
    Err.Raise vbObjectError + errGetIdentifierFailed, _
        mstrSource, _
        LoadResString(errGetIdentifierFailed)

End Property
Private Sub Class_Terminate()

    mrecIdentifiers.Close

End Sub

```

## cStack.cls

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cStack"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:      cStack.cls
'           Microsoft TPC-H Kit Ver. 1.00
'           Copyright Microsoft, 1999
'           All Rights Reserved
'
' PURPOSE:   This class implements a stack of objects.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

' Used to indicate the source module name when errors
' are raised by this class
Private Const mstrModuleName As String = "cStack."
Private mstrSource As String

```



```

Private mcVector As cVector
Private mlngCount As Long
Public Property Get Item(ByVal Position As Long) As Object
Attribute Item.VB_UserMemId = 0

    Set Item = mcVector(Position)
End Property

Public Sub Push(objToPush As Object)

    mcVector.Add objToPush
End Sub

Public Sub Clear()

    mcVector.Clear
End Sub

Public Function Pop() As Object

    If mcVector.Count > 0 Then
        Set Pop = mcVector.Delete(mcVector.Count - 1)
    Else
        Set Pop = Nothing
    End If
End Function

Public Function Count() As Long

    Count = mcVector.Count
End Function

Private Sub Class_Initialize()

    Set mcVector = New cVector
End Sub

Private Sub Class_Terminate()

    Set mcVector = Nothing
End Sub

```

## cStep.cls

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True

```

```

END
Attribute VB_Name = "cStep"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
Attribute VB_Ext_KEY = "SavedWithClassBuilder" ,"Yes"
Attribute VB_Ext_KEY = "Top_Level" ,"Yes"
' FILE: cStep.cls
' Microsoft TPC-H Kit Ver. 1.00
' Copyright Microsoft, 1999
' All Rights Reserved
'
' PURPOSE: Encapsulates the properties and methods of a step.
' Contains functions to insert, update and delete
' att_steps records from the database.
' Contact: Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

' Local variable(s) to hold property value(s)
Private mlngStepId As Long
Private mstrVersionNo As String
Private mstrStepLabel As String
Private mstrStepTextFile As String
Private mstrStepText As String
Private mstrStartDir As String
Private mlngWorkspaceId As Integer
Private mlngParentStepId As Integer
Private mstrParentVersionNo As String
Private mintSequenceNo As Integer
Private mintStepLevel As Integer
Private mblnEnabledFlag As Boolean
Private mstrDegreeParallelism As String
Private mintExecutionMechanism As Integer
Private mstrFailureDetails As String
Private mintContinuationCriteria As Integer
Private mblnGlobalFlag As Boolean
Private mblnArchivedFlag As Boolean
Private mstrOutputFile As String
'Private mstrLogFile As String
Private mstrErrorFile As String
Private mdbDatabase As Database
Private mintStepType As Integer
Private mintOperation As Operation
Private mlngPosition As Long
Private mstrIteratorName As String
Private mcIterators As cNodeCollections
Private mbIsNewVersion As Boolean
Private msOldVersion As String

```

```

' The following constants are used throughout the project to
' indicate the different options selected by the user
' The options are presented to the user as control arrays of
' option buttons. These constants have to be in sync with the

```

```

' indexes of the option buttons.
' All the control arrays have an lbound of 1. The value 0 is
' used to indicate that the property being represented by the
' control array is not valid for the step
' Public enums are used since we cannot expose public constants
' in class modules. gintNoOption is applicable to all enums,
' but declared in the Execution method enum, since we cannot
' declare it more than once.

' Is here as a comment
' Has been defined in public.bas with the other object types
Public Enum gintStepType
'   gintGlobalStep = 3
'   gintManagerStep
'   gintWorkerStep
End Enum

' Execution Method options
Public Enum ExecutionMethod
   gintNoOption = 0
   gintExecuteODBC
   gintExecuteShell
End Enum

' Failure criteria options
Public Enum FailureCriteria
   gintFailureODBC = 1
   gintFailureTextCompare
End Enum

' Continuation criteria options
' Note: Update the initialization of gsContCriteria in Initialize() if
the
' continuation criteria are modified
Public Enum ContinuationCriteria
   gintOnFailureAbort = 1
   gintOnFailureContinue
   gintOnFailureCompleteSiblings
   gintOnFailureAbortSiblings
   gintOnFailureSkipSiblings
   gintOnFailureAsk
End Enum

' The initial version #
Private Const mstrMinVersion As String = "0.0"

' End of constants for option button control arrays
' Used to indicate the source module name when errors
' are raised by this class
Private mstrSource As String
Private Const mstrModuleName As String = "cStep."

' The cSequence class is used to generate unique step identifiers
Private mStepSeq As cSequence

' The StringSM class is used to carry out string operations

```

```

Private mFieldValue As cStringSM
Private Sub NewVersion()

mbIsNewVersion = True
msOldVersion = mstrVersionNo

End Sub
Public Function IsNewVersion() As Boolean
   IsNewVersion = mbIsNewVersion
End Function

Public Function OldVersionNo() As String
   OldVersionNo = msOldVersion
End Function

Public Sub SaveIterators()
' This procedure checks if any changes have been made
' to the iterators for the step. If so, it calls the
' methods of the iterator class to commit the changes
Dim cItRec As cIterator
Dim lngIndex As Long

On Error GoTo SaveIteratorsErr

For lngIndex = 0 To mcIterators.Count - 1
   Set cItRec = mcIterators(lngIndex)

   Select Case cItRec.IndOperation
      Case QueryOp
         ' No changes were made to the queried Step.
         ' Do nothing

      Case InsertOp
         cItRec.Add mlngStepId, mstrVersionNo
         cItRec.IndOperation = QueryOp

      Case UpdateOp
         cItRec.Update mlngStepId, mstrVersionNo
         cItRec.IndOperation = QueryOp

      Case DeleteOp
         cItRec.Delete mlngStepId, mstrVersionNo
         ' Remove the record from the collection
         mcIterators.Delete lngIndex

   End Select
Next lngIndex

Exit Sub

SaveIteratorsErr:
LogErrors Errors
mstrSource = mstrModuleName & "SaveIterators"
On Error GoTo 0
Err.Raise vbObjectError + errSaveFailed, _
   mstrSource, _

```

```

        LoadResString(errSaveFailed)

End Sub
Public Property Get IndOperation() As Operation

    IndOperation = mintOperation

End Property
Public Property Let IndOperation(ByVal vdata As Operation)

    BugAssert vdata = QueryOp Or vdata = InsertOp Or vdata = UpdateOp Or
vdata = DeleteOp, "Invalid operation"
    mintOperation = vdata

End Property

Public Function Iterators() As Variant
    ' Returns a variant containing all the iterators that
    ' have been defined for the step

    Dim cStepIterators() As cIterator
    Dim cTempIt As cIterator
    Dim lngIndex As Long
    Dim lngItCount As Long

    On Error GoTo IteratorsErr

    lngItCount = 0
    For lngIndex = 0 To mcIterators.Count - 1
        ' Increase the array dimension and add the constraint
        ' to it
        Set cTempIt = mcIterators(lngIndex)

        If cTempIt.IndOperation <> DeleteOp Then
            ReDim Preserve cStepIterators(lngItCount)
            Set cStepIterators(lngItCount) = cTempIt
            lngItCount = lngItCount + 1
        End If

    Next lngIndex

    If lngItCount = 0 Then
        Iterators = Empty
    Else
        Iterators = cStepIterators()
    End If

    Call QuickSort(Iterators)

    Exit Function

IteratorsErr:
    LogErrors Errors
    On Error GoTo 0
    Err.Raise vbObjectError + errIteratorsFailed, _
        mstrModuleName & "Iterators", _

```

```

        LoadResString(errIteratorsFailed)

End Function
Public Function IteratorCount() As Long
    ' Returns a count of all the iterators for the step

    Dim lngItCount As Long
    Dim lngIndex As Long
    Dim cTempIt As cIterator

    On Error GoTo IteratorsErr

    lngItCount = 0
    For lngIndex = 0 To mcIterators.Count - 1

        If mcIterators(lngIndex).IndOperation <> DeleteOp Then
            lngItCount = lngItCount + 1
        End If

    Next lngIndex

    IteratorCount = lngItCount

    Exit Function

IteratorsErr:
    LogErrors Errors
    On Error GoTo 0
    Err.Raise vbObjectError + errIteratorsFailed, _
        mstrSource, _
        LoadResString(errIteratorsFailed)

End Function
Public Sub Validate()
    ' Each distinct object will have a Validate method which
    ' will check if the class properties are valid. This method
    ' will be used to check interdependant properties that
    ' cannot be validated by the let procedures.
    ' It should be called by the add and modify methods of the class

    ' Check if the step label has been specified
    If StringEmpty(mstrStepLabel) Then
        ShowError errStepLabelMandatory
        On Error GoTo 0
        Err.Raise vbObjectError + errValidateFailed, _
            "Validate", LoadResString(errValidateFailed)
    End If

    If Not IsStringEmpty(mstrStepText) And Not
IsStringEmpty(mstrStepTextFile) Then
        ShowError errStepTextOrFile
        On Error GoTo 0
        Err.Raise vbObjectError + errStepTextOrFile, _
            "Validate", LoadResString(errStepTextOrFile)
    End If

```

```

End Sub

Public Function IncVersionY() As String
    ' The version number for a step is stored in the x.y
    ' format where x is the parent component and y is the
    ' child component of the step. This function will increment
    ' the y component of the step by 1

    On Error GoTo IncVersionYErr

    ' Store the old version number for the step
    Call NewVersion

    mstrVersionNo = Trim$(Str$(GetX(mstrVersionNo))) & gstrVerSeparator
& _
    Trim$(Str(GetY(mstrVersionNo) + 1))
    IncVersionY = mstrVersionNo

Exit Function

IncVersionYErr:
    ' Log the error code raised by Visual Basic
    Call LogErrors(Errors)
    gstrSource = mstrModuleName & "IncVersionY"
    On Error GoTo 0
    Err.Raise vbObjectError + errIncVersionYFailed, _
        gstrSource, _
        LoadResString(errIncVersionYFailed)

End Function

Public Function IncVersionX() As String
    ' The version number for a step is stored in the x.y
    ' format where x is the parent component and y is the
    ' child component of the step. This function will increment
    ' the y component of the step by 1 and reset the x component
    ' to 0

    On Error GoTo IncVersionXErr

    ' Store the old version number for the step
    Call NewVersion

    mstrVersionNo = Trim$(Str$(GetX(mstrVersionNo) + 1)) &
gstrVerSeparator & "0"
    IncVersionX = mstrVersionNo

Exit Function

IncVersionXErr:
    ' Log the error code raised by Visual Basic
    Call LogErrors(Errors)
    gstrSource = mstrModuleName & "IncVersionX"
    On Error GoTo 0
    Err.Raise vbObjectError + errIncVersionXFailed, _
        gstrSource, _
        LoadResString(errIncVersionXFailed)

```

```

End Function

Private Function GetY(strVersion As String) As Long
    ' The version number for a step is stored in the x.y
    ' format where x is the parent component and y is the
    ' child component of the step. Given an argument of type
    ' x.y, it returns y

    ' Truncate the fractional part to get the parent component
    ' of the version number (x.y)
    GetY = Val(Mid(strVersion, InStr(strVersion, gstrVerSeparator) + 1))

End Function

Private Function GetX(strVersion As String) As Long
    ' The version number for a step is stored in the x.y
    ' format where x is the parent component and y is the
    ' child component of the step. Given an argument of type
    ' x.y, it returns x

    ' Truncate the fractional part to get the parent component
    ' of the version number (x.y)
    GetX = Val(Left(strVersion, InStr(strVersion, gstrVerSeparator) -
1))

End Function

Public Function Clone(Optional cCloneStep As cStep) As cStep

    ' Creates a copy of a given step

    Dim lngIndex As Long
    Dim cItRec As cIterator
    Dim cItClone As cIterator

    On Error GoTo CloneErr

    If cCloneStep Is Nothing Then
        Set cCloneStep = New cStep
    End If

    ' Copy all the step properties to the newly created step
    ' Initialize the global flag first since subsequent
    ' validations might depend on it
    cCloneStep.GlobalFlag = mblnGlobalFlag
    cCloneStep.GlobalRunMethod = mintGlobalRunMethod

    cCloneStep.StepType = mintStepType
    cCloneStep.StepId = mlngStepId
    cCloneStep.VersionNo = mstrVersionNo
    cCloneStep.StepLabel = mstrStepLabel
    cCloneStep.StepTextFile = mstrStepTextFile
    cCloneStep.StepText = mstrStepText
    cCloneStep.StartDir = mstrStartDir
    cCloneStep.WorkspaceId = mlngWorkspaceId

```

```

cCloneStep.ParentStepId = mlngParentStepId
cCloneStep.ParentVersionNo = mstrParentVersionNo
cCloneStep.StepLevel = mintStepLevel
cCloneStep.SequenceNo = mintSequenceNo
cCloneStep.EnabledFlag = mblnEnabledFlag
cCloneStep.DegreeParallelism = mstrDegreeParallelism
cCloneStep.ExecutionMechanism = mintExecutionMechanism
cCloneStep.FailureDetails = mstrFailureDetails
cCloneStep.ContinuationCriteria = mintContinuationCriteria
cCloneStep.ArchivedFlag = mblnArchivedFlag
cCloneStep.OutputFile = mstrOutputFile
cCloneStep.LogFile = mstrLogFile
cCloneStep.ErrorFile = mstrErrorFile
cCloneStep.IteratorName = mstrIteratorName

cCloneStep.IndOperation = mintOperation
cCloneStep.Position = mlngPosition

Set cCloneStep.NodeDB = mdbDatabase

' Clone all the iterators for the step
For lngIndex = 0 To mcIterators.Count - 1
    Set cItRec = mcIterators(lngIndex)
    Set cItClone = cItRec.Clone
    cCloneStep.LoadIterator cItClone
Next lngIndex

' And set the return value to the newly created step
Set Clone = cCloneStep

Exit Function

CloneErr:
    LogErrors Errors
    mstrSource = mstrModuleName & "Clone"
    On Error GoTo 0
    Err.Raise vbObjectError + errCloneFailed, _
        mstrSource, LoadResString(errCloneFailed)

End Function
'End Sub
'
Public Property Let OutputFile(ByVal vdata As String)

    mstrOutputFile = vdata

End Property

Public Property Get OutputFile() As String

    OutputFile = mstrOutputFile

End Property

'Public Property Let LogFile(ByVal vdata As String)
'

```

```

'    mstrLogFile = vdata
'
'End Property
'
'Public Property Get LogFile() As String
'
'    LogFile = mstrLogFile
'
'End Property

Public Property Let ErrorFile(ByVal vdata As String)

    mstrErrorFile = vdata

End Property
Public Property Let IteratorName(ByVal vdata As String)

    mstrIteratorName = vdata

End Property

Public Property Get ErrorFile() As String

    ErrorFile = mstrErrorFile

End Property
Public Property Get IteratorName() As String

    IteratorName = mstrIteratorName

End Property

Public Property Set NodeDB(vdata As Database)

    Set mdbDatabase = vdata
    Set mcIterators.NodeDB = vdata

End Property
Public Property Get NodeDB() As Database

    Set NodeDB = mdbDatabase

End Property

Private Function IsStringEmpty(strToCheck As String) As Boolean

    IsStringEmpty = (strToCheck = gstrEmptyString)

End Function

Public Property Let EnabledFlag(ByVal vdata As Boolean)

' The enabled flag must be False for all global steps.
' This check must be made by the global step class. Only
' generic step validations will be carried out by this
' class

```

```

        mblnEnabledFlag = vdata
End Property

Public Property Let GlobalFlag(ByVal vdata As Boolean)

    mblnGlobalFlag = vdata
End Property
Public Property Get EnabledFlag() As Boolean

    EnabledFlag = mblnEnabledFlag
End Property

Public Property Let ArchivedFlag(ByVal vdata As Boolean)

    mblnArchivedFlag = vdata
End Property

Public Property Get ArchivedFlag() As Boolean

    ArchivedFlag = mblnArchivedFlag
End Property

Public Property Get GlobalFlag() As Boolean

    GlobalFlag = mblnGlobalFlag
End Property

Public Sub Add()
    ' Inserts a step record into the database - it initializes
    ' the necessary properties for the step and calls InsertStepRec
    ' to do the database work

    On Error GoTo AddErr

    ' A new record would have the deleted_flag turned off!
    mblnArchivedFlag = False

    Call InsertStepRec

    ' If a new version of a step has been created, reset the old version
info, since
    ' it's already been saved to the db
    If IsNewVersion() Then
        mblnIsNewVersion = False
        msOldVersion = gstrEmptyString
    End If

    Exit Sub

AddErr:

```

```

LogErrors Errors
On Error GoTo 0
Err.Raise vbObjectError + errAddStepFailed, _
    mstrModuleName & "Add", LoadResString(errAddStepFailed)
End Sub
Private Sub InsertStepRec()
    ' Inserts a step record into the database
    ' It first generates the insert statement using the different
    ' step properties and then executes it

    Dim strInsert As String
    Dim qy As DAO.QueryDef

    On Error GoTo InsertStepRecErr

    ' First check if the database object is valid
    Call CheckDB

    ' Check if the step record is valid
    Call Validate

    If IsNewVersion() Then
        Call UpdOldVersionsArchFlg
    End If

    ' Create a temporary querydef object
    strInsert = "insert into att_steps " & _
        "( workspace_id, step_id, version_no, " & _
        " step_label, step_file_name, step_text, start_directory, " & _
        " parent_step_id, parent_version_no, sequence_no, " & _
        " enabled_flag, step_level, " & _
        " degree_parallelism, execution_mechanism, " & _
        " failure_details, " & _
        " continuation_criteria, global_flag, " & _
        " archived_flag, " & _
        " output_file_name, error_file_name, " & _
        " iterator_name ) values ( "

    ' log_file_name,

    #If USE_JET Then

    strInsert = strInsert & " [w_id], [s_id], [ver_no], " & _
        " [s_label], [s_file_name], [s_text], [s_start_dir], " & _
        " [p_step_id], [p_version_no], [seq_no], " & _
        " [enabled], [s_level], [deg_parallelism], " & _
        " [exec_mechanism], [fail_dtls], " & _
        " [cont_criteria], [global], [archived], " & _
        " [output_file], [error_file], " & _
        " [it_name] ) "

    ' [log_file],

    Set qy = mdbaDatabase.CreateQueryDef(gstrEmptyString, strInsert)

    ' Call a procedure to execute the Querydef object

```

```

Call AssignParameters(qy)

qy.Execute dbFailOnError
qy.Close
#Else

    strInsert = strInsert & Str(mlngWorkspaceId) & ", " &
Str(mlngStepId) & _
    ", " & mFieldValue.MakeStringFieldValid(mstrVersionNo)

    ' For fields that may be null, call a function to determine
    ' the string to be appended to the insert statement
    strInsert = strInsert & ", " &
mFieldValue.MakeStringFieldValid(mstrStepLabel)
    strInsert = strInsert & ", " &
mFieldValue.MakeStringFieldValid(mstrStepTextFile)
    strInsert = strInsert & ", " &
mFieldValue.MakeStringFieldValid(mstrStepText)
    strInsert = strInsert & ", " &
mFieldValue.MakeStringFieldValid(mstrStartDir)

    strInsert = strInsert & ", " & Str(mlngParentStepId) & _
    ", " & mFieldValue.MakeStringFieldValid(mstrParentVersionNo) & _
    ", " & Str(mintSequenceNo) & _
    ", " & Str(mblnEnabledFlag) & ", " & Str(mintStepLevel)

    strInsert = strInsert & ", " &
mFieldValue.MakeStringFieldValid(mstrDegreeParallelism)
    strInsert = strInsert & ", " & Str(mintExecutionMechanism)

    strInsert = strInsert & ", " &
mFieldValue.MakeStringFieldValid(mstrFailureDetails) & _
    ", " & Str(mintContinuationCriteria) & _
    ", " & Str(mblnGlobalFlag) & _
    ", " & Str(mblnArchivedFlag)

    strInsert = strInsert & ", " &
mFieldValue.MakeStringFieldValid(mstrOutputFile)
    ' strInsert = strInsert & ", " &
mFieldValue.MakeStringFieldValid(mstrLogFile)
    strInsert = strInsert & ", " &
mFieldValue.MakeStringFieldValid(mstrErrorFile)
    strInsert = strInsert & ", " &
mFieldValue.MakeStringFieldValid(mstrIteratorName)

    strInsert = strInsert & " ) "

    BugMessage strInsert
    mdbaDatabase.Execute strInsert, dbFailOnError

#End If

Exit Sub

InsertStepRecErr:
mstrSource = mstrModuleName & "InsertStepRec"

```

```

LogErrors Errors
On Error GoTo 0
Err.Raise vbObjectError + errInsertStepFailed, _
    mstrSource, LoadResString(errInsertStepFailed)
End Sub
Private Sub UpdOldVersionsArchFlg()
    ' Updates the archived flag on all old version for the step to True

    Dim sUpdate As String
    Dim qy As DAO.QueryDef

    On Error GoTo UpdOldVersionsArchFlgErr
    mstrSource = mstrModuleName & "UpdOldVersionsArchFlg"

#If USE_JET Then

    sUpdate = "update att_steps " & _
        " set archived_flag = True "

    ' Append the Where clause
    sUpdate = sUpdate & " where step_id = [s_id] " & _
        " and version_no <> [ver_no]"

    Set qy = mdbaDatabase.CreateQueryDef(gstrEmptyString, sUpdate)

    ' Call a procedure to execute the Querydef object
    Call AssignParameters(qy)
    qy.Execute dbFailOnError

    If qy.RecordsAffected = 0 Then
        On Error GoTo 0
        Err.Raise vbObjectError + errModifyStepFailed, _
            mstrSource, LoadResString(errModifyStepFailed)
    End If

    qy.Close

#Else

    sUpdate = "update att_steps " & _
        " set archived_flag = True "

    sUpdate = sUpdate & " where step_id = " & Str(mlngStepId) & _
        " and version_no <> " &
mFieldValue.MakeStringFieldValid(mstrVersionNo)

    BugMessage sUpdate
    mdbaDatabase.Execute sUpdate, dbFailOnError
#End If

Exit Sub

UpdOldVersionsArchFlgErr:
mstrSource = mstrModuleName & "UpdOldVersionsArchFlg"
LogErrors Errors
On Error GoTo 0

```

```

    Err.Raise vbObjectError + errModifyStepFailed, _
        mstrSource, LoadResString(errModifyStepFailed)
End Sub
Public Sub InsertIterator(cItRecord As cIterator)
    ' Inserts the iterator record into the database

    Call cItRecord.Add(mlngStepId, mstrVersionNo)
End Sub
Public Sub UpdateIterator(cItRecord As cIterator)
    ' Updates the iterator record in the database

    Call cItRecord.Update(mlngStepId, mstrVersionNo)
End Sub
Public Sub UpdateIteratorVersion()
    ' Updates the iterator record in the database

    Dim lngIndex As Long
    Dim cTempIt As cIterator

    On Error GoTo UpdateIteratorVersionErr

    For lngIndex = 0 To mcIterators.Count - 1
        ' Increase the array dimension and add the constraint
        ' to it
        Set cTempIt = mcIterators(lngIndex)

        If cTempIt.IndOperation <> DeleteOp Then
            ' Set the operation to indicate an insert
            cTempIt.IndOperation = InsertOp
        End If

    Next lngIndex

Exit Sub

UpdateIteratorVersionErr:
    mstrSource = mstrModuleName & "UpdateIteratorVersion"
    LogErrors Errors
    On Error GoTo 0
    Err.Raise vbObjectError + errUpdateFailed, _
        mstrSource, LoadResString(errUpdateFailed)
End Sub
Public Sub AddIterator(cItRecord As cIterator)
    ' Adds the iterator record to the collection of iterators
    ' for the step

    Call mcIterators.Add(cItRecord)
End Sub
Public Sub AddAllIterators()
    ' Sets the indicator variable for all iterators to insert

    Dim lngIndex As Long

```

```

    For lngIndex = 0 To mcIterators.Count - 1
        mcIterators(lngIndex).Validate
        mcIterators(lngIndex).IndOperation = InsertOp
    Next lngIndex
End Sub

Public Sub LoadIterator(cItRecord As cIterator)
    ' Adds the iterator record to the collection of iterators
    ' for the step

    Call mcIterators.Load(cItRecord)
End Sub

Public Sub UnloadIterators()
    ' Unloads all iterator records for the step

    Dim lngIndex As Long

    For lngIndex = mcIterators.Count - 1 To 0 Step -1
        ' Calls the collection method to unload the node
        ' from the array
        mcIterators.Unload lngIndex
    Next lngIndex
End Sub

Public Sub ModifyIterator(cItRecord As cIterator)
    ' Modifies the iterator record in the collection

    Call mcIterators.Modify(cItRecord)
End Sub

Public Sub DeleteIterator(cItRecord As cIterator)
    ' Deletes the iterator record from the database

    Call cItRecord.Delete(mlngStepId, mstrVersionNo)
End Sub

Public Sub RemoveIterator(cItRecord As cIterator)
    ' Marks the iterator record in the collection to
    ' indicate a delete

    Call mcIterators.Delete(cItRecord.Position)
End Sub

Private Sub AssignParameters(qyExec As DAO.QueryDef)
    ' Assigns values to the parameters in the querydef object
    ' The parameter names are cryptic to make them different
    ' from the actual field names. When the parameter names
    ' are the same as the field names, parameters in the
    ' where clause do not get created.

    Dim prmParam As DAO.Parameter

```



```

On Error GoTo AssignParametersErr
mstrSource = mstrModuleName & "AssignParameters"

For Each prmParam In qyExec.Parameters
    Select Case prmParam.Name
        Case "[w_id]"
            prmParam.Value = mlngWorkspaceId
        Case "[s_id]"
            prmParam.Value = mlngStepId
        Case "[ver_no]"
            prmParam.Value = mstrVersionNo
        Case "[s_label]"
            prmParam.Value = mstrStepLabel
        Case "[s_file_name]"
            prmParam.Value = mstrStepTextFile
        Case "[s_text]"
            prmParam.Value = mstrStepText
        Case "[s_start_dir]"
            prmParam.Value = mstrStartDir
        Case "[p_step_id]"
            prmParam.Value = mlngParentStepId
        Case "[p_version_no]"
            prmParam.Value = mstrParentVersionNo
        Case "[seq_no]"
            prmParam.Value = mintSequenceNo
        Case "[enabled]"
            prmParam.Value = mblnEnabledFlag
        Case "[s_level]"
            prmParam.Value = mintStepLevel
        Case "[deg_parallelism]"
            prmParam.Value = mstrDegreeParallelism
        Case "[exec_mechanism]"
            prmParam.Value = mintExecutionMechanism
        Case "[fail_dtls]"
            prmParam.Value = mstrFailureDetails
        Case "[cont_criteria]"
            prmParam.Value = mintContinuationCriteria
        Case "[global]"
            prmParam.Value = mblnGlobalFlag
        Case "[archived]"
            prmParam.Value = mblnArchivedFlag
        Case "[output_file]"
            prmParam.Value = mstrOutputFile
        Case "[log_file]"
            prmParam.Value = mstrLogFile
        Case "[error_file]"
            prmParam.Value = mstrErrorFile
        Case "[it_name]"
            prmParam.Value = mstrIteratorName
        Case Else
            ' Write the parameter name that is faulty
            WriteError errInvalidParameter, mstrSource, _
                prmParam.Name
            On Error GoTo 0
            Err.Raise errInvalidParameter, mstrSource, _
                LoadResString(errInvalidParameter)
    End Select
Next prmParam

If qyExec.Parameters("s_id") = 0 Or
StringEmpty(qyExec.Parameters("ver_no")) Then
    WriteError errInvalidParameter, mstrSource
    On Error GoTo 0
    Err.Raise errInvalidParameter, mstrSource,
LoadResString(errInvalidParameter)
End If

Exit Sub

AssignParametersErr:

mstrSource = mstrModuleName & "AssignParameters"
Call LogErrors(Errors)
On Error GoTo 0
Err.Raise vbObjectError + errAssignParametersFailed, _
    mstrSource, LoadResString(errAssignParametersFailed)

End Sub

Public Sub Modify()

    Dim strUpdate As String
    Dim qy As QueryDef

    On Error GoTo ModifyErr
    mstrSource = mstrModuleName & "Modify"

    ' Check if the database object is valid
    Call CheckDB

    ' Check if the step record is valid
    Call Validate

    ' The step_id and version_no will never be updated -
    ' whenever a step is modified a copy of the old step will
    ' be created with an incremented version_no

    #If USE_JET Then

        strUpdate = "update att_steps " & _
            " set step_label = [s_label] " & _
            " , step_file_name = [s_file_name] " & _
            " , step_text = [s_text] " & _
            " , start_directory = [s_start_dir] " & _
            " , workspace_id = [w_id] " & _
            " , parent_step_id = [p_step_id] " & _
            " , parent_version_no = [p_version_no] " & _
            " , sequence_no = [seq_no] " & _
            " , step_level = [s_level] " & _
            " , enabled_flag = [enabled] " & _
            " , degree_parallelism = [deg_parallelism] " & _

```

```

    , execution_mechanism = [exec_mechanism] " & _
    , failure_details = [fail_dtls] " & _
    , continuation_criteria = [cont_criteria] " & _
    , global_flag = [global] " & _
    , archived_flag = [archived] " & _
    , output_file_name = [output_file] " & _
    , error_file_name = [error_file] " & _
    , iterator_name = [it_name] "

' " , log_file_name = [log_file] " & _

' Append the Where clause
strUpdate = strUpdate & " where step_id = [s_id] " & _
    " and version_no = [ver_no]"

Set qy = mdbaDatabase.CreateQueryDef(gstrEmptyString, strUpdate)

' Call a procedure to execute the Querydef object
Call AssignParameters(qy)
qy.Execute dbFailOnError

If qy.RecordsAffected = 0 Then
    On Error GoTo 0
    Err.Raise vbObjectError + errModifyStepFailed, _
        mstrSource, LoadResString(errModifyStepFailed)
End If

qy.Close

#Else

strUpdate = "update att_steps " & _
    " set step_label = "

' For fields that may be null, call a function to determine
' the string to be appended to the update statement
strUpdate = strUpdate &
mFieldValue.MakeStringFieldValid(mstrStepLabel)

strUpdate = strUpdate & " , step_file_name = " &
mFieldValue.MakeStringFieldValid(mstrStepTextFile)
strUpdate = strUpdate & " , step_text = " &
mFieldValue.MakeStringFieldValid(mstrStepText)
strUpdate = strUpdate & " , start_directory = " &
mFieldValue.MakeStringFieldValid(mstrStartDir)

strUpdate = strUpdate & " , workspace_id = " & Str(mlngWorkspaceId)
& _
    " , parent_step_id = " & Str(mlngParentStepId) & _
    " , parent_version_no = " &
mFieldValue.MakeStringFieldValid(mstrParentVersionNo) & _
    " , sequence_no = " & Str(mintSequenceNo) & _
    " , step_level = " & Str(mintStepLevel) & _
    " , enabled_flag = " & Str(mblnEnabledFlag) & _
    " , degree_parallelism = " &
mFieldValue.MakeStringFieldValid(mstrDegreeParallelism) & _

```

```

    , execution_mechanism = " & Str(mintExecutionMechanism) & _
    , failure_details = " &
mFieldValue.MakeStringFieldValid(mstrFailureDetails) & _
    , continuation_criteria = " & Str(mintContinuationCriteria) &
_
    , global_flag = " & Str(mblnGlobalFlag) & _
    , archived_flag = " & Str(mblnArchivedFlag) & _
    , output_file_name = " &
mFieldValue.MakeStringFieldValid(mstrOutputFile) & _
    , error_file_name = " &
mFieldValue.MakeStringFieldValid(mstrErrorFile) & _
    , iterator_name = " &
mFieldValue.MakeStringFieldValid(mstrIteratorName)

'
    " , log_file_name = " &
mFieldValue.MakeStringFieldValid(mstrLogFile) & _

strUpdate = strUpdate & " where step_id = " & Str(mlngStepId) & _
    " and version_no = " &
mFieldValue.MakeStringFieldValid(mstrVersionNo)

BugMessage strUpdate
mdbaDatabase.Execute strUpdate, dbFailOnError
#End If

Exit Sub

ModifyErr:
LogErrors Errors
mstrSource = mstrModuleName & "Modify"
On Error GoTo 0
Err.Raise vbObjectError + errModifyStepFailed, _
    mstrSource, LoadResString(errModifyStepFailed)

End Sub

Private Sub CheckDB()
' Check if the database object has been initialized

If mdbaDatabase Is Nothing Then
    ShowError errInvalidDB
    On Error GoTo 0
    Err.Raise vbObjectError + errInvalidDB, _
        mstrModuleName, LoadResString(errInvalidDB)
End If

End Sub

Public Sub Delete()

Dim strDelete As String
Dim qy As DAO.QueryDef

On Error GoTo DeleteErr

Call CheckDB

strDelete = "delete from att_steps " & _

```

```

        " where step_id = [s_id] " & _
        " and version_no = [ver_no] ""
'   mdfsDatabase.Execute strDelete, dbFailOnError
Set qy = mdfsDatabase.CreateQueryDef(gstrEmptyString, strDelete)

Call AssignParameters(qy)
qy.Execute dbFailOnError

qy.Close

Exit Sub

DeleteErr:
LogErrors Errors
On Error GoTo 0
Err.Raise vbObjectError + errDeleteStepFailed, _
    mstrModuleName & "Delete", _
LoadResString(errDeleteStepFailed)
End Sub
Public Property Get DegreeParallelism() As String

    DegreeParallelism = mstrDegreeParallelism

End Property
Public Property Get Position() As Long

    Position = mlngPosition

End Property

Public Property Let DegreeParallelism(ByVal vdata As String)

' The degree of parallelism must be zero for all global steps
' This check must be made by the global step class. Only
' generic step validations will be carried out by this
' class
mstrDegreeParallelism = vdata

End Property

Public Property Let ExecutionMechanism(ByVal vdata As ExecutionMethod)

BugAssert vdata = gintExecuteODBC Or vdata = gintExecuteShell Or
vdata = gintNoOption, _
    "Execution mechanism invalid"
mintExecutionMechanism = vdata

End Property

Public Property Let FailureDetails(ByVal vdata As String)

mstrFailureDetails = vdata

End Property
Public Property Let SequenceNo(ByVal vdata As Integer)
mintSequenceNo = vdata

```

```

End Property

Public Property Let Position(ByVal vdata As Long)
    mlngPosition = vdata
End Property

Public Property Let ParentStepId(ByVal vdata As Long)
    mlngParentStepId = vdata
End Property

Public Property Get SequenceNo() As Integer

    SequenceNo = mintSequenceNo

End Property

Public Property Get StepLevel() As Integer
    StepLevel = mintStepLevel
End Property

Public Property Get ParentVersionNo() As String
    ParentVersionNo = mstrParentVersionNo
End Property

Public Property Let ParentVersionNo(ByVal vdata As String)
    mstrParentVersionNo = vdata
End Property

Public Property Get ParentStepId() As Long
    ParentStepId = mlngParentStepId
End Property

Public Property Let WorkspaceId(ByVal vdata As Long)
    mlngWorkspaceId = vdata
End Property

Public Property Let VersionNo(ByVal vdata As String)
' The version number of a step is stored in the x.y format where
' x represents a change to the step as a result of modifications
' to any of the step properties
' y represents a change to the step as a result of modifications
' to the sub-steps associated with it. Hence the y-component
' of the version will be incremented when a sub-step is added,
' modified or deleted
' x will be referred to throughout this code as the parent
' component of the version and y will be referred to as the
' child component of the version
' The version information for a step is maintained by the
' calling function

    mstrVersionNo = vdata

End Property

Public Property Get StepType() As gintStepType

```

```

On Error GoTo StepTypeErr

If mintStepType = 0 Then
    ' The step type variable has not been initialized -
    If mblnGlobalFlag Then
        mintStepType = gintGlobalStep
    ElseIf IsStringEmpty(mstrStepText) And _
        IsStringEmpty(mstrStepTextFile) Then
        mintStepType = gintManagerStep
    Else
        mintStepType = gintWorkerStep
    End If
End If

StepType = mintStepType

Exit Property

StepTypeErr:
LogErrors Errors
mstrSource = mstrModuleName & "StepType"
On Error GoTo 0
Err.Raise vbObjectError + errGetStepTypeFailed, _
    mstrSource, _
    LoadResString(errGetStepTypeFailed)

End Property

Public Property Let StepType(vdata As gintStepType)

    On Error GoTo StepTypeErr

    Select Case vdata
        Case gintGlobalStep, gintManagerStep, gintWorkerStep
            mintStepType = vdata

        Case Else
            On Error GoTo 0
            Err.Raise vbObjectError + errStepTypeInvalid, _
                mstrModuleName & "StepType", _
                LoadResString(errStepTypeInvalid)
        End Select
    End Select
Exit Property

StepTypeErr:
LogErrors Errors
mstrSource = mstrModuleName & "StepType"
On Error GoTo 0
Err.Raise vbObjectError + errLetStepTypeFailed, _
    mstrSource, _
    LoadResString(errLetStepTypeFailed)

End Property

Public Property Get WorkspaceId() As Long
    WorkspaceId = mlngWorkspaceId

```

```

End Property

Public Property Get ContinuationCriteria() As ContinuationCriteria
    ContinuationCriteria = mintContinuationCriteria
End Property

Public Property Let ContinuationCriteria(ByVal vdata As ContinuationCriteria)
    ' The Continuation criteria must be null for all global steps
    ' and non-null for all manager and worker steps
    ' These checks will have to be made by the corresponding
    ' classes - only generic step validations will be made
    ' by this class
    BugAssert vdata = gintOnFailureAbortSiblings Or vdata =
gintOnFailureCompleteSiblings _
    Or vdata = gintOnFailureSkipSiblings Or vdata =
gintOnFailureAbort _
    Or vdata = gintOnFailureContinue Or vdata =
gintOnFailureAsk _
    Or vdata = gintNoOption, _
    "Invalid continuation criteria"
    mintContinuationCriteria = vdata
End Property

Public Property Get ExecutionMechanism() As ExecutionMethod
    ExecutionMechanism = mintExecutionMechanism
End Property

Public Property Get FailureDetails() As String
    FailureDetails = mstrFailureDetails
End Property

Public Property Let StepText(ByVal vdata As String)
    ' Has to be null for manager steps
    ' The check will have to be made by the user interface or
    ' by the manager step class
    mstrStepText = vdata
End Property

Public Property Let StepLevel(ByVal vdata As Integer)
    ' The step level must be zero for all global steps
    ' This check must be made in the global step class
    mintStepLevel = vdata
End Property

Public Property Get StepText() As String
    StepText = mstrStepText
End Property

```

```

Public Property Let StepTextFile(ByVal vdata As String)
    ' Has to be null for manager steps
    ' The check will have to be made by the user interface and
    ' by the manager step class
    mstrStepTextFile = vdata
End Property

Public Property Get StepTextFile() As String
    StepTextFile = mstrStepTextFile
End Property

Public Property Let StepLabel(ByVal vdata As String)
    ' Cannot be null for manager steps
    ' But this check cannot be made here since we do not know
    ' at this point if the step being created is a manager
    ' or a worker step
    ' The check will have to be made by the user interface and
    ' by the manager step class
    mstrStepLabel = vdata
End Property

Public Property Get StepLabel() As String
    StepLabel = mstrStepLabel
End Property

Public Property Let StartDir(ByVal vdata As String)
    mstrStartDir = vdata
End Property

Public Property Get StartDir() As String
    StartDir = mstrStartDir
End Property

Public Property Get VersionNo() As String
    ' The version number of a step is stored in the x.y format where
    ' x represents a change to the step as a result of modifications
    ' to any of the step properties
    ' y represents a change to the step as a result of modifications
    ' to the sub-steps associated with it. Hence the y-component
    ' of the version will be incremented when a sub-step is added,
    ' modified or deleted
    ' x will be referred to throughout this code as the parent
    ' component of the version and y will be referred to as the
    ' child component of the version
    ' The version information for a step is maintained by the
    ' calling function

    VersionNo = mstrVersionNo
End Property

Public Property Get StepId() As Long

    StepId = mlngStepId

```

```

End Property
Public Property Get NextStepId() As Long

    Dim lngNextId As Long

    On Error GoTo NextStepIdErr

    ' First check if the database object is valid
    Call CheckDB

    ' Retrieve the next identifier using the sequence class
    Set mStepSeq = New cSequence
    Set mStepSeq.IdDatabase = mdbDatabase
    mStepSeq.IdentifierColumn = "step_id"
    lngNextId = mStepSeq.Identifier
    Set mStepSeq = Nothing

    NextStepId = lngNextId
    Exit Property

NextStepIdErr:
    LogErrors Errors
    mstrSource = mstrModuleName & "NextStepId"
    On Error GoTo 0
    Err.Raise vbObjectError + errStepIdGetFailed, _
        mstrSource, LoadResString(errStepIdGetFailed)

End Property
Public Property Let StepId(ByVal vdata As Long)

    mlngStepId = vdata

End Property

Private Sub Class_Initialize()

    ' Initialize the operation indicator variable to Query
    ' It will be modified later by the collection class when
    ' inserts, updates or deletes are performed
    mintOperation = QueryOp
    mbIsNewVersion = False
    msOldVersion = gstrEmptyString

    Set mFieldValue = New cStringSM
    Set mcIterators = New cNodeCollections

End Sub

Private Sub Class_Terminate()

    Set mFieldValue = Nothing
    Set mcIterators = Nothing

End Sub

```

## cStepTree.cls

```
VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cStepTree"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:      cStepTree.cls
'           Microsoft TPC-H Kit Ver. 1.00
'           Copyright Microsoft, 1999
'           All Rights Reserved
'
' PURPOSE:   Implements step navigation functions such as determining
'           the child of a step and so on.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

' Used to indicate the source module name when errors
' are raised by this class
Private Const mstrModuleName As String = "cStepTree."
Private mstrSource As String

Public StepRecords As cArrSteps
Public Property Get HasChild(Optional ByVal StepKey As String, _
    Optional ByVal StepId As Long = 0) As Boolean

    Dim lTemp As Long

    HasChild = False
    StepId = GetStepId(StepKey, StepId)

    For lTemp = 0 To StepRecords.StepCount - 1
        If StepRecords(lTemp).StepType <> gintGlobalStep And
StepRecords(lTemp).ParentStepId = StepId Then
            HasChild = True
            Exit For
        End If
    Next lTemp
End Property
Public Property Get ChildStep(Optional ByVal StepKey As String, _
    Optional ByVal StepId As Long = 0) As cStep

    Dim lTemp As Long

    Set ChildStep = Nothing
    StepId = GetStepId(StepKey, StepId)

    For lTemp = 0 To StepRecords.StepCount - 1
```

```
        If StepRecords(lTemp).StepType <> gintGlobalStep And
StepRecords(lTemp).ParentStepId = StepId And _
            StepRecords(lTemp).SequenceNo = gintMinSequenceNo Then
                Set ChildStep = StepRecords(lTemp)
                Exit For
            End If
        Next lTemp
End Property
Public Property Get NextStep(Optional ByVal StepKey As String, _
    Optional ByVal StepId As Long = 0) As cStep

    Dim lTemp As Long
    Dim cChildStep As cStep

    Set NextStep = Nothing
    StepId = GetStepId(StepKey, StepId)
    Set cChildStep = StepRecords.QueryStep(StepId)

    For lTemp = 0 To StepRecords.StepCount - 1
        If StepRecords(lTemp).StepType <> gintGlobalStep And _
            StepRecords(lTemp).ParentStepId =
cChildStep.ParentStepId And
            StepRecords(lTemp).SequenceNo = cChildStep.SequenceNo +
1 Then
                Set NextStep = StepRecords(lTemp)
                Exit For
            End If
        Next lTemp
End Property
Private Function GetStepId(Optional ByVal StepKey As String, _
    Optional ByVal StepId As Long = 0) As Long
    If StepId = 0 Then
        If StringEmpty(StepKey) Then
            Err.Raise vbObjectError + errMandatoryParameterMissing, _
                mstrModuleName & "GetStepId",
LoadResString(errMandatoryParameterMissing)
        Else
            GetStepId = IIf(IsLabel(StepKey), 0,
MakeIdentifierValid(StepKey))
        End If
    Else
        GetStepId = StepId
    End If
End Function
```

## cStringSM.cls

```
VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cStringSM"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
```

```

Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:      cStringSM.cls
'            Microsoft TPC-H Kit Ver. 1.00
'            Copyright Microsoft, 1999
'            All Rights Reserved
'
' PURPOSE:   This module contains common procedures that can be used
'            to manipulate strings
'            It is called StringSM, since String is a Visual Basic
keyword
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

' Used to indicate the source module name when errors
' are raised by this class
Private mstrSource As String
Private Const mstrModuleName As String = "cStringSM."

Private mstrText As String

Private Const mstrNullValue = "null"
Private Const mstrSQ = ""
Private Const mstrEnvVarSeparator = "%"
Public Function InsertEnvVariables( _
    Optional ByVal strComString As String) As String
    ' This function replaces all environment variables in
    ' the passed in string with their values - they are
    ' enclosed by "%"

    Dim intPos As Integer
    Dim intEndPos As Integer
    Dim strEnvVariable As String
    Dim strValue As String
    Dim strCommand As String

    On Error GoTo InsertEnvVariablesErr
    mstrSource = mstrModuleName & "InsertEnvVariables"

    ' Initialize the return value of the function to the
    ' passed in command
    If IsStringEmpty(strComString) Then
        strCommand = mstrText
    Else
        strCommand = strComString
    End If

    intPos = InStr(strCommand, mstrEnvVarSeparator)
    Do While intPos <> 0
        ' Extract the environment variable from the passed
        ' in string
        intEndPos = InStr(intPos + 1, strCommand, mstrEnvVarSeparator)
        strEnvVariable = Mid(strCommand, intPos + 1, intEndPos - intPos)

```

```

' Get the value of the variable and call a function
' to replace the variable with it's value
strValue = Environ$(strEnvVariable)
strCommand = ReplaceSubString(strCommand, _
    mstrEnvVarSeparator & strEnvVariable &
    mstrEnvVarSeparator, _
    strValue)

    intPos = InStr(strCommand, mstrEnvVarSeparator)
Loop

InsertEnvVariables = strCommand
Exit Function

InsertEnvVariablesErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
' Return an empty string
InsertEnvVariables = gstrEmptyString

End Function
Public Function MakeStringFieldValid( _
    Optional strField As String = gstrEmptyString) As String
    ' Returns a string that can be appended to any insert
    ' or modify (sql) statement
    ' If an argument is not passed to this function, the
    ' default text property is used

    Dim strTemp As String

    On Error GoTo MakeStringFieldValidErr

    If IsStringEmpty(strField) Then
        strTemp = mstrText
    Else
        strTemp = strField
    End If

    ' It checks whether the text is empty
    ' If so, it returns the string, "null"
    If IsStringEmpty(strTemp) Then
        MakeStringFieldValid = mstrNullValue
    Else
        ' Single-quotes have to be replaced by two single-quotes,
        ' since a single-quote is the identifier delimiter
        ' character - call a procedure to do the replace
        strTemp = ReplaceSubString(strTemp, mstrSQ, mstrSQ & mstrSQ)

        ' Replace pipe characters with the corresponding chr function
        strTemp = ReplaceSubString(strTemp, "|", "'" & Chr(124) & "'")

        ' Enclose the string in single quotes
        MakeStringFieldValid = mstrSQ & strTemp & mstrSQ
    End If

```

- 1)

```

Exit Function

MakeStringFieldValidErr:
mstrSource = mstrModuleName & "MakeStringFieldValid"
LogErrors Errors
On Error GoTo 0
Err.Raise vbObjectError + errMakeFieldValidFailed, _
    mstrSource, LoadResString(errMakeFieldValidFailed)

End Function

Public Function MakeDateFieldValid( _
    Optional dtmField As Date = gdtmEmpty) As String
' Returns a string that can be appended to any insert
' or modify (sql) statement

' Enclose the date in single quotes
MakeDateFieldValid = mstrSQ & dtmField & mstrSQ

End Function

Private Function IsStringEmpty(strToCheck As String) As Boolean

If strToCheck = gstrEmptyString Then
IsStringEmpty = True
Else
IsStringEmpty = False
End If

End Function

Public Function ReplaceSubString(ByVal MainString As String, _
    ByVal ReplaceString As String, _
    ByVal ReplaceWith As String) As String

' Replaces all occurrences of ReplaceString in MainString with
ReplaceWith

Dim intPos As Integer
Dim strTemp As String

On Error GoTo ReplaceSubStringErr

strTemp = MainString

intPos = InStr(strTemp, ReplaceString)
Do While intPos <> 0
    strTemp = Left(strTemp, intPos - 1) & ReplaceWith & _
        Mid(strTemp, intPos + Len(ReplaceString))
    intPos = InStr(intPos + Len(ReplaceString) + 1, strTemp,
ReplaceString)
Loop
ReplaceSubString = strTemp

Exit Function

ReplaceSubStringErr:

```

```

Call LogErrors(Errors)
mstrSource = mstrModuleName & "ReplaceSubString"
On Error GoTo 0
Err.Raise vbObjectError + errParseStringFailed, _
    mstrSource, _
    LoadResString(errParseStringFailed)

End Function

Public Property Get Text() As String
Attribute Text.VB_UserMemId = 0
Text = mstrText
End Property

Public Property Let Text(ByVal vdata As String)
mstrText = vdata
End Property

```

### cSubStep.cls

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cSubStep"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:      cSubStep.cls
'            Microsoft TPC-H Kit Ver. 1.00
'            Copyright Microsoft, 1999
'            All Rights Reserved
'
' PURPOSE:   This module encapsulates the properties of sub-steps
'            that are used during the execution of a workspace.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

' Used to indicate the source module name when errors
' are raised by this class
Private Const mstrModuleName As String = "cSubStep"

Private mlngStepId As Long
Private mintRunning As Integer ' Number of running tasks
Private mintComplete As Integer ' Number of completed tasks
' The last iterator for this sub-step
Private mcLastIterator As cRunItDetails

Public Function NewIteration(cStepRec As cStep) As cIterator
' Calls a procedure to determine the next iterator value
' for the passed in step - returns the value to be used
' in the iteration.
' It updates the instance node with the new iteration

```



```

' for the step.
Dim cItRec As cIterator
On Error GoTo NewIterationErr

' Call a function that will populate an iterator record
' with the iterator values
Set cItRec = NextIteration(cStepRec)

' Initialize the run node with the new iterator
' values
If Not mcLastIterator Is Nothing Then
    If cItRec Is Nothing Then
        mcLastIterator.Value = gstrEmptyString
    Else
        mcLastIterator.Value = cItRec.Value

        ' And if the iterator is a list of values, then update
        ' the sequence number as well
        If mcLastIterator.IteratorType = gintValue Then
            mcLastIterator.Sequence = cItRec.SequenceNo
        End If
    End If
End If

Set NewIteration = cItRec
Set cItRec = Nothing

Exit Function

NewIterationErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
On Error GoTo 0
Err.Raise vbObjectError + errIterateFailed, mstrModuleName, _
    LoadResString(errIterateFailed)

End Function
Public Function NextIteration(cStepRec As cStep) As cIterator

' Retrieves the next iterator value for the passed in step -
' returns an iterator record with the new iterator values

Dim cItRec As cIterator
Dim vntIterators As Variant
Dim lngValue As String

On Error GoTo NextIterationErr

vntIterators = cStepRec.Iterators

If Not mcLastIterator Is Nothing Then
    ' The run node contains the iterator details
    ' Get the next value for the iterator
    If mcLastIterator.IteratorType = gintValue Then

```

```

' Find the next iterator that appears in the list of
' iterator values
Set cItRec = NextInSequence(vntIterators,
mcLastIterator.Sequence)
Else
    lngValue = CLng(Trim$(mcLastIterator.Value))
    ' Determine whether the new iterator value falls in the
    ' range between From and To
    If (mcLastIterator.RangeStep > 0 And _
        (mcLastIterator.RangeFrom <= mcLastIterator.RangeTo)
And _
        (mcLastIterator.RangeStep + lngValue) <=
mcLastIterator.RangeTo) Or _
        (mcLastIterator.RangeStep < 0 And _
        (mcLastIterator.RangeFrom >= mcLastIterator.RangeTo)
And _
        (mcLastIterator.RangeStep + lngValue) >=
mcLastIterator.RangeTo) Then
        Set cItRec = New cIterator
        cItRec.Value = Trim$(CStr(mcLastIterator.RangeStep +
lngValue))
    Else
        Set cItRec = Nothing
    End If
End If
Else
    Set cItRec = Nothing
End If

Set NextIteration = cItRec
Exit Function

NextIterationErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
On Error GoTo 0
Err.Raise vbObjectError + errIterateFailed, mstrModuleName, _
    LoadResString(errIterateFailed)

End Function
Public Sub InitializeIt(cPendingStep As cStep, _
    ColParameters As cArrParameters, _
    Optional vntIterators As Variant)

' Initializes the LastIteration structure with the iterator details
for the
' passed in step

On Error GoTo InitializeItErr

If IsMissing(vntIterators) Then
    vntIterators = cPendingStep.Iterators
End If

If IsArray(vntIterators) And Not IsEmpty(vntIterators) Then
    mcLastIterator.IteratorName = cPendingStep.IteratorName

```

```

    If vntIterators(LBound(vntIterators)).IteratorType = _
        gintValue Then
        mcLastIterator.IteratorType = gintValue
        ' Since the sequence numbers begin at 0
        mcLastIterator.Sequence = gintMinIteratorSequence - 1
    Else
        mcLastIterator.IteratorType = gintFrom
        Call InitializeItRange(vntIterators,
            cPendingStep.WorkspaceId, _
                ColParameters)
    End If
Else
    Set mcLastIterator = Nothing
End If

Exit Sub

InitializeItErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
On Error GoTo 0
Err.Raise vbObjectError + errIterateFailed, mstrModuleName, _
    LoadResString(errIterateFailed)

End Sub

Private Sub InitializeItRange(vntIterators As Variant, ByVal lWorkspace
As Long, _
    ColParameters As cArrParameters)

' Initializes the LastIteration structure for range iterators from
the
' passed in variant containing the iterator records

Dim lngIndex As Long
Dim cItRec As cIterator

On Error GoTo InitializeItRangeErr

If IsArray(vntIterators) And Not IsEmpty(vntIterators) Then

' Check if the iterator range has been completely initialized
RangeComplete(vntIterators)

' Initialize the Run node with the values for the From,
' To and Step boundaries
For lngIndex = LBound(vntIterators) To UBound(vntIterators)
    Set cItRec = vntIterators(lngIndex)
    Select Case cItRec.IteratorType
        Case gintFrom
            mcLastIterator.RangeFrom =
SubstituteParameters(cItRec.Value, lWorkspace,
WspParameters:=ColParameters)
            Case gintTo

```

```

                mcLastIterator.RangeTo =
SubstituteParameters(cItRec.Value, lWorkspace,
WspParameters:=ColParameters)
            Case gintStep
                mcLastIterator.RangeStep =
SubstituteParameters(cItRec.Value, lWorkspace,
WspParameters:=ColParameters)
            Case Else
                On Error GoTo 0
                Err.Raise vbObjectError + errTypeInvalid,
mstrModuleName, _
                    LoadResString(errTypeInvalid)
            End Select
        Next lngIndex

        mcLastIterator.Value = Trim$(CStr(mcLastIterator.RangeFrom -
mcLastIterator.RangeStep))
    End If

Exit Sub

InitializeItRangeErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
On Error GoTo 0
Err.Raise vbObjectError + errIterateFailed, mstrModuleName, _
    LoadResString(errIterateFailed)

End Sub

Private Function NextInSequence(vntIterators As Variant, _
    lngOldSequence As Long) As cIterator

Dim lngIndex As Long
Dim cItRec As cIterator

On Error GoTo NextInSequenceErr

If IsArray(vntIterators) And Not IsEmpty(vntIterators) Then
    For lngIndex = LBound(vntIterators) To UBound(vntIterators)
        Set cItRec = vntIterators(lngIndex)
        If cItRec.IteratorType <> gintValue Then
            On Error GoTo 0
            Err.Raise vbObjectError + errTypeInvalid, mstrModuleName,
                LoadResString(errTypeInvalid)
        End If
        If cItRec.SequenceNo = lngOldSequence + 1 Then
            Exit For
        End If
    Next lngIndex

    If cItRec.SequenceNo <> lngOldSequence + 1 Then
        Set cItRec = Nothing
    End If
Else

```

```

        Set cItRec = Nothing
    End If

    Set NextInSequence = cItRec

    Exit Function

NextInSequenceErr:
    ' Log the error code raised by Visual Basic
    Call LogErrors(Errors)
    On Error GoTo 0
    Err.Raise vbObjectError + errIterateFailed, mstrModuleName, _
        LoadResString(errIterateFailed)

End Function

Public Property Get LastIterator() As cRunItDetails

    Set LastIterator = mcLastIterator

End Property
Public Property Set LastIterator(vdata As cRunItDetails)

    Set mcLastIterator = vdata

End Property

Public Property Get TasksRunning() As Integer

    TasksRunning = mintRunning

End Property

Public Property Let TasksRunning(ByVal vdata As Integer)

    mintRunning = vdata

End Property

Public Property Get TasksComplete() As Integer

    TasksComplete = mintComplete

End Property
Public Property Let TasksComplete(ByVal vdata As Integer)

    mintComplete = vdata

End Property
Public Property Get StepId() As Long

    StepId = mlngStepId

End Property
Public Property Let StepId(ByVal vdata As Long)

```

```

        mlngStepId = vdata

    End Property

```

## cSubSteps.cls

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cSubSteps"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:          cSubSteps.cls
'               Microsoft TPC-H Kit Ver. 1.00
'               Copyright Microsoft, 1999
'               All Rights Reserved
'
' PURPOSE:       This module provides a type-safe wrapper around cVector
to
'               implement a collection of cSubStep objects.
' Contact:       Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

Private mcSubSteps As cVector

Public Sub Add(ByVal objItem As cSubStep)

    mcSubSteps.Add objItem

End Sub

Public Sub Clear()

    mcSubSteps.Clear

End Sub

Public Function Count() As Long

    Count = mcSubSteps.Count

End Function

Public Function Delete(ByVal lngDelete As Long) As cSubStep

    Set Delete = mcSubSteps.Delete(lngDelete)

End Function

```

```
Public Property Get Item(ByVal Position As Long) As cSubStep
Attribute Item.VB_UserMemId = 0
```

```
Set Item = mcSubSteps.Item(Position)
```

```
End Property
```

```
Private Sub Class_Initialize()
```

```
Set mcSubSteps = New cVector
```

```
End Sub
```

```
Private Sub Class_Terminate()
```

```
Set mcSubSteps = Nothing
```

```
End Sub
```

## cTermProcess.cls

```
VERSION 1.0 CLASS
```

```
BEGIN
```

```
MultiUse = -1 'True
```

```
END
```

```
Attribute VB_Name = "cTermProcess"
```

```
Attribute VB_GlobalNameSpace = False
```

```
Attribute VB_Creatable = True
```

```
Attribute VB_PredeclaredId = False
```

```
Attribute VB_Exposed = False
```

```
' FILE: cTermProcess.cls
' Microsoft TPC-H Kit Ver. 1.00
' Copyright Microsoft, 1999
' All Rights Reserved
'
```

```
' PURPOSE: This module raises an event if a completed step exists.
' Contact: Reshma Tharamal (reshmat@microsoft.com)
```

```
Option Explicit
```

```
Private WithEvents moTimer As cTimerSM
Attribute moTimer.VB_VarHelpID = -1
Private bTermProcessExists As Boolean
Public Event TermProcessExists()
```

```
Public Sub ProcessTerminated()
```

```
bTermProcessExists = True
moTimer.Enabled = True
```

```
End Sub
```

```
Private Sub Class_Initialize()
```

```
bTermProcessExists = False
```

```
Set moTimer = New cTimerSM
moTimer.Enabled = False
```

```
End Sub
```

```
Private Sub Class_Terminate()
```

```
Set moTimer = Nothing
```

```
End Sub
```

```
Private Sub moTimer_Timer()
```

```
On Error GoTo moTimer_TimerErr
```

```
If bTermProcessExists Then
RaiseEvent TermProcessExists
End If
```

```
moTimer.Enabled = False
bTermProcessExists = False
```

```
Exit Sub
```

```
moTimer_TimerErr:
LogErrors Errors
```

```
End Sub
```

## cTermStep.cls

```
VERSION 1.0 CLASS
```

```
BEGIN
```

```
MultiUse = -1 'True
```

```
END
```

```
Attribute VB_Name = "cTermStep"
```

```
Attribute VB_GlobalNameSpace = False
```

```
Attribute VB_Creatable = True
```

```
Attribute VB_PredeclaredId = False
```

```
Attribute VB_Exposed = False
```

```
' FILE: cTermStep.cls
' Microsoft TPC-H Kit Ver. 1.00
' Copyright Microsoft, 1999
' All Rights Reserved
'
```

```
' PURPOSE: This module encapsulates the properties of steps that
have completed execution such as status and time of
completion.
```

```
' Contact: Reshma Tharamal (reshmat@microsoft.com)
```

```
Option Explicit
```

```

Public TimeComplete As Currency
Public Index As Long
Public InstanceId As Long
Public ExecutionStatus As InstanceStatus

```

## cTermSteps.cls

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cTermSteps"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:      cTermSteps.cls
'           Microsoft TPC-H Kit Ver. 1.00
'           Copyright Microsoft, 1999
'           All Rights Reserved
'
' PURPOSE:   This module provides a type-safe wrapper around cVector
to
'           implement a collection of cTermStep objects. Raises an
'           event if a step that has completed execution exists.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

Private mcTermSteps As cVector
Private WithEvents moTimer As cTimerSM
Attribute moTimer.VB_VarHelpID = -1
Public Event TermStepExists(cStepDetails As cTermStep)

Public Sub Add(ByVal citem As cTermStep)

    Call mcTermSteps.Add(citem)
    moTimer.Enabled = True

End Sub

Public Sub Clear()

    mcTermSteps.Clear

End Sub

Public Function Delete()

    Call mcTermSteps.Delete(0)
' Disable the timer if there are no more pending events
    If mcTermSteps.Count = 0 Then moTimer.Enabled = False

End Function

```

```

Public Property Get Item(ByVal Position As Long) As cTermStep

    Set Item = mcTermSteps(Position)

End Property

Public Function Count() As Long

    Count = mcTermSteps.Count

End Function

Private Sub Class_Initialize()

    Set mcTermSteps = New cVector

    Set moTimer = New cTimerSM
    moTimer.Enabled = False

End Sub

Private Sub Class_Terminate()

    Set mcTermSteps = Nothing
    Set moTimer = Nothing

End Sub

Private Sub moTimer_Timer()

    On Error GoTo moTimer_TimerErr

    If mcTermSteps.Count > 0 Then
        ' Since items are appended to the end of the array
        RaiseEvent TermStepExists(mcTermSteps(0))
    Else
        moTimer.Enabled = False
    End If
    Exit Sub

moTimer_TimerErr:
    LogErrors Errors

End Sub

```

## cTimerSM.cls

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cTimerSM"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False

```

```

Attribute VB_Exposed = False
' FILE:      cTimer.cls
'           Microsoft TPC-H Kit Ver. 1.00
'           Copyright Microsoft, 1999
'           All Rights Reserved
'
' PURPOSE:   This module implements a timer.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'

```

```
Option Explicit
```

```
Public Event Timer()
```

```
Private Const mnDefaultInterval As Long = 1
```

```
Private mnTimerID As Long
Private mnInterval As Long
Private mfEnabled As Boolean
```

```
Public Property Get Interval() As Long
    Interval = mnInterval
End Property
Public Property Let Interval(Value As Long)
    If mnInterval <> Value Then
        mnInterval = Value
        If mfEnabled Then
            SetInterval mnInterval, mnTimerID
        End If
    End If
End Property
```

```
Public Property Get Enabled() As Boolean
    Enabled = mfEnabled
End Property
Public Property Let Enabled(Value As Boolean)
    If mfEnabled <> Value Then
```

```

        If Value Then
            mnTimerID = StartTimer(mnInterval)
            If mnTimerID <> 0 Then
                mfEnabled = True
                'Storing Me in the global would add a reference to Me,
                ' would prevent Me from being released, which in turn
                ' prevent my Class_Terminate code from running. To
                ' this, I store a "soft reference" - the collection
                ' pointer to me without incrementing my reference
                gcTimerObjects.Add ObjPtr(Me), Str$(mnTimerID)
            End If
        Else
            StopTimer mnTimerID
        End If
    End If
End Property

```

```

mfEnabled = False
gcTimerObjects.Remove Str$(mnTimerID)
End If
End If
End Property

Private Sub Class_Initialize()
    If gcTimerObjects Is Nothing Then Set gcTimerObjects = New
    Collection
    mnInterval = mnDefaultInterval
End Sub

Private Sub Class_Terminate()
    Enabled = False
End Sub

Friend Sub Tick()
    RaiseEvent Timer
End Sub

```

## cVBErrorsSM.cls

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cVBErrorsSM"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
Attribute VB_Ext_KEY = "SavedWithClassBuilder" ,"Yes"
Attribute VB_Ext_KEY = "Top_Level" ,"Yes"
' FILE:      cVBErrors.cls
'           Microsoft TPC-H Kit Ver. 1.00
'           Copyright Microsoft, 1999
'           All Rights Reserved
'
' PURPOSE:   This module encapsulates the handling of Visual Basic
errors.
'           This module does not do any error handling - any error
handler
'           will erase the errors object!
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

' The Execute class exposes a method, WriteError through which we can
write to the
' error log that is currently being used by the Execute object. Store a
reference to
' Execute object locally.
Private mcExecObjRef As EXECUTEDLLLib.Execute
Public Sub WriteError(ByVal ErrorCode As errErrorConstants, _
    Optional ByVal ErrorSource As String = gstrEmptyString, _

```

```

        Optional ByVal OptArgs As String = gstrEmptyString)

Dim sError As String

sError = "StepMaster Error:" & ErrorCode & vbCrLf &
LoadResString(ErrorCode) & vbCrLf

If Not StringEmpty(ErrorSource) Then
    sError = sError & "(Source: " & ErrorSource & ")" & vbCrLf
End If
sError = sError & OptArgs

Call LogMessage(sError)

End Sub
Private Function InitErrorString() As String
    ' Initializes a string with all the properties of the
    ' Err object

    Dim strError As String
    Dim errCode As Long

    If Err.Number = 0 Then
        InitErrorString = gstrEmptyString
    Else
        With Err
            If Err.Number > vbObjectError And Err.Number < (vbObjectError +
65536) Then
                errCode = .Number - vbObjectError
            Else
                errCode = .Number
            End If
            strError = "Error #: " & errCode & vbCrLf
            strError = strError & "Description: " & .Description & vbCrLf
            strError = strError & "Source: " & Err.Source & vbCrLf
        End With

        Debug.Print strError
        InitErrorString = strError
    End If

End Function
Public Sub LogVBErrors()

    Dim strErr As String

    strErr = InitErrorString

    On Error GoTo LogVBErrorsErr

    If Not StringEmpty(strErr) Then
        ' Write an error using the WriteError method of the Execute
object.
        If Not mcExecObjRef Is Nothing Then
            mcExecObjRef.WriteError strErr
        Else
            WriteMessage strErr
        End If
    End If

    Exit Sub

LogVBErrorsErr:
    Call LogErrors(Errors)
    ' Since write to the error file for the step has failed, write to
the project log
    Call WriteMessage(strErr)

End Sub
Public Property Set ErrorFile(vdata As EXECUTEDLLLib.Execute)

    Set mcExecObjRef = vdata

End Property
Private Sub Class_Terminate()

```

```

        WriteMessage strErr
    End If
End If

Err.Clear

Exit Sub

LogVBErrorsErr:
    Call LogErrors(Errors)
    ' Since write to the error file for the step has failed, write to
the project log
    Call WriteMessage(strErr)

End Sub
Public Sub DisplayErrors()

    Dim strErr As String

    strErr = InitErrorString

    If Not StringEmpty(strErr) Then
        ' Display the error message
        MsgBox strErr
    End If

    Err.Clear

End Sub
Public Sub LogMessage(strMsg As String)

    On Error GoTo LogMessageErr

    ' Write an error using the WriteError method of the Execute object.
    If Not mcExecObjRef Is Nothing Then
        mcExecObjRef.WriteError strMsg
    Else
        WriteMessage strMsg
    End If

    Exit Sub

LogMessageErr:
    Call LogErrors(Errors)
    ' Since write to the error file for the step has failed, write to
the project log
    Call WriteMessage(strMsg)

End Sub
Public Property Set ErrorFile(vdata As EXECUTEDLLLib.Execute)

    Set mcExecObjRef = vdata

End Property
Private Sub Class_Terminate()

```

```
Set mcExecObjRef = Nothing
```

```
End Sub
```

## cVector.cls

```
VERSION 1.0 CLASS
```

```
BEGIN
```

```
MultiUse = -1 'True
```

```
END
```

```
Attribute VB_Name = "cVector"
```

```
Attribute VB_GlobalNameSpace = False
```

```
Attribute VB_Creatable = True
```

```
Attribute VB_PredeclaredId = False
```

```
Attribute VB_Exposed = False
```

```
' FILE:      cVector.cls  
'           Microsoft TPC-H Kit Ver. 1.00  
'           Copyright Microsoft, 1999  
'           All Rights Reserved  
'  
'
```

```
' PURPOSE:   This class implements an array of objects.
```

```
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
```

```
'
```

```
Option Explicit
```

```
' Used to indicate the source module name when errors  
' are raised by this class
```

```
Private mstrSource As String
```

```
Private Const mstrModuleName As String = "cVector."
```

```
' Array counter
```

```
Private mlngCount As Long
```

```
Private mcarrItems() As Object
```

```
Public Sub Add(ByVal objItem As Object)
```

```
' Adds the passed in Object variable to the array
```

```
On Error GoTo AddErr
```

```
ReDim Preserve mcarrItems(mlngCount)
```

```
' Set the newly added element in the array to the  
' passed in variable
```

```
Set mcarrItems(mlngCount) = objItem
```

```
mlngCount = mlngCount + 1
```

```
Exit Sub
```

```
AddErr:
```

```
LogErrors Errors
```

```
gstrSource = mstrModuleName & "Add"
```

```
On Error GoTo 0
```

```
Err.Raise vbObjectError + errLoadInArrayFailed, _  
mstrSource, _
```

```
LoadResString(errLoadInArrayFailed)
```

```
End Sub
```

```
Public Sub Clear()
```

```
' Clear the array
```

```
ReDim mcarrItems(0)
```

```
mlngCount = 0
```

```
End Sub
```

```
Public Function Delete(ByVal lngDelete As Long) As Object
```

```
Dim lngIndex As Long
```

```
On Error GoTo DeleteErr
```

```
If lngDelete < (mlngCount - 1) Then
```

```
' We want to maintain the order of all items in the  
' array - so move all remaining elements in the array  
' up by 1
```

```
For lngIndex = lngDelete To mlngCount - 2
```

```
MoveDown lngIndex
```

```
Next lngIndex
```

```
End If
```

```
' Return the deleted node
```

```
Set Delete = mcarrItems(mlngCount - 1)
```

```
' Delete the last Node from the array
```

```
mlngCount = mlngCount - 1
```

```
If mlngCount > 0 Then
```

```
ReDim Preserve mcarrItems(0 To mlngCount - 1)
```

```
Else
```

```
ReDim mcarrItems(0)
```

```
End If
```

```
Exit Function
```

```
DeleteErr:
```

```
LogErrors Errors
```

```
mstrSource = mstrModuleName & "Delete"
```

```
On Error GoTo 0
```

```
Err.Raise vbObjectError + errDeleteArrayElementFailed, _  
mstrSource, _
```

```
LoadResString(errDeleteArrayElementFailed)
```

```
End Function
```

```
Public Property Get Item(ByVal Position As Long) As Object
```

```
Attribute Item.VB_UserMemId = 0
```

```
' Returns the element at the passed in position in the array
```

```
If Position >= 0 And Position < mlngCount Then
```

```
Set Item = mcarrItems(Position)
```

```
Else
```



```

    On Error GoTo 0
    Err.Raise vbObjectError + errItemDoesNotExist, mstrSource, _
        LoadResString(errItemDoesNotExist)
End If

End Property
Public Property Set Item(ByVal Position As Long, _
    ByVal Value As Object)

    ' Returns the element at the passed in position in the array
    If Position >= 0 Then
        ' If the passed in position is outside the array
        ' bounds, then resize the array
        If Position >= mlngCount Then
            ReDim Preserve mcarrItems(Position)
            mlngCount = Position + 1
        End If

        ' Set the newly added element in the array to the
        ' passed in variable
        Set mcarrItems(Position) = Value
    Else
        On Error GoTo 0
        Err.Raise vbObjectError + errItemDoesNotExist, mstrSource, _
            LoadResString(errItemDoesNotExist)
    End If

End Property
Public Sub MoveUp(ByVal Position As Long)
    ' Moves the element at the passed in position up by 1

    Dim cTemp As Object

    If Position > 0 And Position < mlngCount Then
        Set cTemp = mcarrItems(Position)

        Set mcarrItems(Position) = mcarrItems(Position - 1)
        Set mcarrItems(Position - 1) = cTemp
    End If

End Sub
Public Sub MoveDown(ByVal Position As Long)
    ' Moves the element at the passed in position down by 1

    Dim cTemp As Object

    If Position >= 0 And Position < mlngCount - 1 Then
        Set cTemp = mcarrItems(Position)

        Set mcarrItems(Position) = mcarrItems(Position + 1)
        Set mcarrItems(Position + 1) = cTemp
    End If

End Sub

Public Function Count() As Long

```

```

    Count = mlngCount
End Function

Private Sub Class_Initialize()

    mlngCount = 0
End Sub

Private Sub Class_Terminate()

    Call Clear
End Sub

```

### **cVectorLng.cls**

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cVectorLng"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:      cVectorLng.cls
'            Microsoft TPC-H Kit Ver. 1.00
'            Copyright Microsoft, 1999
'            All Rights Reserved
'
' PURPOSE:   This class implements an array of longs.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

' Used to indicate the source module name when errors
' are raised by this class
Private mstrSource As String
Private Const mstrModuleName As String = "cVectorLng."

' Array counter
Private mlngCount As Long
Private mcarrItems() As Long

Public Sub Add(ByVal lngItem As Long)
    ' Adds the passed in long variable to the array

    On Error GoTo AddErr

    ReDim Preserve mcarrItems(mlngCount)

```

```

' Set the newly added element in the array to the
' passed in variable
mcarrItems(mlngCount) = lngItem
mlngCount = mlngCount + 1

Exit Sub

AddErr:
LogErrors Errors
gstrSource = mstrModuleName & "Add"
On Error GoTo 0
Err.Raise vbObjectError + errLoadInArrayFailed, _
    mstrSource, _
    LoadResString(errLoadInArrayFailed)

End Sub
Public Sub Clear()

' Clear the array
ReDim mcarrItems(0)

End Sub

Public Sub Delete(Optional ByVal Position As Long = -1, _
    Optional ByVal Item As Long = -1)
' The user can opt to delete either a specific item in
' the list or the item at a specified position. If no
' parameters are passed in, we delete the element at
' position 0!

Dim lngDelete As Long
Dim lngIndex As Long

On Error GoTo DeleteErr

If Position = -1 Then
' Since we can never store an element at position -1,
' we can be sure that the user is trying to delete
' a given item
lngDelete = Find(Item)
Else
lngDelete = Position
End If

If lngDelete < (mlngCount - 1) Then

' We want to maintain the order of all items in the
' array - so move all remaining elements in the array
' up by 1
For lngIndex = lngDelete To mlngCount - 2
MoveDown lngIndex
Next lngIndex

End If

' Delete the last Node from the array
mlngCount = mlngCount - 1
If mlngCount > 0 Then
ReDim Preserve mcarrItems(0 To mlngCount - 1)
Else
ReDim mcarrItems(0)
End If

Exit Sub

DeleteErr:
LogErrors Errors
mstrSource = mstrModuleName & "Delete"
On Error GoTo 0
Err.Raise vbObjectError + errDeleteArrayElementFailed, _
    mstrSource, _
    LoadResString(errDeleteArrayElementFailed)

End Sub
Public Function Find(ByVal Item As Long) As Long

' Returns the position at which the passed in value occurs
' in the array

Dim lngIndex As Long

On Error GoTo FindErr

' Find the element in the array to be deleted
For lngIndex = 0 To mlngCount - 1

If mcarrItems(lngIndex) = Item Then
Find = lngIndex
Exit Function
End If

Next lngIndex

Find = -1

Exit Function

FindErr:
LogErrors Errors
mstrSource = mstrModuleName & "Find"
On Error GoTo 0
Err.Raise vbObjectError + errItemNotFound, mstrSource, _
    LoadResString(errItemNotFound)

End Function
Public Property Get Item(ByVal Position As Long) As Long
Attribute Item.VB_UserMemId = 0

' Returns the element at the passed in position in the array
If Position >= 0 And Position < mlngCount Then
Item = mcarrItems(Position)

```

```

Else
    On Error GoTo 0
    Err.Raise vbObjectError + errItemDoesNotExist, mstrSource, _
        LoadResString(errItemDoesNotExist)
End If

End Property

Public Property Let Item(ByVal Position As Long, _
    ByVal Value As Long)

    ' Returns the element at the passed in position in the array
    If Position >= 0 Then
        ' If the passed in position is outside the array
        ' bounds, then resize the array
        If Position >= mlngCount Then
            ReDim Preserve mcarrItems(Position)
            mlngCount = Position + 1
        End If

        ' Set the newly added element in the array to the
        ' passed in variable
        mcarrItems(Position) = Value
    Else
        On Error GoTo 0
        Err.Raise vbObjectError + errItemDoesNotExist, mstrSource, _
            LoadResString(errItemDoesNotExist)
    End If

End Property

Public Sub MoveUp(ByVal Position As Long)
    ' Moves the element at the passed in position up by 1

    Dim lngTemp As Long

    If Position > 0 And Position < mlngCount Then
        lngTemp = mcarrItems(Position)

        mcarrItems(Position) = mcarrItems(Position - 1)
        mcarrItems(Position - 1) = lngTemp
    End If

End Sub

Public Sub MoveDown(ByVal Position As Long)
    ' Moves the element at the passed in position down by 1

    Dim lngTemp As Long

    If Position >= 0 And Position < mlngCount - 1 Then
        lngTemp = mcarrItems(Position)

        mcarrItems(Position) = mcarrItems(Position + 1)
        mcarrItems(Position + 1) = lngTemp
    End If

End Sub

```

```

Public Function Count() As Long

    Count = mlngCount

End Function

```

```

Private Sub Class_Initialize()

    mlngCount = 0

End Sub

```

```

Private Sub Class_Terminate()

    Call Clear

End Sub

```

### **cVectorStr.cls**

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cVectorStr"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE: cVectorStr.cls
' Microsoft TPC-H Kit Ver. 1.00
' Copyright Microsoft, 1999
' All Rights Reserved
'
' PURPOSE: This class implements an array of strings.
' Contact: Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

' Used to indicate the source module name when errors
' are raised by this class
Private mstrSource As String
Private Const mstrModuleName As String = "cVectorStr."

' Array counter
Private mlngCount As Long
Private mcarrItems() As String

Public Sub Add(ByVal strItem As String)
    ' Adds the passed in string variable to the array

    On Error GoTo AddErr

```

```

ReDim Preserve mcarrItems(mlngCount)

' Set the newly added element in the array to the
' passed in variable
mcarrItems(mlngCount) = strItem
mlngCount = mlngCount + 1

Exit Sub

AddErr:
Call LogErrors(Errors)
gstrSource = mstrModuleName & "Add"
On Error GoTo 0
Err.Raise vbObjectError + errLoadInArrayFailed, _
    mstrSource, _
    LoadResString(errLoadInArrayFailed)

End Sub
Public Sub Clear()

' Clear the array
ReDim mcarrItems(0)

End Sub

Public Sub Delete(Optional ByVal Position As Long = -1, _
    Optional ByVal Item As String = -1)
' The user can opt to delete either a specific item in
' the list or the item at a specified position. If no
' parameters are passed in, we delete the element at
' position 0!

Dim lngDelete As Long
Dim lngIndex As Long

On Error GoTo DeleteErr
mstrSource = mstrModuleName & "Delete"

If Position = -1 Then
' Since we can never store an element at position -1,
' we can be sure that the user is trying to delete
' a given item
lngDelete = Find(Item)
Else
lngDelete = Position
End If

If lngDelete < (mlngCount - 1) Then

' We want to maintain the order of all items in the
' array - so move all remaining elements in the array
' up by 1
For lngIndex = lngDelete To mlngCount - 2
MoveDown lngIndex
Next lngIndex

```

```

End If

' Delete the last Node from the array
mlngCount = mlngCount - 1
If mlngCount > 0 Then
ReDim Preserve mcarrItems(0 To mlngCount - 1)
Else
ReDim mcarrItems(0)
End If

Exit Sub

DeleteErr:
Call LogErrors(Errors)
mstrSource = mstrModuleName & "Delete"
On Error GoTo 0
Err.Raise vbObjectError + errDeleteArrayElementFailed, _
    mstrSource, _
    LoadResString(errDeleteArrayElementFailed)

End Sub
Public Function Find(ByVal Item As String) As Long

' Returns the position at which the passed in value occurs
' in the array

Dim lngIndex As Long

On Error GoTo FindErr
mstrSource = mstrModuleName & "Find"

' Find the element in the array to be deleted
For lngIndex = 0 To mlngCount - 1

If mcarrItems(lngIndex) = Item Then
Find = lngIndex
Exit Function
End If

Next lngIndex

Find = -1

Exit Function

FindErr:
Call LogErrors(Errors)
mstrSource = mstrModuleName & "Find"
On Error GoTo 0
Err.Raise vbObjectError + errItemNotFound, mstrSource, _
    LoadResString(errItemNotFound)

End Function
Public Property Get Item(ByVal Position As Long) As String
Attribute Item.VB_UserMemId = 0

```

```

' Returns the element at the passed in position in the array
If Position >= 0 And Position < mlngCount Then
    Item = mcarrItems(Position)
Else
    On Error GoTo 0
    Err.Raise vbObjectError + errItemDoesNotExist, mstrSource, _
        LoadResString(errItemDoesNotExist)
End If

End Property
Public Property Let Item(ByVal Position As Long, _
    ByVal Value As String)

' Returns the element at the passed in position in the array
If Position >= 0 Then
    ' If the passed in position is outside the array
    ' bounds, then resize the array
    If Position >= mlngCount Then
        ReDim Preserve mcarrItems(Position)
        mlngCount = Position + 1
    End If

    ' Set the newly added element in the array to the
    ' passed in variable
    mcarrItems(Position) = Value
Else
    On Error GoTo 0
    Err.Raise vbObjectError + errItemDoesNotExist, mstrSource, _
        LoadResString(errItemDoesNotExist)
End If

End Property
Public Sub MoveUp(ByVal Position As Long)
    ' Moves the element at the passed in position up by 1

    Dim strTemp As String

    If Position > 0 And Position < mlngCount Then
        strTemp = mcarrItems(Position)

        mcarrItems(Position) = mcarrItems(Position - 1)
        mcarrItems(Position - 1) = strTemp
    End If

End Sub
Public Sub MoveDown(ByVal Position As Long)
    ' Moves the element at the passed in position down by 1

    Dim strTemp As String

    If Position >= 0 And Position < mlngCount - 1 Then
        strTemp = mcarrItems(Position)

        mcarrItems(Position) = mcarrItems(Position + 1)
        mcarrItems(Position + 1) = strTemp
    End If

```

```

End Sub

Public Function Count() As Long

    Count = mlngCount

End Function

Private Sub Class_Initialize()

    mlngCount = 0

End Sub
Private Sub Class_Terminate()

    Call Clear

End Sub

```

## cWorker.cls

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cWorker"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:          cWorker.cls
'                Microsoft TPC-H Kit Ver. 1.00
'                Copyright Microsoft, 1999
'                All Rights Reserved
'
' PURPOSE:       Encapsulates the properties and methods of a worker step.
'                Implements the cStep class - carries out initializations
'                and validations that are specific to worker steps.
' Contact:       Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

Implements cStep

' Object variable to keep the step reference in
Private mcStep As cStep

' Used to indicate the source module name when errors
' are raised by this class
Private mstrSource As String
Private Const mstrModuleName As String = "cWorker."
Private Sub cStep_AddAllIterators()

```

```

        Call mcStep.AddAllIterators
End Sub
Private Property Let cStep_StartDir(ByVal RHS As String)
    mcStep.StartDir = RHS
End Property
Private Property Get cStep_StartDir() As String
    cStep_StartDir = mcStep.StartDir
End Property
Private Property Set cStep_NodeDB(RHS As DAO.Database)
    Set mcStep.NodeDB = RHS
End Property
Private Property Get cStep_NodeDB() As DAO.Database
    Set cStep_NodeDB = mcStep.NodeDB
End Property
Private Function cStep_IncVersionY() As String
    cStep_IncVersionY = mcStep.IncVersionY
End Function
Private Function cStep_IsNewVersion() As Boolean
    cStep_IsNewVersion = mcStep.IsNewVersion
End Function
Private Function cStep_OldVersionNo() As String
    cStep_OldVersionNo = mcStep.OldVersionNo
End Function
Private Function cStep_IncVersionX() As String
    cStep_IncVersionX = mcStep.IncVersionX
End Function
Private Sub cStep_UpdateIteratorVersion()
    Call mcStep.UpdateIteratorVersion
End Sub
Private Function cStep_IteratorCount() As Long
    cStep_IteratorCount = mcStep.IteratorCount

```

```

End Function
Private Sub cStep_UnloadIterators()
    Call mcStep.UnloadIterators
End Sub
Private Sub cStep_SaveIterators()
    Call mcStep.SaveIterators
End Sub
Private Property Get cStep_IteratorName() As String
    cStep_IteratorName = mcStep.IteratorName
End Property
Private Property Let cStep_IteratorName(ByVal RHS As String)
    mcStep.IteratorName = RHS
End Property
Private Sub cStep_LoadIterator(cItRecord As cIterator)
    Call mcStep.LoadIterator(cItRecord)
End Sub
Private Sub cStep_DeleteIterator(cItRecord As cIterator)
    Call mcStep.DeleteIterator(cItRecord)
End Sub
Private Sub cStep_InsertIterator(cItRecord As cIterator)
    Call mcStep.InsertIterator(cItRecord)
End Sub
Private Function cStep_Iterators() As Variant
    cStep_Iterators = mcStep.Iterators
End Function
Private Sub cStep_ModifyIterator(cItRecord As cIterator)
    Call mcStep.ModifyIterator(cItRecord)
End Sub
Private Sub cStep_RemoveIterator(cItRecord As cIterator)
    Call mcStep.RemoveIterator(cItRecord)
End Sub
Private Sub cStep_UpdateIterator(cItRecord As cIterator)

```

```

        Call mcStep.UpdateIterator(cItRecord)
End Sub
Private Sub cStep_AddIterator(cItRecord As cIterator)
    Call mcStep.AddIterator(cItRecord)
End Sub
Private Property Let cStep_Position(ByVal RHS As Long)
    mcStep.Position = RHS
End Property
Private Property Get cStep_Position() As Long
    cStep_Position = mcStep.Position
End Property
Private Function cStep_Clone(Optional cCloneStep As cStep) As cStep
    Dim cNewWorker As cWorker
    Set cNewWorker = New cWorker
    Set cStep_Clone = mcStep.Clone(cNewWorker)
End Function
Private Sub StepTextOrFileEntered()
    ' Checks if either the step text or the name of the file containing
    ' the text has been entered
    ' If both of them are null or both of them are not null,
    ' the worker step is invalid and an error is raised
    If StringEmpty(mcStep.StepText) And StringEmpty(mcStep.StepTextFile)
Then
        ShowError errStepTextAndFileNull
        On Error GoTo 0
        Err.Raise vbObjectError + errStepTextAndFileNull, _
            mstrSource, LoadResString(errStepTextAndFileNull)
    End If
End Sub
Private Property Get cStep_IndOperation() As Operation
    cStep_IndOperation = mcStep.IndOperation
End Property
Private Property Let cStep_IndOperation(ByVal RHS As Operation)
    mcStep.IndOperation = RHS

```

```

End Property
Private Property Get cStep_NextStepId() As Long
    cStep_NextStepId = mcStep.NextStepId
End Property
Private Property Let cStep_OutputFile(ByVal RHS As String)
    mcStep.OutputFile = RHS
End Property
Private Property Get cStep_OutputFile() As String
    cStep_OutputFile = mcStep.OutputFile
End Property
Private Property Let cStep_ErrorFile(ByVal RHS As String)
    mcStep.ErrorFile = RHS
End Property
Private Property Get cStep_ErrorFile() As String
    cStep_ErrorFile = mcStep.ErrorFile
End Property
Private Property Let cStep_LogFile(ByVal RHS As String)
    '
    '     mcStep.LogFile = RHS
    '
End Property
Private Property Get cStep_LogFile() As String
    '
    '     cStep_LogFile = mcStep.LogFile
    '
End Property
Private Property Let cStep_ArchivedFlag(ByVal RHS As Boolean)
    mcStep.ArchivedFlag = RHS
End Property
Private Property Get cStep_ArchivedFlag() As Boolean
    cStep_ArchivedFlag = mcStep.ArchivedFlag
End Property
Private Sub Class_Initialize()

```

```

' Create the object
Set mcStep = New cStep

' Initialize the object with valid values for a Worker step
' The global flag should be the first field to be initialized
' since subsequent validations might try to check if the
' step being created is global
mcStep.GlobalFlag = False
'
' mcStep.GlobalRunMethod = gintNoOption
mcStep.StepType = gintWorkerStep

End Sub
Private Sub Class_Terminate()

' Remove the step object
Set mcStep = Nothing

End Sub
Private Sub cStep_Add()

' Call a private procedure to see if the step text has been
' entered - since a worker step actually executes a step, entry
' of the text is mandatory
Call StepTextOrFileEntered

' Call the Add method of the step class to carry out the insert
mcStep.Add

End Sub

Private Property Get cStep_ContinuationCriteria() As
ContinuationCriteria

cStep_ContinuationCriteria = mcStep.ContinuationCriteria

End Property

Private Property Let cStep_ContinuationCriteria(ByVal RHS As
ContinuationCriteria)

' The Continuation criteria must be non-null for all worker steps.
' Check if the Continuation Criteria is valid
Select Case RHS
Case gintOnFailureAbortSiblings, gintOnFailureCompleteSiblings,
-
gintOnFailureSkipSiblings, gintOnFailureAbort, _
gintOnFailureContinue, gintOnFailureAsk
mcStep.ContinuationCriteria = RHS

Case Else
On Error GoTo 0
Err.Raise vbObjectError + errContCriteriaInvalid, _
mstrModuleName,
LoadResString(errContCriteriaInvalid)
End Select

End Property

```

```

End Property

Private Property Let cStep_DegreeParallelism(ByVal RHS As String)

mcStep.DegreeParallelism = RHS

End Property

Private Property Get cStep_DegreeParallelism() As String

cStep_DegreeParallelism = mcStep.DegreeParallelism

End Property

Private Sub cStep_Delete()

mcStep.Delete

End Sub

Private Property Get cStep_EnabledFlag() As Boolean

cStep_EnabledFlag = mcStep.EnabledFlag

End Property

Private Property Let cStep_EnabledFlag(ByVal RHS As Boolean)

mcStep.EnabledFlag = RHS

End Property

Private Property Let cStep_ExecutionMechanism(ByVal RHS As
ExecutionMethod)

On Error GoTo ExecutionMechanismErr
mstrSource = mstrModuleName & "cStep_ExecutionMechanism"

Select Case RHS
Case gintExecuteShell, gintExecuteODBC
mcStep.ExecutionMechanism = RHS

Case Else
On Error GoTo 0
Err.Raise vbObjectError + errExecutionMechanismInvalid, _
mstrSource,
LoadResString(errExecutionMechanismInvalid)
End Select

Exit Property

ExecutionMechanismErr:
LogErrors Errors
mstrSource = mstrModuleName & "cStep_ExecutionMechanism"
On Error GoTo 0

```



```

        Err.Raise vbObjectError + errExecutionMechanismLetFailed, _
            mstrSource, LoadResString(errExecutionMechanismLetFailed)
End Property

Private Property Get cStep_ExecutionMechanism() As ExecutionMethod
    cStep_ExecutionMechanism = mcStep.ExecutionMechanism
End Property

Private Property Let cStep_FailureDetails(ByVal RHS As String)
    mcStep.FailureDetails = RHS
End Property

Private Property Get cStep_FailureDetails() As String
    cStep_FailureDetails = mcStep.FailureDetails
End Property

Private Property Get cStep_GlobalFlag() As Boolean
    cStep_GlobalFlag = mcStep.GlobalFlag
End Property

Private Property Let cStep_GlobalFlag(ByVal RHS As Boolean)
    ' Set the global flag to false - this flag is initialized when
    ' an instance of the class is created. Just making sure that
    ' nobody changes the value inadvertently
    mcStep.GlobalFlag = False
End Property

Private Sub cStep_Modify()
    ' Call a private procedure to see if the step text has been
    ' entered - since a worker step actually executes a step, entry
    ' of the text is mandatory
    Call StepTextOrFileEntered

    ' Call the Modify method of the step class to carry out the update
    mcStep.Modify
End Sub

Private Property Let cStep_ParentStepId(ByVal RHS As Long)
    mcStep.ParentStepId = RHS
End Property

Private Property Get cStep_ParentStepId() As Long

```

```

    cStep_ParentStepId = mcStep.ParentStepId
End Property

Private Property Let cStep_ParentVersionNo(ByVal RHS As String)
    mcStep.ParentVersionNo = RHS
End Property

Private Property Get cStep_ParentVersionNo() As String
    cStep_ParentVersionNo = mcStep.ParentVersionNo
End Property

Private Property Let cStep_SequenceNo(ByVal RHS As Integer)
    mcStep.SequenceNo = RHS
End Property

Private Property Get cStep_SequenceNo() As Integer
    cStep_SequenceNo = mcStep.SequenceNo
End Property

Private Property Let cStep_StepId(ByVal RHS As Long)
    mcStep.StepId = RHS
End Property

Private Property Get cStep_StepId() As Long
    cStep_StepId = mcStep.StepId
End Property

Private Property Let cStep_StepLabel(ByVal RHS As String)
    mcStep.StepLabel = RHS
End Property

Private Property Get cStep_StepLabel() As String
    cStep_StepLabel = mcStep.StepLabel
End Property

Private Property Let cStep_StepLevel(ByVal RHS As Integer)

```

```

        mcStep.StepLevel = RHS
    End Property

    Private Property Get cStep_StepLevel() As Integer
        cStep_StepLevel = mcStep.StepLevel
    End Property

    Private Property Let cStep_StepText(ByVal RHS As String)
        mcStep.StepText = RHS
    End Property

    Private Property Get cStep_StepText() As String
        cStep_StepText = mcStep.StepText
    End Property

    Private Property Let cStep_StepTextFile(ByVal RHS As String)
        mcStep.StepTextFile = RHS
    End Property

    Private Property Get cStep_StepTextFile() As String
        cStep_StepTextFile = mcStep.StepTextFile
    End Property

    Private Property Let cStep_StepType(RHS As gintStepType)
        mcStep.StepType = gintWorkerStep
    End Property

    Private Property Get cStep_StepType() As gintStepType
        cStep_StepType = mcStep.StepType
    End Property

    Private Sub cStep_Validate()
        ' The validate routines for each of the steps will
        ' carry out the specific validations for the type and
        ' call the generic validation routine

        On Error GoTo cStep_ValidateErr

        ' Validations specific to worker steps

```

```

        ' Check if the step text or a file name has been
        ' specified
        Call StepTextOrFileEntered

        mcStep.Validate

        Exit Sub

cStep_ValidateErr:
    LogErrors Errors
    mstrSource = mstrModuleName & "cStep_Validate"
    On Error GoTo 0
    Err.Raise vbObjectError + errValidateFailed, _
        mstrSource, _
        LoadResString(errValidateFailed)
End Sub

    Private Property Let cStep_VersionNo(ByVal RHS As String)
        mcStep.VersionNo = RHS
    End Property

    Private Property Get cStep_VersionNo() As String
        cStep_VersionNo = mcStep.VersionNo
    End Property

    Private Property Let cStep_WorkspaceId(ByVal RHS As Long)
        mcStep.WorkspaceId = RHS
    End Property

    Private Property Get cStep_WorkspaceId() As Long
        cStep_WorkspaceId = mcStep.WorkspaceId
    End Property

```

## **cWorkspace.cls**

```

VERSION 1.0 CLASS
BEGIN
    MultiUse = -1 'True
END
Attribute VB_Name = "cWorkspace"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = True
Attribute VB_PredeclaredId = False
Attribute VB_Exposed = False
' FILE:      cWorkspace.cls
'           Microsoft TPC-H Kit Ver. 1.00
'           Copyright Microsoft, 1999
'           All Rights Reserved

```

```

'
'
' PURPOSE:      Encapsulates the properties and methods of a workspace.
'              Contains functions to insert, update and delete
'              att_workspaces records from the database.
' Contact:     Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

' Local variable(s) to hold property value(s)
Private mlngWorkspaceId As Long
Private mstrWorkspaceName As String
Private mblnArchivedFlag As Boolean
Private mdbStepMaster As Database

' Used to indicate the source module name when errors
' are raised by this class
Private mstrSource As String
Private Const mstrModuleName As String = "cWorkspace."

' The cSequence class is used to generate unique workspace identifiers
Private mWorkspaceSeq As cSequence

' The StringSM class is used to carry out string operations
Private mFieldValue As cStringSM

Public Function Clone() As cWorkspace

    ' Creates a copy of a given workspace

    Dim cCloneWsp As cWorkspace

    On Error GoTo CloneErr

    Set cCloneWsp = New cWorkspace

    ' Copy all the workspace properties to the newly
    ' created workspace
    cCloneWsp.WorkspaceId = mlngWorkspaceId
    cCloneWsp.WorkspaceName = mstrWorkspaceName
    cCloneWsp.ArchivedFlag = mblnArchivedFlag

    ' And set the return value to the newly created workspace
    Set Clone = cCloneWsp

    Exit Function

CloneErr:
    LogErrors Errors
    mstrSource = mstrModuleName & "Clone"
    On Error GoTo 0
    Err.Raise vbObjectError + errCloneFailed, _
        mstrSource, LoadResString(errCloneFailed)

End Function

```

```

Public Property Let ArchivedFlag(ByVal vdata As Boolean)

    mblnArchivedFlag = vdata

End Property

Public Property Get ArchivedFlag() As Boolean

    ArchivedFlag = mblnArchivedFlag

End Property

Public Property Set WorkDatabase(vdata As Database)

    Set mdbStepMaster = vdata

End Property

Private Sub WorkspaceNameDuplicate()
    ' Check if the workspace name already exists in the workspace

    Dim rstWorkspace As Recordset
    Dim strSql As String
    Dim qy As DAO.QueryDef

    On Error GoTo WorkspaceNameDuplicateErr
    mstrSource = mstrModuleName & "WorkspaceNameDuplicate"

    ' Create a recordset to retrieve the count of records
    ' having the same workspace name
    strSql = " Select count(*) as workspace_count " & _
        " from att_workspaces " & _
        " where workspace_name = [w_name] " & _
        " and workspace_id <> [w_id] "
    Set qy = mdbStepMaster.CreateQueryDef(gstrEmptyString, strSql)

    ' Call a procedure to assign the parameter values
    Call AssignParameters(qy)

    Set rstWorkspace = qy.OpenRecordset(dbOpenForwardOnly)

    '
    ' mFieldValue.MakeStringFieldValid (mstrWorkspaceName) & _
    ' " and workspace_id <> " & _
    ' Str(mlngWorkspaceId)
    '
    ' Set rstWorkspace = mdbStepMaster.OpenRecordset( _
    '     strSQL, dbOpenForwardOnly)

    If rstWorkspace![workspace_count] > 0 Then
        rstWorkspace.Close
        qy.Close
        ShowError errDuplicateWorkspaceName
        On Error GoTo 0
        Err.Raise vbObjectError + errDuplicateWorkspaceName, _
            mstrSource, LoadResString(errDuplicateWorkspaceName)
    End If

```

```

rstWorkspace.Close
qy.Close

Exit Sub

WorkspaceNameDuplicateErr:
Call LogErrors(Errors)
mstrSource = mstrModuleName & "WorkspaceNameDuplicate"
On Error GoTo 0
Err.Raise vbObjectError + errWorkspaceNameDuplicateFailed, _
    mstrSource, LoadResString(errWorkspaceNameDuplicateFailed)

End Sub
Public Property Let WorkspaceName(vdata As String)

    On Error GoTo WorkspaceNameErr
    mstrSource = mstrModuleName & "WorkspaceName"

    If vdata = gstrEmptyString Then

        On Error GoTo 0
        ' Propagate this error back to the caller
        Err.Raise vbObjectError + errWorkspaceNameMandatory, _
            mstrSource, LoadResString(errWorkspaceNameMandatory)
    Else
        mstrWorkspaceName = vdata
    End If
    Exit Property

WorkspaceNameErr:
LogErrors Errors
mstrSource = mstrModuleName & "WorkspaceName"
On Error GoTo 0
Err.Raise vbObjectError + errWorkspaceNameSetFailed, _
    mstrSource, LoadResString(errWorkspaceNameSetFailed)

End Property

Public Property Let WorkspaceId(vdata As Long)

    On Error GoTo WorkspaceIdErr
    mstrSource = mstrModuleName & "WorkspaceId"

    If (vdata > 0) Then
        mlngWorkspaceId = vdata
    Else
        ' Propagate this error back to the caller
        On Error GoTo 0
        Err.Raise vbObjectError + errWorkspaceIdInvalid, _
            mstrSource, LoadResString(errWorkspaceIdInvalid)
    End If

    Exit Property

WorkspaceIdErr:
LogErrors Errors

mstrSource = mstrModuleName & "WorkspaceId"
On Error GoTo 0
Err.Raise vbObjectError + errWorkspaceIdSetFailed, _
    mstrSource, LoadResString(errWorkspaceIdSetFailed)

End Property

Public Sub AddWorkspace()

    Dim strInsert As String
    Dim qy As DAO.QueryDef

    On Error GoTo AddWorkspaceErr

    ' Retrieve the next identifier using the sequence class
    Set mWorkspaceSeq = New cSequence
    Set mWorkspaceSeq.IdDatabase = mdbStepMaster
    mWorkspaceSeq.IdentifierColumn = FLD_ID_WORKSPACE
    mlngWorkspaceId = mWorkspaceSeq.Identifier
    Set mWorkspaceSeq = Nothing

    ' Call procedure to raise an error if the Workspace name
    ' already exists in the db
    Call WorkspaceNameDuplicate

    ' A new record will have the archived_flag turned off
    mblnArchivedFlag = False

    ' Create a temporary querydef object
    strInsert = "insert into att_workspaces " & _
        "( workspace_id, workspace_name, " & _
        " archived_flag ) " & _
        " values ( [w_id], [w_name], [archived] ) "
    Set qy = mdbStepMaster.CreateQueryDef(gstrEmptyString, strInsert)

    ' Call a procedure to assign the parameter values
    Call AssignParameters(qy)

    qy.Execute dbFailOnError
    qy.Close

    '
    ' strInsert = "insert into att_workspaces " & _
    ' "( workspace_id, workspace_name, " & _
    ' " archived_flag ) " & _
    ' " values ( " & _
    ' Str(mlngWorkspaceId) & _
    ' ", " & mFieldValue.MakeStringFieldValid(mstrWorkspaceName)
    ' & _
    ' ", " & Str(mblnArchivedFlag) & _
    ' " ) "
    '
    ' mdbStepMaster.Execute strInsert, dbFailOnError
    '

    Exit Sub

AddWorkspaceErr:

```

```

Call LogErrors(Errors)
mstrSource = mstrModuleName & "AddWorkspace"
On Error GoTo 0
Err.Raise vbObjectError + errWorkspaceInsertFailed, _
    mstrSource, LoadResString(errWorkspaceInsertFailed)

End Sub
Private Sub AssignParameters(qyExec As DAO.QueryDef)
' Assigns values to the parameters in the querydef object
' The parameter names are cryptic to make them different
' from the field names. When the parameter names are
' the same as the field names, parameters in the where
' clause do not get created.

Dim prmParam As DAO.Parameter

On Error GoTo AssignParametersErr
mstrSource = mstrModuleName & "AssignParameters"

For Each prmParam In qyExec.Parameters
    Select Case prmParam.Name
        Case "[w_id]"
            prmParam.Value = mlngWorkspaceId

        Case "[w_name]"
            prmParam.Value = mstrWorkspaceName

        Case "[archived]"
            prmParam.Value = mblnArchivedFlag

        Case Else
            ' Write the parameter name that is faulty
            WriteError errInvalidParameter, mstrSource, _
                prmParam.Name
            On Error GoTo 0
            Err.Raise errInvalidParameter, mstrSource, _
                LoadResString(errInvalidParameter)
    End Select
Next prmParam

Exit Sub

AssignParametersErr:

mstrSource = mstrModuleName & "AssignParameters"
Call LogErrors(Errors)
On Error GoTo 0
Err.Raise vbObjectError + errAssignParametersFailed, _
    mstrSource, LoadResString(errAssignParametersFailed)

End Sub
Public Sub DeleteWorkspace()

Dim strDelete As String
Dim qy As DAO.QueryDef

```

```

On Error GoTo DeleteWorkspaceErr

strDelete = "delete from att_workspaces " & _
    " where workspace_id = [w_id]"
Set qy = mdfsStepMaster.CreateQueryDef(gstrEmptyString, strDelete)

' Call a procedure to assign the parameter values
Call AssignParameters(qy)

qy.Execute dbFailOnError
qy.Close

' mdfsStepMaster.Execute strDelete, dbFailOnError
' " where workspace_id = " & _
' Str(mlngWorkspaceId)

Exit Sub

DeleteWorkspaceErr:
Call LogErrors(Errors)
mstrSource = mstrModuleName & "DeleteWorkspace"
On Error GoTo 0
Err.Raise vbObjectError + errWorkspaceDeleteFailed, _
    mstrSource, LoadResString(errWorkspaceDeleteFailed)

End Sub

Public Sub ModifyWorkspace()

Dim strUpdate As String
Dim qy As DAO.QueryDef

On Error GoTo ModifyWorkspaceErr

' Call procedure to raise an error if the Workspace name
' already exists in the db
Call WorkspaceNameDuplicate

strUpdate = "update att_workspaces " & _
    " set workspace_name = [w_name] " & _
    ", archived_flag = [archived] " & _
    " where workspace_id = [w_id] "
Set qy = mdfsStepMaster.CreateQueryDef(gstrEmptyString, strUpdate)

' Call a procedure to assign the parameter values
Call AssignParameters(qy)

qy.Execute dbFailOnError
qy.Close

' strUpdate = "update att_workspaces " & _
' " set workspace_name = " & _
' mFieldValue.MakeStringFieldValid(mstrWorkspaceName) & _
' ", archived_flag = " & _
' Str(mblnArchivedFlag) & _
' " where workspace_id = " & _
' Str(mlngWorkspaceId)

```

```

'
'   mdbStepMaster.Execute strUpdate, dbFailOnError
'
Exit Sub

ModifyWorkspaceErr:

Call LogErrors(Errors)
mstrSource = mstrModuleName & "ModifyWorkspace"
On Error GoTo 0
Err.Raise vbObjectError + errWorkspaceUpdateFailed, _
    mstrSource, LoadResString(errWorkspaceUpdateFailed)

End Sub
Public Property Get WorkspaceName() As String

    WorkspaceName = mstrWorkspaceName

End Property

Public Property Get WorkspaceId() As Long

    WorkspaceId = mlngWorkspaceId

End Property

Private Sub Class_Initialize()

    ' Each function will append it's own name to this
    ' variable
    mstrSource = "cWorkspace."

    Set mFieldValue = New cStringSM

End Sub

Private Sub Class_Terminate()

    Set mdbStepMaster = Nothing
    Set mFieldValue = Nothing

End Sub

```

## DatabaseSM.bas

```

Attribute VB_Name = "DatabaseSM"
' FILE:      DatabaseSM.bas
'            Microsoft TPC-H Kit Ver. 1.00
'            Copyright Microsoft, 1999
'            All Rights Reserved
'
'
' PURPOSE:   Contains all the database initialization/cleanup
'            procedures for the project. Also contains upgrade
'            database upgrade functions.
'
' Contact:   Reshma Tharamal (reshmat@microsoft.com)

```

```

'
' This module is called DatabaseSM, since Database is a standard
' Visual Basic object and we want to avoid any confusion with it.

Option Explicit

Public wrkJet As Workspace
Public dbsAttTool As Database
Public gblnDbOpen As Boolean
Public gRunEngine As rdoEngine

' Used to indicate the source module name when errors
' are raised by this module
Private Const mstrModuleName As String = "DatabaseSM."
Public Const gsDefDBFileExt As String = ".stp"
Private Const msDefDBFile As String = "\SMDData" & gsDefDBFileExt

Private Const merrFileNotFound As Integer = 3024
Private Const merrDaoTableMissing As Integer = 3078

Private Const STEPMASTER_SETTINGS_VAL_NAME_DBFILE As String =
"WorkspaceFile"

Public Const DEF_NO_COUNT_DISPLAY           As Boolean = False
Public Const DEF_NO_EXECUTE                 As Boolean = False
Public Const DEF_PARSE_QUERY_ONLY          As Boolean = False
Public Const DEF_ANSI_QUOTED_IDENTIFIERS   As Boolean = False
Public Const DEF_ANSI_NULLS                As Boolean = True
Public Const DEF_SHOW_QUERY_PLAN           As Boolean = False
Public Const DEF_SHOW_STATS_TIME           As Boolean = False
Public Const DEF_SHOW_STATS_IO             As Boolean = False
Public Const DEF_PARSE_ODBC_MSG_PREFIXES   As Boolean = True
Public Const DEF_ROW_COUNT                  As Long = 0
Public Const DEF_TSQL_BATCH_SEPARATOR      As String = "GO"
Public Const DEF_QUERY_TIME_OUT             As Long = 0
Public Const DEF_SERVER_LANGUAGE           As String = "(Default)"
Public Const DEF_CHARACTER_TRANSLATION      As Boolean = True
Public Const DEF_REGIONAL_SETTINGS         As Boolean = False

Public Const PARAM_DEFAULT_DIR              As String = "DEFAULT_DIR"
Public Const PARAM_DEFAULT_DIR_DESC        As String = "Default
destination directory " & _
"for all output and error files. If it is blank, the
StepMaster installation directory will be used."

Public Const PARAM_RUN_ID                   As String = "RUN_ID"
Public Const PARAM_RUN_ID_DESC              As String = "The run
identifier for a run. " & _
"Any modifications will be overwritten before each run."

Public Const PARAM_OUTPUT_DIR               As String = "OUTPUT_DIR"
Public Const PARAM_OUTPUT_DIR_DESC          As String = "The output
directory for a run. " & _
"Any modifications will be overwritten before each run."

Public Const CONNECTION_STRINGS_TO_NAME_SUFFIX As String = "_NAME"

```

```

Private Const TBL_RUN_STEP_HDR As String = "run_header"
Private Const TBL_RUN_STEP_DTLS As String = "run_step_details"
Public Const TBL_CONNECTION_DTLS As String = "connection_dtls"
Public Const TBL_CONNECTION_STRINGS As String = "workspace_connections"
Public Const TBL_STEPS As String = "att_steps"

Public Const FLD_ID_CONN_NAME As String = "connection_name_id"
Public Const FLD_ID_WORKSPACE As String = "workspace_id"
Public Const FLD_ID_STEP As String = "step_id"
Public Const FLD_ID_PARAMETER As String = "parameter_id"

Public Const FLD_CONN_DTL_CONNECTION_NAME As String = "connection_name"
Public Const FLD_CONN_DTL_CONNECTION_STRING As String =
"connection_string_name"
Public Const FLD_CONN_DTL_CONNECTION_TYPE As String = "connection_type"

Public Const FLD_CONN_STR_CONNECTION_NAME As String = "connection_name"

Public Const FLD_STEPS_EXEC_MECHANISM As String = "execution_mechanism"
Public Const FLD_STEPS_EXEC_DTL As String = "start_directory"
Public Const FLD_STEPS_VERSION_NO As String = "version_no"

Public Const DATA_TYPE_CURRENCY As String = "CURRENCY"
Public Const DATA_TYPE_LONG As String = "Long"
Public Const DATA_TYPE_INTEGER As String = "INTEGER"
Public Const DATA_TYPE_TEXT255 As String = "Text(255)"

Private Sub InsertBuiltInParameter(dbFile As Database, sParamName As
String, _
    sParamValue As String, sParamDesc As String)

    Dim sBuf As String
    Dim cTempStr As New cStringSM
    Dim lId As Long
    Dim rTemp As DAO.Recordset
    Dim rParam As DAO.Recordset
    Dim cTempSeq As cSequence

    ' Create the passed in built-in parameter, for each workspace in the
db
    Set cTempSeq = New cSequence
    Set cTempSeq.IdDatabase = dbFile
    cTempSeq.IdentifierColumn = FLD_ID_PARAMETER

    sBuf = "select * from att_workspaces "
    Set rTemp = dbFile.OpenRecordset(sBuf, dbOpenSnapshot)
    If rTemp.RecordCount <> 0 Then
        rTemp.MoveFirst

        While Not rTemp.EOF
            sBuf = "select * from workspace_parameters " & _
                " where workspace_id = " & Str(rTemp!workspace_id) &
                _
                " and parameter_name = " &
cTempStr.MakeStringFieldValid(sParamName)

```

```

Set rParam = dbFile.OpenRecordset(sBuf, dbOpenSnapshot)
If rParam.RecordCount <> 0 Then
    rParam.MoveFirst
    ' Since the parameter already exists, change it to a
built-in type
    sBuf = "update workspace_parameters " & _
        " set parameter_type = " &
CStr(gintParameterBuiltIn) & _
        ", description = " &
cTempStr.MakeStringFieldValid(sParamDesc) & _
        " where workspace_id = " &
Str(rTemp!workspace_id) & _
        " and parameter_id = " &
Str(rParam!parameter_id)
    Else
        ' Else, insert a parameter record
        lId = cTempSeq.Identifier
        sBuf = "insert into workspace_parameters " & _
            "( workspace_id, parameter_id, " & _
            " parameter_name, parameter_value, " & _
            " description, parameter_type ) " & _
            " values ( " & _
Str(rTemp!workspace_id) & ", " & Str(lId) & ", "
& _
            cTempStr.MakeStringFieldValid(sParamName) & ", "
& _
            cTempStr.MakeStringFieldValid(sParamValue) & ",
" & _
            cTempStr.MakeStringFieldValid(sParamDesc) & ", "
& _
            CStr(gintParameterBuiltIn) & _
            " ) "
    End If
    dbFile.Execute sBuf, dbFailOnError
    rParam.Close

    rTemp.MoveNext
Wend
End If
rTemp.Close

End Sub
Public Sub InitRunEngine()

    Set gRunEngine = New rdoEngine
    gRunEngine.rdoDefaultCursorDriver = rdUseServer

End Sub

Public Function DefaultDBFile() As String
    DefaultDBFile = GetSetting(App.Title, "Settings",
STEPMASTER_SETTINGS_VAL_NAME_DBFILE, App.Path & msDefDBFile)
End Function

Public Sub CloseDatabase()

```

```

Dim dbsInstance As Database
Dim recInstance As Recordset

On Error GoTo CloseDatabaseErr

' Close all open recordsets and databases in the workspace
For Each dbsInstance In wrkJet.Databases

    For Each recInstance In dbsAttTool.Recordsets
        recInstance.Close
    Next recInstance
    dbsInstance.Close

Next dbsInstance

Set dbsAttTool = Nothing

gblnDbOpen = False
wrkJet.Close

Exit Sub

CloseDatabaseErr:

    Call LogErrors(Errors)
    Resume Next

End Sub

Private Function NoDbChanges(sVerTo As String, sVerFrom As String) As Boolean

    If sVerTo = gsVersion242 And sVerFrom = gsVersion241 Then
        NoDbChanges = True
    ElseIf sVerTo = gsVersion242 And sVerFrom = gsVersion24 Then
        NoDbChanges = True
    ElseIf sVerTo = gsVersion253 And sVerFrom = gsVersion251 Then
        NoDbChanges = True
    ElseIf sVerTo = gsVersion255 And sVerFrom = gsVersion251 Then
        NoDbChanges = True
    Else
        NoDbChanges = False
    End If

End Function

Public Function SMOpenDatabase(Optional strDbName As String =
gstrEmptyString) As Boolean
    Dim sVersion As String
    Dim bOpeningDb As Boolean ' This flag is used to check if
OpenDatabase failed

    On Error GoTo OpenDatabaseErr

    bOpeningDb = False
    SMOpenDatabase = False

    ' Create Microsoft Jet Workspace object.
    If Not gblnDbOpen Then
        Set wrkJet = CreateWorkspace("att_tool_workspace_setup", "admin",
gstrEmptyString, dbUseJet)
    End If

    ' Prompt the user for the database file if it is not passed in
    If StringEmpty(strDbName) Then
        strDbName = BrowseDBFile
        If StringEmpty(strDbName) Then
            Exit Function
        End If
    End If

    Do
        If gblnDbOpen Then
            #If Not RUN_ONLY Then
                CloseOpenWorkspaces
            #End If

            Set wrkJet = CreateWorkspace("att_tool_workspace_setup",
"admin", gstrEmptyString, dbUseJet)
        End If

        ' Toggle the bOpeningDb flag around the OpenDatabase method -
the value
        ' of this flag will be checked by the error handler to determine
if it is
        ' the OpenDatabase that failed.
        BugMessage "DB File: " & strDbName

        bOpeningDb = True
        ' Open the database for exclusive use
        Set dbsAttTool = wrkJet.OpenDatabase(strDbName, Options:=True)
        bOpeningDb = False

        If dbsAttTool Is Nothing Then
            ' If the file is not present in the directory, display
            ' an error and ask the user to enter a new path
            Call ShowError(errOpenDbFailed, OptArgs:=strDbName)

            strDbName = BrowseDBFile
        Else
            sVersion = DBVersion(dbsAttTool)

            ' Make sure the application and db version numbers match
            If sVersion = gsVersion Then
                Call InitializeData(strDbName)
                gblnDbOpen = True
                SMOpenDatabase = True
            Else
                If UpgradeDb(wrkJet, dbsAttTool, gsVersion, sVersion)
Then
                    Call InitializeData(strDbName)
                    gblnDbOpen = True
                    SMOpenDatabase = True
                End If
            End If
        End If
    Loop Until bOpeningDb

End Function

```



```

Else
    dbsAttTool.Close
    Set dbsAttTool = Nothing

    ShowError errVersionMismatch, _
        OptArgs:=" Please install Version '" &
gsVersion & "' of the workspace definition file."
    strDbName = BrowseDBFile
End If
End If
Loop While gblnDbOpen = False And Not StringEmpty(strDbName)

Exit Function

OpenDatabaseErr:
Call DisplayErrors(Errors)

' If the OpenDatabase failed, continue
If bOpeningDb Then
    Resume Next
End If

Call ShowError(errOpenDbFailed, OptArgs:=strDbName)

End Function
Private Sub InitializeData(sDb As String)

Set gcParameters = New cArrParameters
Set gcParameters.ParamDatabase = dbsAttTool

Set gcSteps = New cArrSteps
Set gcSteps.StepDB = dbsAttTool

Set gcConstraints = New cArrConstraints
Set gcConstraints.ConstraintDB = dbsAttTool

Set gcConnections = New cConnections
Set gcConnections.ConnDb = dbsAttTool

Set gcConnDtls = New cConnDtls
Set gcConnDtls.ConnDb = dbsAttTool

' Disable the error handler since this is not a critical step
On Error GoTo 0
SaveSetting App.Title, "Settings",
STEPMASTER_SETTINGS_VAL_NAME_DBFILE, sDb
End Sub
Private Sub UpdateContinuationCriteria(dbFile As DAO.Database)

Dim qyTemp As DAO.QueryDef
Dim sBuf As String

On Error GoTo UpdateContinuationCriteriaErr

```

```

sBuf = "Since this version of the executable incorporates failure
processing, " & _
    "the upgrade will update the On Failure field for each of
the steps " & _
    "to 'Continue' to be compatible with the existing behaviour."
" & _
    "Proceed?"
If Not Confirm(Buttons:=vbYesNo, strMessage:=sBuf,
strTitle:"Upgrade database") Then
    Exit Sub
End If

' Create a recordset object to retrieve all steps for
' the given workspace
sBuf = " update att_steps a " & _
    " set continuation_criteria = " & CStr(gintOnFailureContinue) &
-
    " where archived_flag = [archived] "

' Find the highest X-component of the version number
sBuf = sBuf & " AND cint( mid( version_no, 1, instr( version_no, " &
gstrDQ & gstrVerSeparator & gstrDQ & " ) - 1 ) ) = " & _
    " ( select max( cint( mid( version_no, 1, instr( version_no, " &
gstrDQ & gstrVerSeparator & gstrDQ & " ) - 1 ) ) ) " & _
    " from att_steps AS d " & _
    " WHERE a.step_id = d.step_id ) "

' Find the highest Y-component of the version number for the highest
X-component
sBuf = sBuf & " AND cint( mid( version_no, instr( version_no, " &
gstrDQ & gstrVerSeparator & gstrDQ & " ) + 1 ) ) = " & _
    " ( select max( cint( mid( version_no, instr( version_no, " &
gstrDQ & gstrVerSeparator & gstrDQ & " ) + 1 ) ) ) " & _
    " from att_steps AS b " & _
    " Where a.step_id = b.step_id " & _
    " AND cint( mid( version_no, 1, instr( version_no, " & gstrDQ &
gstrVerSeparator & gstrDQ & " ) - 1 ) ) = " & _
    " ( select max( cint( mid( version_no, 1, instr( version_no, " &
gstrDQ & gstrVerSeparator & gstrDQ & " ) - 1 ) ) ) " & _
    " from att_steps AS c " & _
    " WHERE a.step_id = c.step_id ) ) "

' Create a temporary Querydef object
Set qyTemp = dbFile.CreateQueryDef(gstrEmptyString, sBuf)
qyTemp.Parameters("archived").Value = False

qyTemp.Execute dbFailOnError
qyTemp.Close

Exit Sub

UpdateContinuationCriteriaErr:
Call LogErrors(Errors)
Err.Raise vbObjectError + errModifyStepFailed, mstrModuleName, _
    LoadResString(errModifyStepFailed)

```

```

End Sub

Private Sub UpdateDbDtls(dbFile As Database, sNewVersion As String)

    Dim sSql As String
    Dim cTemp As New cStringSM

    On Error GoTo UpdateDbDtlsErr

    sSql = "update db_details " & _
        " set db_version = " & _
cTemp.MakeStringFieldValid(sNewVersion)

    dbFile.Execute sSql, dbFailOnError

    Exit Sub

UpdateDbDtlsErr:
    Call LogErrors(Errors)
    Err.Raise vbObjectError + errUpgradeFailed, mstrModuleName, _
        LoadResString(errUpgradeFailed)

End Sub

Private Sub Upgrade10to21(UpgradeWsp As DAO.Workspace, dbFile As
Database, sVersion As String)

    Dim sSql As String

    On Error GoTo Upgrade10to21Err

    Call UpdateDbDtls(dbFile, sVersion)

    Call UpdateContinuationCriteria(dbFile)

    Exit Sub

Upgrade10to21Err:
    UpgradeWsp.Rollback
    Call LogErrors(Errors)
    Err.Raise vbObjectError + errUpgradeFailed, mstrModuleName, _
        LoadResString(errUpgradeFailed)

End Sub

Private Sub Upgrade21to23(UpgradeWsp As DAO.Workspace, dbFile As
Database, sVersion As String)

    Dim sBuf As String
    Dim cTempStr As New cStringSM

    On Error GoTo Upgrade21to23Err

    ' Add a parameter type field and a description field to the
parameter table
    sBuf = "alter table workspace_parameters " & _
        " add column description TEXT(255) " & _

```

```

dbFile.Execute sBuf, dbFailOnError

    sBuf = "alter table workspace_parameters " & _
        " add column parameter_type INTEGER " & _
dbFile.Execute sBuf, dbFailOnError

    ' Initialize the parameter type on all parameters to indicate
generic parameters
    sBuf = "update workspace_parameters " & _
        " set parameter_type = " & CStr(gintParameterGeneric)
dbFile.Execute sBuf, dbFailOnError

    sBuf = "Release 2.3 onwards, connection string parameters will be "
& _
        "displayed in a separate node. After this upgrade, all
connection " & _
        "string parameters will appear under the Globals/Connection
Strings " & _
        "node in the workspace. "
    Call MsgBox(sBuf, vbOKOnly + vbApplicationModal, "Upgrade database")

    ' Update the parameter type on all parameters that look like db
connection strings
    sBuf = "update workspace_parameters " & _
        " set parameter_type = " & CStr(gintParameterConnect) & _
        " where UCase(parameter_value) like '*DRIVER*' " & _
        " or UCase(parameter_value) like '*DSN*'"
dbFile.Execute sBuf, dbFailOnError

    ' Add an elapsed time field to the run_step_details table - this
field is
    ' needed to store the elapsed time in milliseconds.
    sBuf = "alter table run_step_details " & _
        " add column elapsed_time LONG " & _
dbFile.Execute sBuf, dbFailOnError

    ' The failure_details field has some data for the case when an ODBC
failure
    ' threshold was specified. Since that's no longer relevant, update
the failure_details
    ' field for records with failure_criteria = gintFailureODBC to empty.
    ' failure_criteria = gintFailureODBC = 1
    sBuf = "update att_steps " & _
        " set failure_details = " & _
cTempStr.MakeStringFieldValid(gstrEmptyString) & _
        " where failure_criteria = '1'"
dbFile.Execute sBuf, dbFailOnError

    Call UpdateDbDtls(dbFile, sVersion)

    UpgradeWsp.CommitTrans

    On Error GoTo DropColumnErr

    UpgradeWsp.BeginTrans

```

```

' This ddl cannot be in the same transaction as the failure_details
update
' But we can do this in a separate transaction since we do not
expect this
' statement to fail - AND, it doesn't matter if this transaction
fails
' Drop the failure_criteria column from the att_steps table
sBuf = "alter table att_steps " & _
      " drop column failure_criteria "
dbFile.Execute sBuf, dbFailOnError

Exit Sub

DropColumnErr:
Call LogErrors(Errors)
ShowError errDeleteColumnFailed
Exit Sub

Upgrade21to23Err:
UpgradeWsp.Rollback
Call LogErrors(Errors)
Err.Raise vbObjectError + errUpgradeFailed, mstrModuleName, _
      LoadResString(errUpgradeFailed)

End Sub
Private Sub Upgrade23to24(UpgradeWsp As DAO.Workspace, dbFile As
Database, sVersion As String)

Dim sBuf As String
Dim lId As Long
Dim rTemp As DAO.Recordset
Dim cTempStr As New cStringSM

On Error GoTo Upgrade23to24Err

' Add a new table for connection properties
sBuf = CreateConnectionsTableScript()
' TODO: Not sure of column sizes for row count, tsqL_batch_separator
and server_language
dbFile.Execute sBuf, dbFailOnError

' Move all connection parameters from the parameter table to the
connections tables
' Insert default values for the newly added connection properties
sBuf = "select * from workspace_parameters " & _
      "where parameter_type = " & CStr(gintParameterConnect)
Set rTemp = dbFile.OpenRecordset(sBuf, dbOpenSnapshot)
lId = 1
If rTemp.RecordCount <> 0 Then
rTemp.MoveFirst

While Not rTemp.EOF
sBuf = "insert into workspace_connections " & _
      "( workspace_id, connection_id, " & _
      "connection_name, connection_value, " & _
      "description, no_count_display, " & _

```

```

      "no_execute, parse_query_only, " & _
      "ANSI_quoted_identifiers, ANSI_nulls, " & _
      "show_query_plan, show_stats_time, " & _
      "show_stats_io, parse_odbc_msg_prefixes, " & _
      "row_count, tsqL_batch_separator, " & _
      "query_time_out, server_language, " & _
      "character_translation, regional_settings ) " & _
      " values ( " & _
      Str(rTemp!workspace_id) & ", " & Str(lId) & ", " & _
      cTempStr.MakeStringFieldValid(" " & rTemp!parameter_name) & ",
" & _
      cTempStr.MakeStringFieldValid(" " & rTemp!parameter_value) &
", " & _
      cTempStr.MakeStringFieldValid(" " & rTemp!Description) & ", "
& _
      Str(DEF_NO_COUNT_DISPLAY) & ", " &
      Str(DEF_NO_EXECUTE) & ", " & Str(DEF_PARSE_QUERY_ONLY) & ",
" & _
      Str(DEF_ANSI_QUOTED_IDENTIFIERS) & ", " &
Str(DEF_ANSI_NULLS) & ", " &
      Str(DEF_SHOW_QUERY_PLAN) & ", " & Str(DEF_SHOW_STATS_TIME) &
", " & _
      Str(DEF_SHOW_STATS_IO) & ", " &
Str(DEF_PARSE_ODBC_MSG_PREFIXES) & ", " & _
      Str(DEF_ROW_COUNT) & ", " &
cTempStr.MakeStringFieldValid(DEF_TSQ_L_BATCH_SEPARATOR) & ", " & _
      Str(DEF_QUERY_TIME_OUT) & ", " &
cTempStr.MakeStringFieldValid(DEF_SERVER_LANGUAGE) & ", " & _
      Str(DEF_CHARACTER_TRANSLATION) & ", " &
Str(DEF_REGIONAL_SETTINGS) & _
      " ) "
dbFile.Execute sBuf, dbFailOnError

lId = lId + 1
rTemp.MoveNext
Wend
End If
rTemp.Close

' Add an identifier column for the connection_id field
sBuf = "alter table att_identifiers " & _
      " add column connection_id long "
dbFile.Execute sBuf, dbFailOnError

' Initialize the value of the connection identifier, initialized
above
sBuf = "update att_identifiers " & _
      " set connection_id = " & Str(lId)
dbFile.Execute sBuf, dbFailOnError

' Delete all connection strings from the parameter table
sBuf = "delete from workspace_parameters " & _
      "where parameter_type = " & CStr(gintParameterConnect)
dbFile.Execute sBuf, dbFailOnError

```

```

' Create the built-in parameter, default directory, for each
workspace in the db
Call InsertBuiltInParameter(dbFile, PARAM_DEFAULT_DIR,
gstrEmptyString, PARAM_DEFAULT_DIR_DESC)

Call UpdateDbDtIs(dbFile, sVersion)

Exit Sub

Upgrade23to24Err:
UpgradeWsp.Rollback
Call LogErrors(Errors)
Err.Raise vbObjectError + errUpgradeFailed, mstrModuleName, _
LoadResString(errUpgradeFailed)

End Sub
Private Sub Upgrade243to25(UpgradeWsp As DAO.Workspace, dbFile As
Database, sVersion As String)

Dim sBuf As String
Dim qy As DAO.QueryDef
Dim rTemp As DAO.Recordset
Dim lId As Long
Dim cTempStr As New cStringSM

On Error GoTo Upgrade243to25Err

sBuf = "Release " & gsVersion25 & " onwards, new 'Connections' must
be created for all " & _
"connection strings. " & vbCrLf & vbCrLf & _
"Connections will appear under the Globals/Connections " & _
"node in the workspace. " & vbCrLf & _
"Strings') " & _
"A list of all 'Connections' (instead of 'Connection
" & _
"in the workspace will be displayed in the 'Connections'
field for " & _
"ODBC steps on the Step definition screen. " & vbCrLf &
vbCrLf & _
"Each Connection can be marked as static or dynamic. " &
vbCrLf & _
"Dynamic connections will be created when a step starts
execution and " & _
"closed once the step completes. " & vbCrLf & _
"Static connections will be kept open till the run
completes." & vbCrLf & vbCrLf & _
"Currently dynamic 'Connections' have been created for all
existing 'Connection Strings' " & _
"with the suffix " & CONNECTION_STRINGS_TO_NAME_SUFFIX
Call MsgBox(sBuf, vbOKOnly + vbApplicationModal, "Upgrade database")

' Add a new table for the connection name entity
' This table has been added in order to satisfy the TPC-H
requirement that
' all the queries in a stream need to be executed on a single
connection.
sBuf = CreateConnectionDtIsTableScript()

```

```

dbFile.Execute sBuf, dbFailOnError

' Add an identifier column for the connection_name_id field
sBuf = "alter table att_identifiers " & _
" add column " & FLD_ID_CONN_NAME & " long "
dbFile.Execute sBuf, dbFailOnError

Call UpdateDbDtIs(dbFile, sVersion)

' insert connection_dtl records for each of the connection strings
sBuf = "select * from " & TBL_CONNECTION_STRINGS
Set rTemp = dbFile.OpenRecordset(sBuf, dbOpenSnapshot)

sBuf = "insert into " & TBL_CONNECTION_DTLS & _
"( " & FLD_ID_WORKSPACE & _
", " & FLD_ID_CONN_NAME & _
", " & FLD_CONN_DTL_CONNECTION_NAME & _
", " & FLD_CONN_DTL_CONNECTION_STRING & _
", " & FLD_CONN_DTL_CONNECTION_TYPE & " ) " & _
" values ( [w_id], [c_id], [c_name], [c_str], [c_type] ) "
Set qy = dbFile.CreateQueryDef("", sBuf)

lId = glMinId
If rTemp.RecordCount <> 0 Then
rTemp.MoveFirst

While Not rTemp.EOF
qy.Parameters("w_id").Value = rTemp.Fields(FLD_ID_WORKSPACE)
qy.Parameters("c_id").Value = lId
qy.Parameters("c_name").Value =
rTemp.Fields(FLD_CONN_STR_CONNECTION_NAME) &
CONNECTION_STRINGS_TO_NAME_SUFFIX
qy.Parameters("c_str").Value =
rTemp.Fields(FLD_CONN_STR_CONNECTION_NAME)
qy.Parameters("c_type").Value = ConnTypeDynamic

qy.Execute dbFailOnError

lId = lId + 1
rTemp.MoveNext
Wend
End If
qy.Close
rTemp.Close

' Initialize the value of the connection_name_id
sBuf = "update att_identifiers " & _
" set " & FLD_ID_CONN_NAME & " = " & Str(lId)
dbFile.Execute sBuf, dbFailOnError

' Update the start_directory field in att_steps to point to the
newly
' created connections
Call ReadStepsInWorkspace(rTemp, qy, glInvalidId, dbLoad:=dbFile, _
bSelectArchivedRecords:=False)

```

```

sBuf = "update " & TBL_STEPS & _
      " set " & FLD_STEPS_EXEC_DTL & " = [c_name] " & _
      " where " & FLD_ID_STEP & " = [s_id] " & _
      " and " & FLD_STEPS_VERSION_NO & " = [ver_no] "
Set qy = dbFile.CreateQueryDef("", sBuf)

If rTemp.RecordCount <> 0 Then
    rTemp.MoveFirst

    While Not rTemp.EOF
        If rTemp.Fields(FLD_STEPS_EXEC_MECHANISM).Value =
gintExecutedODBC Then
            If Not (StringEmpty("") &
rTemp.Fields(FLD_STEPS_EXEC_DTL)) Then
                sBuf = rTemp.Fields(FLD_STEPS_EXEC_DTL)
                ' Strip the enclosing "%" characters
                sBuf = Mid(sBuf, 2, Len(sBuf) - 2) &
CONNECTION_STRINGS_TO_NAME_SUFFIX

                qy.Parameters("c_name").Value = sBuf
                qy.Parameters("s_id").Value =
rTemp.Fields(FLD_ID_STEP)
                qy.Parameters("ver_no").Value =
rTemp.Fields(FLD_STEPS_VERSION_NO)

                qy.Execute dbFailOnError
            End If
        End If
    End If
    rTemp.MoveNext
Wend
End If

qy.Close
rTemp.Close

Exit Sub

Upgrade243to25Err:
UpgradeWsp.Rollback
Call LogErrors(Errors)
Err.Raise vbObjectError + errUpgradeFailed, mstrModuleName, _
    LoadResString(errUpgradeFailed)

End Sub
Private Sub Upgrade25to251(UpgradeWsp As DAO.Workspace, dbFile As
Database, sVersion As String)

    On Error GoTo Upgrade25to251Err

    ' Create the built-in parameters, run_id and output_dir, for each
workspace in the db
    Call InsertBuiltInParameter(dbFile, PARAM_RUN_ID, gstrEmptyString,
PARAM_RUN_ID_DESC)
    Call InsertBuiltInParameter(dbFile, PARAM_OUTPUT_DIR,
gstrEmptyString, PARAM_OUTPUT_DIR_DESC)

```

```

Call UpdateDbDtIs(dbFile, sVersion)

Exit Sub

Upgrade25to251Err:
UpgradeWsp.Rollback
Call LogErrors(Errors)
Err.Raise vbObjectError + errUpgradeFailed, mstrModuleName, _
    LoadResString(errUpgradeFailed)

End Sub

Private Sub Upgrade242to243(UpgradeWsp As DAO.Workspace, dbFile As
Database, sVersion As String)

    Dim sBuf As String
    Dim cTempStr As New cStringSM
    Dim iResponse As Integer

    On Error GoTo DeleteHistoryErr

    Call DeleteRunHistory(dbFile)

    On Error GoTo Upgrade242to243Err

    UpgradeWsp.CommitTrans

    UpgradeWsp.BeginTrans

    ' Add a parameter type field and a description field to the
parameter table
    sBuf = "alter table run_step_details " & _
        " add column parent_instance_id LONG "

    dbFile.Execute sBuf, dbFailOnError

    sBuf = "alter table run_step_details " & _
        " add column iterator_value TEXT(255) "

    dbFile.Execute sBuf, dbFailOnError

    Call AlterFieldType(dbFile, TBL_RUN_STEP_DTLS, "start_time",
DATA_TYPE_CURRENCY)
    Call AlterFieldType(dbFile, TBL_RUN_STEP_DTLS, "end_time",
DATA_TYPE_CURRENCY)
    Call AlterFieldType(dbFile, TBL_RUN_STEP_HDR, "start_time",
DATA_TYPE_CURRENCY)
    Call AlterFieldType(dbFile, TBL_RUN_STEP_HDR, "end_time",
DATA_TYPE_CURRENCY)

    Call UpdateDbDtIs(dbFile, sVersion)

Exit Sub

DeleteHistoryErr:
' This is not a critical error - continue with upgrade

```

```

    Call LogErrors(Errors)
    Resume Next

Upgrade242to243Err:
    UpgradeWsp.Rollback
    Call LogErrors(Errors)
    Err.Raise vbObjectError + errUpgradeFailed, mstrModuleName, _
        LoadResString(errUpgradeFailed)

End Sub
'*****
' The AlterFieldType Sub procedure requires three string
' parameters. The first string specifies the name of the table
' containing the field to be changed. The second string specifies
' the name of the field to be changed. The third string specifies
' the new data type for the field.
'*****

Private Sub AlterFieldType(dbFile As Database, TblName As String,
    FieldName As String, _
        NewDataType As String)
    Dim qdf As DAO.QueryDef
    Dim sSql As String

    ' Add a temporary field to the table.
    sSql = "ALTER TABLE [" & TblName & _
        "]" ADD COLUMN AlterTempField " & NewDataType
    Set qdf = dbFile.CreateQueryDef("", sSql)
    qdf.Execute

    ' Copy the data from old field into the new field.
    qdf.SQL = "UPDATE DISTINCTROW [" & TblName & "] SET AlterTempField =
[" & FieldName & "]"
    qdf.Execute

    ' Delete the old field.
    qdf.SQL = "ALTER TABLE [" & TblName & "] DROP COLUMN [" & FieldName
& "]"
    qdf.Execute

    ' Rename the temporary field to the old field's name.
    dbFile.TableDefs("[" & TblName & "]").Fields("AlterTempField").Name
= FieldName
    dbFile.TableDefs.Refresh

    ' Clean up.
End Sub
Private Sub Upgrade01to21(UpgradeWsp As DAO.Workspace, dbFile As
DAO.Database, sVersion As String)
    Dim sSql As String

    On Error GoTo Upgrade01to21Err

    sSql = "Create table db_details (" & _
        "db_version          Text(50) " & _
        ");"

```

```

    dbFile.Execute sSql, dbFailOnError

    sSql = "insert into db_details " & _
        "( db_version ) values ( '" & sVersion & "' ) "

    dbFile.Execute sSql, dbFailOnError

    Call UpdateContinuationCriteria(dbFile)

    Exit Sub

Upgrade01to21Err:
    Call LogErrors(Errors)
    UpgradeWsp.Rollback
    Err.Raise vbObjectError + errUpgradeFailed, mstrModuleName, _
        LoadResString(errUpgradeFailed)

End Sub
Private Function UpgradeDb(UpgradeWsp As DAO.Workspace, dbFile As
Database, _
    sVerTo As String, sVerFrom As String) As Boolean

    Dim sMsg As String

    On Error GoTo UpgradedbErr

    UpgradeDb = False
    If Not ValidUpgrade(sVerTo, sVerFrom) Then Exit Function

    If NoDbChanges(sVerTo, sVerFrom) Then
        UpgradeDb = True
        Exit Function
    End If

    sMsg = "The database needs to be upgraded from Version " & sVerFrom
& _
        " to Version " & sVerTo & "." & vbCrLf & _
        "Proceed?"

    If Not Confirm(Buttons:=vbYesNo, strMessage:=sMsg,
strTitle:"Upgrade database") Then
        Exit Function
    End If

    UpgradeWsp.BeginTrans

    Select Case sVerFrom
        Case gsVersion25
            Call Upgrade25to251(UpgradeWsp, dbFile, gsVersion251)

        Case gsVersion243
            Call Upgrade243to25(UpgradeWsp, dbFile, gsVersion25)
            Call Upgrade25to251(UpgradeWsp, dbFile, gsVersion251)

        Case gsVersion24, gsVersion241, gsVersion242

```

```

        sMsg = "After this upgrade, the run history for previous
runs will no longer be available. " & _
        "Continue?"
        If Not Confirm(Buttons:=vbYesNo, strMessage:=sMsg,
strTitle:="Upgrade database") Then
            UpgradeWsp.CommitTrans
            Exit Function
        End If
        Call Upgrade242to243(UpgradeWsp, dbFile, gsVersion243)
        Call Upgrade243to25(UpgradeWsp, dbFile, gsVersion25)
        Call Upgrade25to251(UpgradeWsp, dbFile, gsVersion251)

    Case gsVersion23
        Call Upgrade23to24(UpgradeWsp, dbFile, gsVersion24)
        Call Upgrade242to243(UpgradeWsp, dbFile, gsVersion242)
        Call Upgrade243to25(UpgradeWsp, dbFile, gsVersion25)
        Call Upgrade25to251(UpgradeWsp, dbFile, gsVersion251)

    Case gsVersion21
        Call Upgrade21to23(UpgradeWsp, dbFile, gsVersion23)
        Call Upgrade23to24(UpgradeWsp, dbFile, gsVersion24)
        Call Upgrade242to243(UpgradeWsp, dbFile, gsVersion242)
        Call Upgrade243to25(UpgradeWsp, dbFile, gsVersion25)
        Call Upgrade25to251(UpgradeWsp, dbFile, gsVersion251)

    Case gsVersion10
        Call Upgrade10to21(UpgradeWsp, dbFile, gsVersion21)
        Call Upgrade21to23(UpgradeWsp, dbFile, gsVersion23)
        Call Upgrade23to24(UpgradeWsp, dbFile, gsVersion24)
        Call Upgrade242to243(UpgradeWsp, dbFile, gsVersion242)
        Call Upgrade243to25(UpgradeWsp, dbFile, gsVersion25)
        Call Upgrade25to251(UpgradeWsp, dbFile, gsVersion251)

    Case gsVersion01
        Call Upgrade01to21(UpgradeWsp, dbFile, gsVersion21)
        Call Upgrade21to23(UpgradeWsp, dbFile, gsVersion23)
        Call Upgrade23to24(UpgradeWsp, dbFile, gsVersion24)
        Call Upgrade242to243(UpgradeWsp, dbFile, gsVersion242)
        Call Upgrade243to25(UpgradeWsp, dbFile, gsVersion25)
        Call Upgrade25to251(UpgradeWsp, dbFile, gsVersion251)

End Select

UpgradeWsp.CommitTrans

UpgradeDb = True
Exit Function

UpgradeDbErr:
    Call LogErrors(Errors)
    ShowError errUpgradeFailed

End Function

Private Function DBVersion(TestDb As Database) As String
    ' Retrieves the database version
    Dim rVersion As Recordset

```

```

        On Error GoTo DBVersionErr

        Set rVersion = TestDb.OpenRecordset("Select db_version from
db_details ", _
        dbOpenForwardOnly)

        BugAssert rVersion.RecordCount <> 0
        DBVersion = rVersion!db_version

        rVersion.Close
        Exit Function

DBVersionErr:
    If Err.Number = merrDaoTableMissing Then
        DBVersion = gsVersion01
    Else
        LogErrors Errors
        Err.Raise vbObjectError + errUpgradeFailed, mstrModuleName, _
        LoadResString(errUpgradeFailed)
    End If

End Function

Private Function ValidUpgrade(sVerTo As String, sVerFrom As String) As
Boolean

    If sVerTo = gsVersion And sVerFrom = gsVersion251 Then
        ValidUpgrade = True
    ElseIf sVerTo = gsVersion And sVerFrom = gsVersion25 Then
        ValidUpgrade = True
    ElseIf sVerTo = gsVersion And sVerFrom = gsVersion243 Then
        ValidUpgrade = True
    ElseIf sVerTo = gsVersion And sVerFrom = gsVersion242 Then
        ValidUpgrade = True
    ElseIf sVerTo = gsVersion And sVerFrom = gsVersion241 Then
        ValidUpgrade = True
    ElseIf sVerTo = gsVersion And sVerFrom = gsVersion24 Then
        ValidUpgrade = True
    ElseIf sVerTo = gsVersion And sVerFrom = gsVersion23 Then
        ValidUpgrade = True
    ElseIf sVerTo = gsVersion And sVerFrom = gsVersion21 Then
        ValidUpgrade = True
    ElseIf sVerTo = gsVersion And sVerFrom = gsVersion10 Then
        ValidUpgrade = True
    ElseIf sVerTo = gsVersion And sVerFrom = gsVersion01 Then
        ValidUpgrade = True
    Else
        ValidUpgrade = False
    End If

End Function

```

## DebugSM.bas

```
Attribute VB_Name = "DebugSM"
```

```

' FILE:      DebugSM.bas
'           Microsoft TPC-H Kit Ver. 1.00
'           Copyright Microsoft, 1999
'           All Rights Reserved
'
' PURPOSE:   Contains all the functions that carry out error/debug
'           processing for the project.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
' Most of the functions in this module that manipulate the
' error object do not have an On Error GoTo statement - this
' is because it will clear the passed in error object - let
' the calling functions handle the errors raised by this
' module, if any
Option Explicit

' Used to indicate the source module name when errors
' are raised by this module
Private Const mstrModuleName As String = "DebugSM."

Private mcLogFile As cFileSM
Private mcErrorFile As cFileSM

Private Const FORMAT_MESSAGE_FROM_SYSTEM = &H1000
Private Const FORMAT_MESSAGE_IGNORE_INSERTS = &H200
Private Const pNull = 0

Declare Function FormatMessage Lib "kernel32" Alias "FormatMessageA"
(ByVal dwFlags As Long, lpSource As Any, ByVal dwMessageId As Long,
ByVal dwLanguageId As Long, ByVal lpbuffer As String, ByVal nSize As
Long, Arguments As Long) As Long
Public Function Confirm(Optional lngMessageCode As conConfirmMsgCodes, _
Optional lngTitleCode As conConfirmMsgTitleCodes, _
Optional TitleParameter As String, _
Optional ByVal Buttons As Integer = -1, _
Optional strMessage As String = gstrEmptyString, _
Optional strTitle As String = gstrEmptyString) _
As Boolean
' Displays a confirmation message corresponding to the
' passed in message code. Returns True if the user says
' Ok and False otherwise

Dim intResponse As Integer
Dim intButtonStyle As Integer

On Error GoTo ConfirmErr

Confirm = False

' If the buttons style hasn't been specified, set the
' default style to display OK and Cancel buttons
If Buttons = -1 Then
intButtonStyle = vbOKCancel
Else
intButtonStyle = Buttons

```

```

End If

' Find the message string for the passed in code
If StringEmpty(strMessage) Then
strMessage = Trim$(LoadResString(lngMessageCode))
End If

If StringEmpty(strTitle) Then
strTitle = Trim$(LoadResString(lngTitleCode))
End If

If Not StringEmpty(TitleParameter) Then
strTitle = strTitle & Chr$(vbKeySpace) & _
gstrSQ & TitleParameter & gstrSQ
End If

' Display the confirmation message with the Cancel button
' set to the default - assume that we are confirming
' potentially dangerous operations!
intResponse = MsgBox(strMessage, _
intButtonStyle + vbQuestion + vbApplicationModal, _
strTitle)

' Translate the user response into a True/False return code
If intButtonStyle = vbOKCancel Then
If intResponse = vbOK Then
Confirm = True
Else
Confirm = False
End If
Else
If intResponse = vbYes Then
Confirm = True
Else
Confirm = False
End If
End If

Exit Function

ConfirmErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
On Error GoTo 0
gstrSource = mstrModuleName & "Confirm"
Err.Raise vbObjectError + errConfirmFailed, _
gstrSource, _
LoadResString(errConfirmFailed)

End Function
Public Sub LogSystemError()
Dim eErrCode As Long

eErrCode = GetLastError()
If eErrCode <> 0 Then

```



```

        WriteToFile "System Error: " & eErrCode & vbCrLf &
    ApiError(eErrCode), _
        blnError:=True
    End If

End Sub
Public Function ApiError(ByVal e As Long) As String

    Dim s As String
    Dim c As Long

    s = String(256, 0)
    c = FormatMessage(FORMAT_MESSAGE_FROM_SYSTEM Or _
        FORMAT_MESSAGE_IGNORE_INSERTS, _
        pNull, e, 0&, s, Len(s), ByVal pNull)
    If c Then ApiError = e & ": " & Left$(s, c)

End Function

' Output flags determine output destination of BugAsserts and messages
#Const afLogFile = 1
#Const afMsgBox = 2
#Const afDebugWin = 4
#Const afAppLog = 8

' Display appropriate error message, and then stop
' program. These errors should NOT be possible in
' shipping product.
Sub BugAssert(ByVal fExpression As Boolean, _
    Optional sExpression As String)
#If afDebug Then
    If fExpression Then Exit Sub
    BugMessage "BugAssert failed: " & sExpression
    Stop
#End If
End Sub

Sub BugMessage(sMsg As String)

#If afDebug And afLogFile Then
    ' Since we are writing log messages, the error flag is turned off
    Call WriteToFile(sMsg, False)
#End If
#If afDebug And afMsgBox Then
    MsgBox sMsg
#End If
#If afDebug And afDebugWin Then
    Debug.Print sMsg
#End If
#If afDebug And afAppLog Then
    App.LogEvent sMsg
#End If

End Sub
Public Function ProjectLogFile() As String

```

```

    ProjectLogFile = mcLogFile.FileName

End Function
Public Function ProjectErrorFile() As String

    ProjectErrorFile = mcErrorFile.FileName

End Function

Private Sub WriteToFile(sMsg As String, Optional ByVal blnError As
    Boolean)

    ' Calls procedures to write the passed in message to the log -
    ' The blnError flag is used to indicate that the message
    ' should be logged to the error file - by default the log
    ' file is used

    Dim mcFileObj As cFileSM
    Dim strFileName As String
    Dim strFileHdr As String

    On Error GoTo WriteToFileErr

    If blnError Then
        If mcErrorFile Is Nothing Then
            Set mcErrorFile = New cFileSM
        End If
        Set mcFileObj = mcErrorFile
    Else
        If mcLogFile Is Nothing Then
            Set mcLogFile = New cFileSM
        End If
        Set mcFileObj = mcLogFile
    End If

    If StringEmpty(mcFileObj.FileName) Then
        If blnError Then
            strFileName = gstrProjectPath & "\" & App.EXENAME & ".ERR"
            strFileHdr = "Stepmaster Errors"
        Else
            strFileName = gstrProjectPath & "\" & App.EXENAME & ".DBG"
            strFileHdr = "Stepmaster Log"
        End If

        mcFileObj.FileName = strFileName
        mcFileObj.WriteLine strFileHdr
        mcFileObj.WriteLine "Log start time : " & Now
    End If

    mcFileObj.WriteLine sMsg

    Exit Sub

WriteToFileErr:
    ' Display the error code raised by Visual Basic
    Call DisplayErrors(Errors)

```

```

' An error message would've been displayed by the called
' procedures
End Sub
Public Sub WriteMessage(sMsg As String)

    Call WriteToFile(sMsg, True)

End Sub

Sub BugTerm()
#If afDebug And afLogFile Then
    ' Close log file
    mcLogFile.CloseFile
#End If
End Sub

Public Sub ShowError(ByVal ErrorCode As errErrorConstants, _
    Optional ByVal ErrorSource As String = gstrEmptyString, _
    Optional ByVal OptArgs As String = gstrEmptyString, _
    Optional ByVal DoWriteError As Boolean = True)

    If DoWriteError Then
        ' Call a procedure to write the error to a log file
        Call WriteError(ErrorCode, ErrorSource, OptArgs)
    End If

    ' Re-initialize the values of the Error object before
    ' displaying the error to the user
    Call InitErrObject(ErrorCode, ErrorSource, OptArgs)

    Call DisplayErrors(Errors)

    Err.Clear

End Sub
Public Sub WriteError(ByVal ErrorCode As errErrorConstants, _
    Optional ByVal ErrorSource As String = gstrEmptyString, _
    Optional ByVal OptArgs As String = gstrEmptyString)

    ' Initialize the values of the Error object before
    ' calling the log function
    Call InitErrObject(ErrorCode, ErrorSource, OptArgs)

    Call LogErrors(Errors)

    Err.Clear

End Sub
Private Sub InitErrObject(ByVal ErrorCode As errErrorConstants, _
    Optional ByVal ErrorSource As String = gstrEmptyString, _
    Optional ByVal OptArgs As String = gstrEmptyString)

    Dim lngError As Long

```

```

    lngError = IIf(ErrorCode > vbObjectError And ErrorCode <
vbObjectError + 65535, _
        ErrorCode - vbObjectError, ErrorCode)
    Err.Number = lngError + vbObjectError
    Err.Description = LoadResString(lngError) & OptArgs
    Err.Source = App.EXENAME & ErrorSource

End Sub
Public Sub ShowMessage(ByVal MessageCode As errErrorConstants, _
    Optional ByVal OptArgs As String)

    Dim strMessage As String

    On Error GoTo ShowMessageErr

    strMessage = LoadResString(MessageCode) & OptArgs

    ' Write the error to a log file
    BugMessage strMessage

    MsgBox strMessage, vbOKOnly

Exit Sub

ShowMessageErr:
    ' Log the error and exit
    Call DisplayErrors(Errors)

End Sub
Public Sub ShowMessageStr(sMessage As String)

    ' Write the error to a log file
    BugMessage sMessage

    MsgBox sMessage, vbOKOnly

End Sub
Public Sub DisplayErrors(myErrCollection As Errors)
    Dim strError As String
    Dim errLoop As Error
    Dim errCode As Long

    ' Enumerate Errors collection and display properties of
    ' each Error object.
    If Err.Number <> 0 Then
        If Err.Number > vbObjectError And Err.Number < (vbObjectError +
65536) Then
            errCode = Err.Number - vbObjectError
        Else
            errCode = Err.Number
        End If
        strError = "Error # " & Str(errCode) & " was generated by " _
            & Err.Source & Chr(13) & Err.Description
        MsgBox strError, , "Error", Err.HelpFile, Err.HelpContext
    Else

```

```

    For Each errLoop In myErrCollection
        With errLoop
            If Err.Number > vbObjectError And Err.Number <
(vbObjectError + 65536) Then
                errCode = .Number - vbObjectError
            Else
                errCode = .Number
            End If
            strError = "Error #" & errCode & vbCrLf
            strError = strError & " " & .Description & vbCrLf
            strError = strError & _
                " (Source: " & .Source & ")" & vbCrLf
            strError = strError & _
                "Press F1 to see topic " & .HelpContext & vbCrLf
            strError = strError & _
                " in the file " & .HelpFile & "."
        End With

        MsgBox strError
    Next
End If

End Sub

Public Sub LogErrors(myErrCollection As Errors)
    Dim cColErrors As cVectorStr
    Dim strError As String
    Dim errLoop As Error
    Dim errCode As Long
    Dim lngIndex As Long

    Set cColErrors = New cVectorStr

    ' Enumerate Errors collection and display properties of
    ' each Error object.
    If Err.Number <> 0 Then
        If Err.Number > vbObjectError And Err.Number < (vbObjectError +
65536) Then
            errCode = Err.Number - vbObjectError
        Else
            errCode = Err.Number
        End If
        strError = "Error # " & Str(errCode) & " was generated by " & _
            & Err.Source & vbCrLf & Err.Description

        cColErrors.Add strError
    End If

    ' Log all database errors, if any
    For Each errLoop In myErrCollection
        With errLoop
            If Err.Number > vbObjectError And Err.Number <
(vbObjectError + 65536) Then
                errCode = .Number - vbObjectError
            Else
                errCode = .Number
            End If

```

```

                strError = "Error #" & errCode & vbCrLf
                strError = strError & " " & .Description & vbCrLf
                strError = strError & _
                    " (Source: " & .Source & ")" & vbCrLf
            End With

            cColErrors.Add strError
        Next

        ' We can have a error handler now that we have stored all
        ' errors away safely! - having an error handler before
        ' enumerating all the errors would have cleared the error
        ' collection
        On Error GoTo LogErrorsErr
        gstrSource = mstrModuleName & "LogErrors"

        For lngIndex = 0 To cColErrors.Count - 1
            strError = cColErrors(lngIndex)
            Debug.Print strError
            Call WriteToFile(strError, True)
        Next lngIndex

        Set cColErrors = Nothing

    Exit Sub

LogErrorsErr:
    ' Display the error code raised by Visual Basic
    DisplayErrors Errors
    On Error GoTo 0
    ShowError errUnableToWriteError, DoWriteError:=False

End Sub

```

## FileCommon.bas

```

Attribute VB_Name = "FileCommon"
' FILE:      FileCommon.bas
'           Microsoft TPC-H Kit Ver. 1.00
'           Copyright Microsoft, 1999
'           All Rights Reserved
'
' PURPOSE:   This module contains common functionality to display
'           the File Open dialog.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

' Used to indicate the source module name when errors
' are raised by this module
Private Const mstrModuleName As String = "FileCommon."

Private Enum EOpenFile
    OFN_OVERWRITEPROMPT = &H2
    OFN_HIDEREADONLY = &H4

```

```

    OFN_FILEMUSTEXIST = &H1000
    OFN_EXPLORER = &H80000
End Enum

' The locations for the different output files are presented to
' the user in a list box. These constants are used while loading the
' data and while reading the data from the list box.
' These constants also represent the different file types that are
' displayed to the user in File Open dialogs
Public Enum gFileTypes
    gintOutputFile = 0
    '    gintLogFile = 1
    gintErrorFile
    gintStepTextFile
    gintOutputCompareFile
    gintDBFile
    gintDBFileNew
    gintImportFile
    gintExportFile
End Enum

Public Const gsSqlFileSuffix = ".sql"
Public Const gsCmdFileSuffix = ".cmd"

Public Const gsOutputFileSuffix = ".out"
Public Const gstrLogFileSuffix = ".log"
Public Const gsErrorFileSuffix = ".err"
Public Function BrowseDBFile() As String
    ' Prompts the user for a database file with the workspace
    information
    ' Call CallFileDialog to display the open file dialog
    BrowseDBFile = CallFileDialog(gintDBFile)
End Function
Public Function CallFileDialog(intFileType As Integer, _
    Optional ByVal strDefaultFile As String = gstrEmptyString) As
String
    ' This function initializes the values of the filter property,
    ' the dialog title and flags for the File Open dialog depending
    ' on the FileType passed in
    ' It then calls ShowFileDialog to set these properties and
    ' display the File Open dialog to the user

    ' All the properties used by the File Open dialog are defined
    ' as constants in this function and passed to ShowFileDialog
    ' as parameters. So if any of the dialog properties need to be
    ' modified, these constants are what need to be changed
    Const s_DLG_TITLE_OPEN = "Open"
    Const s_DLG_TITLE_NEW = "New"
    Const s_DLG_TITLE_IMPORT = "Import From"
    Const s_DLG_TITLE_EXPORT = "Export To"

    Const mlng_FILE_STEP_TEXT_FLAGS = OFN_EXPLORER Or OFN_FILEMUSTEXIST
Or OFN_HIDEREADONLY
    Const mlng_FILE_OUTPUT_COMPARE_FLAGS = mlng_FILE_STEP_TEXT_FLAGS
    Const mlng_FILE_DB_FLAGS = mlng_FILE_STEP_TEXT_FLAGS

```

```

    Const mlng_FILE_OUTPUT_FLAGS = OFN_EXPLORER Or OFN_HIDEREADONLY Or
OFN_OVERWRITEPROMPT
    Const mlng_FILE_LOG_FLAGS = mlng_FILE_OUTPUT_FLAGS
    Const mlng_FILE_ERROR_FLAGS = mlng_FILE_OUTPUT_FLAGS
    Const mlng_FILE_DB_NEW_FLAGS = mlng_FILE_OUTPUT_FLAGS

    Const mstr_FILE_ALL_FILTER = "|All Files (*.*)|*.*"
    Const mstr_FILE_STEP_TEXT_FILTER = "Query Files (*.*)" &
gsSqlFileSuffix &
    "|*" & gsSqlFileSuffix & "|Command Script Files (*.*)" &
gsCmdFileSuffix &
    "|*" & gsCmdFileSuffix
    Const mstr_FILE_OUTPUT_COMPARE_FILTER = "Text Files (*.txt)|*.txt"
    Const mstr_FILE_OUTPUT_FILTER = "Output Files (*.out)|*.out"
    Const mstr_FILE_LOG_FILTER = "Log Files (*.log)|*.log"
    Const mstr_FILE_ERROR_FILTER = "Error Files (*.err)|*.err"
    Const mstr_FILE_DB_FILTER = "Stepmaster Workspace Files (*.*)" &
gsDefDBFileExt & "|*" & gsDefDBFileExt

    Dim strFileName As String

    On Error GoTo CallFileDialogErr

    Select Case intFileType
        Case gintStepTextFile
            strFileName = ShowFileDialog( _
                mstr_FILE_STEP_TEXT_FILTER & mstr_FILE_ALL_FILTER, _
                s_DLG_TITLE_OPEN, _
                mlng_FILE_STEP_TEXT_FLAGS, _
                strDefaultFile)

        Case gintOutputCompareFile
            strFileName = ShowFileDialog( _
                mstr_FILE_OUTPUT_COMPARE_FILTER & mstr_FILE_ALL_FILTER,
                s_DLG_TITLE_OPEN, _
                mlng_FILE_OUTPUT_COMPARE_FLAGS, _
                strDefaultFile)

        Case gintOutputFile
            strFileName = ShowFileDialog( _
                mstr_FILE_OUTPUT_FILTER & mstr_FILE_ALL_FILTER, _
                s_DLG_TITLE_OPEN, _
                mlng_FILE_OUTPUT_FLAGS, _
                strDefaultFile)

        Case gintLogFile
            strFileName = ShowFileDialog( _
                mstr_FILE_LOG_FILTER & mstr_FILE_ALL_FILTER, _
                s_DLG_TITLE_OPEN, _
                mlng_FILE_LOG_FLAGS, _
                strDefaultFile)

        Case gintErrorFile
            strFileName = ShowFileDialog( _
                mstr_FILE_ERROR_FILTER & mstr_FILE_ALL_FILTER, _

```

```

        s_DLG_TITLE_OPEN, _
        mlng_FILE_ERROR_FLAGS, _
        strDefaultFile)

Case gintDBFile
    strFileName = ShowFileOpenDialog( _
        mstr_FILE_DB_FILTER & mstr_FILE_ALL_FILTER, _
        s_DLG_TITLE_OPEN, _
        mlng_FILE_DB_FLAGS, _
        strDefaultFile)

Case gintDBFileNew
    strFileName = ShowFileOpenDialog( _
        mstr_FILE_DB_FILTER & mstr_FILE_ALL_FILTER, _
        s_DLG_TITLE_NEW, _
        mlng_FILE_DB_NEW_FLAGS, _
        strDefaultFile)

Case gintImportFile
    strFileName = ShowFileOpenDialog( _
        mstr_FILE_DB_FILTER & mstr_FILE_ALL_FILTER, _
        s_DLG_TITLE_IMPORT, _
        mlng_FILE_DB_FLAGS, _
        strDefaultFile)

Case gintExportFile
    strFileName = ShowFileOpenDialog( _
        mstr_FILE_DB_FILTER & mstr_FILE_ALL_FILTER, _
        s_DLG_TITLE_EXPORT, _
        mlng_FILE_DB_FLAGS, _
        strDefaultFile)

Case Else
    BugAssert True, "Incorrect file type passed in."
    ' Default processing will be for the output file
    strFileName = ShowFileOpenDialog( _
        mstr_FILE_OUTPUT_FILTER & mstr_FILE_ALL_FILTER, _
        s_DLG_TITLE_OPEN, _
        mlng_FILE_OUTPUT_FLAGS, _
        strDefaultFile)

End Select
CallFileDialog = strFileName

Exit Function

CallFileDialogErr:
    CallFileDialog = gstrEmptyString
    ' Log the error code raised by Visual Basic
    Call LogErrors(Errors)
    gstrSource = mstrModuleName & "CallFileDialog"
    Call ShowError(errBrowseFailed)

End Function

```

## frmSplash.frm

```

VERSION 5.00
Begin VB.Form frmSplash
    BorderStyle = 3 'Fixed Dialog
    ClientHeight = 4710
    ClientLeft = 45
    ClientTop = 45
    ClientWidth = 7455
    ControlBox = 0 'False
    Icon = "frmSplash.frx":0000
    LinkTopic = "Form1"
    LockControls = -1 'True
    MaxButton = 0 'False
    MinButton = 0 'False
    ScaleHeight = 4710
    ScaleWidth = 7455
    ShowInTaskbar = 0 'False
    StartUpPosition = 2 'CenterScreen
    Visible = 0 'False
    Begin VB.Frame fraMainFrame
        Height = 4590
        Left = 45
        TabIndex = 0
        Top = -15
        Width = 7380
        Begin VB.PictureBox picLogo
            Height = 2385
            Left = 510
            Picture = "frmSplash.frx":0442
            ScaleHeight = 2325
            ScaleWidth = 1755
            TabIndex = 1
            Top = 855
            Width = 1815
        End
        Begin VB.Label lblReserved
            AutoSize = -1 'True
            Caption = "All Rights Reserved."
            Height = 195
            Left = 5520
            TabIndex = 8
            Top = 4080
            Width = 1440
        End
        Begin VB.Label lblCopyright
            AutoSize = -1 'True
            Caption = "Copyright © 1998"
            BeginProperty Font
                Name = "Arial"
                Size = 8.25
                Charset = 0
                Weight = 400
                Underline = 0 'False
                Italic = 0 'False
                Strikethrough = 0 'False
            EndProperty
        End
    End
End

```

```

EndProperty
Height      = 210
Left       = 5550
TabIndex   = 7
Tag        = "Copyright"
Top        = 3850
Width      = 1380
WordWrap   = -1 'True
End
Begin VB.Label lblCompany
AutoSize   = -1 'True
Caption    = "Microsoft Corporation"
BeginProperty Font
    Name     = "Arial"
    Size     = 8.25
    Charset  = 0
    Weight   = 400
    Underline = 0 'False
    Italic   = 0 'False
    Strikethrough = 0 'False
EndProperty
Height     = 210
Left      = 5460
TabIndex  = 6
Tag       = "Company"
Top       = 3640
Width    = 1560
End
Begin VB.Label lblRestrictions
AutoSize   = -1 'True
Caption    = "See License Agreement for Restrictions"
Height     = 195
Left      = 460
TabIndex  = 5
Top       = 4080
Width    = 2790
End
Begin VB.Label lblProductName
AutoSize   = -1 'True
Caption    = "StepMaster"
BeginProperty Font
    Name     = "Arial"
    Size     = 32.25
    Charset  = 0
    Weight   = 700
    Underline = 0 'False
    Italic   = 0 'False
    Strikethrough = 0 'False
EndProperty
Height     = 765
Left      = 2670
TabIndex  = 4
Tag       = "Product"
Top       = 1200
Width    = 3495
End

Begin VB.Label lblVersion
Alignment  = 1 'Right Justify
AutoSize   = -1 'True
Caption    = "Version 2.4"
BeginProperty Font
    Name     = "Arial"
    Size     = 12
    Charset  = 0
    Weight   = 700
    Underline = 0 'False
    Italic   = 0 'False
    Strikethrough = 0 'False
EndProperty
Height     = 285
Left      = 4800
TabIndex  = 3
Tag       = "Version"
Top       = 2040
Width    = 1275
End
Begin VB.Label lblWarning
AutoSize   = -1 'True
Caption    = "Do Not Redistribute"
BeginProperty Font
    Name     = "Arial"
    Size     = 8.25
    Charset  = 0
    Weight   = 400
    Underline = 0 'False
    Italic   = 0 'False
    Strikethrough = 0 'False
EndProperty
Height     = 210
Left      = 480
TabIndex  = 2
Tag       = "Warning"
Top       = 3850
Width    = 1380
End
End
End
Attribute VB_Name = "frmSplash"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = False
Attribute VB_PredeclaredId = True
Attribute VB_Exposed = False
' FILE:      frmSplash.frm
'           Microsoft TPC-H Kit Ver. 1.00
'           Copyright Microsoft, 1999
'           All Rights Reserved
'
' PURPOSE:   Splash screen for StepMaster
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

```

```

Private Sub Form_Load()
'   lblVersion.Caption = "Version " & App.Major & "." & App.Minor & "."
& App.Revision
  lblProductName.Caption = App.Title
  lblVersion.Caption = GetVersionString
End Sub

```

## frmWorkspaceOpen.frm

```

VERSION 5.00
Begin VB.Form frmWorkspaceOpen
  BorderStyle      = 3   'Fixed Dialog
  Caption          = "Open Workspace"
  ClientHeight    = 2550
  ClientLeft      = 45
  ClientTop       = 330
  ClientWidth     = 4695
  LinkTopic       = "Form1"
  LockControls    = -1  'True
  MaxButton       = 0   'False
  MinButton       = 0   'False
  ScaleHeight     = 2550
  ScaleWidth      = 4695
  ShowInTaskbar   = 0   'False
  StartUpPosition = 1   'CenterOwner
  Begin VB.CommandButton cmdOK
    Caption        = "OK"
    Default        = -1  'True
    Height         = 375
    Left           = 2160
    TabIndex       = 2
    Top            = 2040
    Width          = 1095
  End
  Begin VB.CommandButton cmdCancel
    Cancel         = -1  'True
    Caption        = "Cancel"
    Height         = 375
    Left           = 3360
    TabIndex       = 3
    Top            = 2040
    Width          = 1095
  End
  Begin VB.ListBox lstWorkspaces
    Height         = 1425
    ItemData       = "frmWorkspaceOpen.frx":0000
    Left           = 240
    List           = "frmWorkspaceOpen.frx":0002
    MultiSelect    = 2   'Extended
    TabIndex       = 1
    Top            = 480
  End

```

```

    Width          = 4215
  End
  Begin VB.Label lblWorkspaces
    AutoSize       = -1  'True
    Caption        = "Workspace"
    Height         = 195
    Left           = 240
    TabIndex       = 0
    Top            = 120
    Width          = 825
  End
End
Attribute VB_Name = "frmWorkspaceOpen"
Attribute VB_GlobalNameSpace = False
Attribute VB_Creatable = False
Attribute VB_PredeclaredId = True
Attribute VB_Exposed = False
' FILE:      frmWorkspaceOpen.frm
'           Microsoft TPC-H Kit Ver. 1.00
'           Copyright Microsoft, 1999
'           All Rights Reserved
'
' PURPOSE:   Used to display a list of all workspaces in a
'           workspace definition file for Open, Import, Export
'           and Run (in SMRunOnly) workspace
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit
#If RUN_ONLY Then
  Private WithEvents cRunOnlyInst As cRunOnly
  Attribute cRunOnlyInst.VB_VarHelpID = -1

  Private Sub cRunOnlyInst_Done()
    ShowFree
  End Sub

  Private Sub Run()
    Dim iIndex As Integer

    Set cRunOnlyInst = New cRunOnly

    For iIndex = 0 To Me.lstWorkspaces.ListCount - 1
      If Me.lstWorkspaces.Selected(iIndex) Then
        ShowBusy
        cRunOnlyInst.WorkspaceId =
Me.lstWorkspaces.ItemData(Me.lstWorkspaces.ListIndex)
        cRunOnlyInst.WspName =
Me.lstWorkspaces.List(Me.lstWorkspaces.ListIndex)
        cRunOnlyInst.RunWsp
      End If
    Next iIndex
  End Sub
#End If

```

```
Private Sub cmdCancel_Click()
```

```
Unload Me
```

```
End Sub
```

```
Private Sub cmdOK_Click()
```

```
#If RUN_ONLY Then
```

```
Call Run
```

```
#Else
```

```
Call WorkspaceOpenOk
```

```
#End If
```

```
End Sub
```

```
Private Sub lstWorkspaces_DblClick()
```

```
' A double click on the workspaces list box is considered  
' equivalent to selecting an item in the list and then selecting  
' the OK command  
Call cmdOK_Click
```

```
End Sub
```

## IteratorCommon.bas

```
Attribute VB_Name = "IteratorCommon"
```

```
' FILE:      IteratorCommon.bas  
'           Microsoft TPC-H Kit Ver. 1.00  
'           Copyright Microsoft, 1999  
'           All Rights Reserved  
'  
'  
'
```

```
' PURPOSE:   Contains functionality common across StepMaster and  
'           SMRunOnly, pertaining to iterators  
'           Specifically, functions to read iterators records  
'           in the workspace, load them in an array and so on.  
' Contact:   Reshma Tharamal (reshmat@microsoft.com)  
'
```

```
Option Explicit
```

```
' Used to indicate the source module name when errors  
' are raised by this module
```

```
Private Const mstrModuleName As String = "IteratorCommon."
```

```
Public Const gintMinIteratorSequence As Integer = 0
```

```
Public Sub RangeComplete(vntIterators As Variant)
```

```
' This is a debug procedure  
' Checks if the from, to and step values are present in  
' the array
```

```
Dim bReset As Byte
```

```
Dim bShift As Byte  
Dim lngIndex As Long
```

```
' Set the three lowest order bits to 1  
bReset = 7
```

```
BugAssert IsArray(vntIterators) And Not IsEmpty(vntIterators), _  
"Iterators not specified!"
```

```
For lngIndex = LBound(vntIterators) To _  
UBound(vntIterators)
```

```
bShift = 1
```

```
bShift = bShift * (2 ^ (vntIterators(lngIndex).IteratorType -  
1))
```

```
bReset = bReset Xor bShift  
Next lngIndex
```

```
' Assert that all the elements are present  
BugAssert bReset = 0, "Range not completely specified!"
```

```
End Sub
```

```
Public Sub LoadIteratorsForWsp(cStepsCol As cArrSteps, _  
ByVal lngWorkspaceId As Long, rstStepsInWsp As Recordset)
```

```
' Initializes the step records in with all the iterator  
' values for each step
```

```
Dim recIterators As Recordset
```

```
On Error GoTo LoadIteratorsForWspErr
```

```
#If QUERY_ALL Then
```

```
Dim dtStart As Date
```

```
dtStart = Now
```

```
Set recIterators = ReadWspIterators(lngWorkspaceId)
```

```
Call LoadIteratorsArray(cStepsCol, recIterators)
```

```
recIterators.Close
```

```
BugMessage "QueryAll Read + load took: " & CStr(DateDiff("s",  
dtStart, Now))
```

```
#Else
```

```
Dim dtStart As Date
```

```
Dim qqIt As DAO.QueryDef
```

```
Dim sSql As String
```

```
dtStart = Now
```

```
If rstStepsInWsp.RecordCount = 0 Then
```

```
Exit Sub
```

```
End If
```

```
' This method has the advantage that if the steps are queried right,  
everything else follows
```



```

sSql = "Select step_id, version_no, type, iterator_value, " & _
      " sequence_no " & _
      " from iterator_values " & _
      " where step_id = [s_id] " & _
      " and version_no = [ver_no] "

' Order the iterators by sequence within a step
sSql = sSql & " order by sequence_no "

Set qyIt = dbsAttTool.CreateQueryDef(gstrEmptyString, sSql)
rstStepsInWsp.MoveFirst

While Not rstStepsInWsp.EOF

    qyIt.Parameters("s_id").Value = rstStepsInWsp!step_id
    qyIt.Parameters("ver_no").Value = rstStepsInWsp!version_no

    Set recIterators = qyIt.OpenRecordset(dbOpenSnapshot)

    Call LoadIteratorsArray(cStepsCol, recIterators)
    recIterators.Close

    rstStepsInWsp.MoveNext
Wend

qyIt.Close

BugMessage "Query step at a time Read + load took: " &
CStr(DateDiff("s", dtStart, Now))

#End If

Exit Sub

LoadIteratorsForWspErr:
LogErrors Errors
gstrSource = mstrModuleName & "LoadIteratorsForWsp"
On Error GoTo 0
Err.Raise vbObjectError + errLoadRsInArrayFailed, _
    gstrSource, _
    LoadResString(errLoadRsInArrayFailed)

End Sub
Private Function ReadWspIterators(ByVal lngWorkspaceId As Long) As
Recordset

' This function will return a recordset that is populated
' with the iterators for all the steps in a given workspace

Dim recIterators As Recordset
Dim qyIt As DAO.QueryDef
Dim strSql As String

On Error GoTo ReadWspIteratorsErr
gstrSource = mstrModuleName & "ReadWspIterators"

```

```

strSql = "Select i.step_id, i.version_no, " & _
      " i.type, i.iterator_value, " & _
      " i.sequence_no " & _
      " from iterator_values i, att_steps a " & _
      " where i.step_id = a.step_id " & _
      " and i.version_no = a.version_no " & _
      " and a.workspace_id = [w_id] " & _
      " and a.archived_flag = [archived] "

' Find the highest X-component of the version number
strSql = strSql & " AND cint( mid( a.version_no, 1,
instr( a.version_no, " & gstrDQ & gstrVerSeparator & gstrDQ & " ) -
1 ) ) = " & _
      " ( select max( cint( mid( version_no, 1, instr( version_no, " &
gstrDQ & gstrVerSeparator & gstrDQ & " ) - 1 ) ) ) " & _
      " from att_steps AS d " & _
      " WHERE a.step_id = d.step_id ) "

' Find the highest Y-component of the version number for the highest
X-component
strSql = strSql & " AND cint( mid( a.version_no, instr( a.version_no,
" & gstrDQ & gstrVerSeparator & gstrDQ & " ) + 1 ) ) = " & _
      " ( select max( cint( mid( version_no, instr( version_no, " &
gstrDQ & gstrVerSeparator & gstrDQ & " ) + 1 ) ) ) " & _
      " from att_steps AS b " & _
      " Where a.step_id = b.step_id " & _
      " AND cint( mid( version_no, 1, instr( version_no, " & gstrDQ &
gstrVerSeparator & gstrDQ & " ) - 1 ) ) = " & _
      " ( select max( cint( mid( version_no, 1, instr( version_no, " &
gstrDQ & gstrVerSeparator & gstrDQ & " ) - 1 ) ) ) " & _
      " from att_steps AS c " & _
      " WHERE a.step_id = c.step_id ) ) "

' Order the iterators by sequence within a step
strSql = strSql & " order by i.step_id, i.sequence_no "

Set qyIt = dbsAttTool.CreateQueryDef(gstrEmptyString, strSql)
qyIt.Parameters("w_id").Value = lngWorkspaceId
qyIt.Parameters("archived").Value = False

Set recIterators = qyIt.OpenRecordset(dbOpenSnapshot)

qyIt.Close
Set ReadWspIterators = recIterators

Exit Function

ReadWspIteratorsErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
On Error GoTo 0
Err.Raise vbObjectError + errReadDataFailed, _
    gstrSource, LoadResString(errReadDataFailed)

End Function

```

```

Private Sub LoadIteratorsArray(cStepsCol As cArrSteps, _
    recIterators As Recordset)
    ' Initializes the step records with the iterators for
    ' the step

    Dim cNewIt As cIterator
    Dim cStepRec As cStep
    Dim lngStepId As Long

    On Error GoTo LoadIteratorsArrayErr
    gstrSource = mstrModuleName & "LoadIteratorsArray"

    If recIterators.RecordCount = 0 Then
        Exit Sub
    End If

    recIterators.MoveFirst
    While Not recIterators.EOF
        Set cNewIt = New cIterator

        lngStepId = CLng(ErrorOnNullField(recIterators, "step_id"))
        If Not cStepRec Is Nothing Then
            If cStepRec.StepId <> lngStepId Then
                Set cStepRec = cStepsCol.QueryStep(lngStepId)
            End If
        Else
            Set cStepRec = cStepsCol.QueryStep(lngStepId)
        End If

        ' Initialize iterator values
        cNewIt.IteratorType = CInt(ErrorOnNullField(recIterators,
"type"))
        cNewIt.Value = CStr(ErrorOnNullField(recIterators,
"iterator_value"))
        cNewIt.SequenceNo = CInt(ErrorOnNullField(recIterators,
"sequence_no"))

        ' Add this record to the array of iterators
        cStepRec.LoadIterator cNewIt

        Set cNewIt = Nothing
        recIterators.MoveNext
    Wend

    Exit Sub

LoadIteratorsArrayErr:
    LogErrors Errors
    gstrSource = mstrModuleName & "LoadIteratorsArray"
    On Error GoTo 0
    Err.Raise vbObjectError + errLoadRsInArrayFailed, _
        gstrSource, _
        LoadResString(errLoadRsInArrayFailed)

End Sub

```

## MsgConfirm.bas

```

Attribute VB_Name = "MsgConfirm"
' FILE:      MsgConfirm.bas
'           Microsoft TPC-H Kit Ver. 1.00
'           Copyright Microsoft, 1999
'           All Rights Reserved
'
'
' PURPOSE:   Contains constants for confirmation messages that
'           will be displayed by StepMaster
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

' A public enum containing the codes for all the confirmation
' messages that will be used by the project - each of the codes
' has the prefix, con
Public Enum conConfirmMsgCodes
    conWspDelete = 2000
    conSave
    conStopRun
    conSaveConnect
    conSaveDB
End Enum

' A public enum containing the titles for all the confirmation
' messages that will be used by the project - each of the codes
' has the prefix, cont - most confirmation message codes will
' have a corresponding title code in here
Public Enum conConfirmMsgTitleCodes
    contWspDelete = 3000
    contSave
    contStopRun
    contSaveConnect
    contSaveDB
End Enum

```

## OpenFiles.bas

```

Attribute VB_Name = "OpenFiles"
' FILE:      OpenFiles.bas
'           Microsoft TPC-H Kit Ver. 1.00
'           Copyright Microsoft, 1999
'           All Rights Reserved
'
'
' PURPOSE:   This module holds a list of all files that have been
'           opened by the project. This module is needed since there
'           is no way to share static data between different
instances
'           of a class.
'           Many procedure in this module do not do any error
handling -
'           this is 'coz it is also used by procedures that log error

```

```
'          messages and any error handler will erase the collection
'          of errors!
```

```
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
```

```
Option Explicit
```

```
' Used to indicate the source module name when errors
' are raised by this class
Private Const mstrModuleName As String = ".OpenFiles."
```

```
Private mOpenFiles As cNodeCollections
```

```
Private Const mstrTempDir As String = "\Temp\"
```

```
' The maximum number of temporary files that we can create in a
' session
```

```
Private Const mlngMaxFileIndex As Long = 999999
Private Const mstrFileIndexFormat As String = "000000"
Private Const mstrTempFilePrefix As String = "SM"
Private Const mstrTempFileSuffix As String = ".cmd"
```

```
Private Const merrFileNotFound As Long = 76
Private Function GetFileHandle(strFileName) As cFileInfo
```

```
    Dim lngIndex As Long
    Dim blnFileOpen As Boolean
```

```
    If Not mOpenFiles Is Nothing Then
```

```
        blnFileOpen = False
        For lngIndex = 0 To mOpenFiles.Count - 1
            If mOpenFiles(lngIndex).FileName = strFileName Then
                blnFileOpen = True
                Exit For
            End If
        Next lngIndex
```

```
        If blnFileOpen Then
            Set GetFileHandle = mOpenFiles(lngIndex)
        Else
            Set GetFileHandle = Nothing
        End If
```

```
    Else
        Set GetFileHandle = Nothing
    End If
```

```
End Function
```

```
Private Function GetTempFileDir() As String
```

```
    Dim strTempFileDir As String
```

```
    On Error GoTo GetTempFileDirErr
```

```
    strTempFileDir = gstrProjectPath & mstrTempDir
```

```
    If StringEmpty(Dir$(strTempFileDir, vbDirectory)) Then
        Mkdir strTempFileDir
    End If
```

```
    GetTempFileDir = strTempFileDir
```

```
    Exit Function
```

```
GetTempFileDirErr:
```

```
    ' Log the error code raised by Visual Basic
    Call LogErrors(Errors)
    gstrSource = mstrModuleName & "GetTempFileDir"
    On Error GoTo 0
    Err.Raise vbObjectError + errProgramError, gstrSource, _
        LoadResString(errProgramError)
```

```
End Function
```

```
Public Function MakePathValid(strFileName As String) As String
    ' Checks if the passed in file path is valid
```

```
    Dim strFileDir As String
    Dim strTempDir As String
    Dim strTempFile As String
    Dim intPos As Integer
    Dim intStart As Integer
```

```
    On Error GoTo MakePathValidErr
    gstrSource = mstrModuleName & "MakePathValid"
```

```
    strTempFile = strFileName
    intPos = InstrR(strFileName, gstrFileSeparator)
```

```
    If intPos > 0 Then
        strFileDir = Left$(strTempFile, intPos - 1)
        If StringEmpty(Dir$(strFileDir, vbDirectory)) Then
            ' Loop through the entire path starting at the root
            ' since Mkdir can create only one level of sub-directory
            ' at a time
            intStart = InStr(strFileDir, gstrFileSeparator)
```

```
            Do While strTempDir <> strFileDir
```

```
                If intStart > 0 Then
                    strTempDir = Left$(strFileDir, intStart - 1)
                Else
                    strTempDir = strFileDir
                End If
```

```
                If StringEmpty(Dir$(strTempDir, vbDirectory)) Then
                    ' If the specified directory doesn't exist, try to
                    ' create it.
                    Mkdir strTempDir
                Else
                    ' The directory exists - go to it's sub-directory
```

```

        End If
        intStart = InStr(intStart + 1, strFileDir,
gstrFileSeparator)
    Loop

    ' Sanity check
    If StringEmpty(Dir$(strFileDir, vbDirectory)) Then
        ' We were unable to create the file directory
        ShowError errCreateDirectoryFailed, gstrSource, _
            strFileDir, DoWriteError:=False
        MakePathValid = gstrEmptyString
    Else
        MakePathValid = strTempFile
    End If
Else
    ' The specified directory exists - we should be able
    ' to create the output file in it
    MakePathValid = strTempFile
End If

Else
    ' The user has only specified a filename - VB will try
    ' to create it in the current directory
    MakePathValid = strTempFile
End If

Exit Function

MakePathValidErr:
    ' Log the error code raised by Visual Basic
    Call LogErrors(Errors)
    gstrSource = mstrModuleName & "MakePathValid"
    ' Log the filename for debug
    Call WriteError(errInvalidFile, gstrSource, strTempFile)
    On Error GoTo 0
    Err.Raise vbObjectError + errProgramError, gstrSource, _
        LoadResString(errProgramError)

End Function
Public Function OpenFileSM(strFileName As String) As Integer
    Dim intHFile As Integer
    Dim NewFileInfo As cFileInfo

    On Error GoTo OpenFileSMErr
    gstrSource = mstrModuleName & "OpenFileSM"

    If StringEmpty(strFileName) Then
        On Error GoTo 0
        Err.Raise vbObjectError + errInvalidFile, gstrSource, _
            LoadResString(errInvalidFile)
    End If

    If mOpenFiles Is Nothing Then
        Set mOpenFiles = New cNodeCollections
    End If

    Set NewFileInfo = GetFileHandle(strFileName)

```

```

If NewFileInfo Is Nothing Then
    ' The file has not been opened yet

    ' If the filename has not been initialized, do not
    ' attempt to open it
    strFileName = MakePathValid(strFileName)

    If strFileName <> gstrEmptyString Then
        intHFile = FreeFile
        Open strFileName For Output Shared As intHFile

        Set NewFileInfo = New cFileInfo
        NewFileInfo.FileHandle = intHFile
        NewFileInfo.FileName = strFileName
        mOpenFiles.Load NewFileInfo
    Else
        ' Either the directory was invalid or s'thing failed
        ' Display the error to the user instead of trying
        ' to log to the file
        ShowError errInvalidFile, gstrSource, strFileName, _
            DoWriteError:=False
        intHFile = 0
    End If
Else
    intHFile = NewFileInfo.FileHandle
End If

OpenFileSM = intHFile

Exit Function

OpenFileSMErr:
    ' Log the error code raised by Visual Basic
    Call LogErrors(Errors)
    ' The Open command failed for some reason - write an error
    ' and let the calling function handle the error
    ShowError errInvalidFile, gstrSource, strFileName, _
        DoWriteError:=False
    OpenFileSM = 0

End Function
Public Function CreateTempFile() As String

    Dim strTempFileDir As String
    Dim strTempFileName As String

    Static lngLastFileIndex As Long

    On Error GoTo CreateTempFileErr

    strTempFileDir = GetTempFileDir()

    Do
        If lngLastFileIndex = mlngMaxFileIndex Then
            On Error GoTo 0

```

```

        Err.Raise vbObjectError + errMaxTempFiles, gstrSource, _
            LoadResString(errMaxTempFiles)
    End If

    lngLastFileIndex = lngLastFileIndex + 1
    strTempFileName = mstrTempFilePrefix & _
        Format$(lngLastFileIndex, mstrFileIndexFormat) & _
        mstrTempFileSuffix

    If Not StringEmpty(Dir$(strTempFileDir & strTempFileName)) Then
        ' Remove any files left over from a previous run,
        ' if they still exist
        Kill strTempFileDir & strTempFileName
    End If

    ' Looping in case the file delete doesn't go through for
    ' some reason
    Loop While Not StringEmpty(Dir$(strTempFileDir & strTempFileName))

    CreateTempFile = GetShortName(strTempFileDir)
    CreateTempFile = CreateTempFile & strTempFileName

    Exit Function

CreateTempFileErr:
    ' Log the error code raised by Visual Basic
    Call LogErrors(Errors)
    gstrSource = gstrSource & "CreateTempFile"
    On Error GoTo 0
    Err.Raise vbObjectError + errProgramError, gstrSource, _
        LoadResString(errProgramError)

End Function

Public Sub CloseFileSM(strFileName As String)
    Dim FileToClose As cFileInfo

    If Not mOpenFiles Is Nothing Then

        ' Get the handle to the open file, if it exists
        Set FileToClose = GetFileHandle(strFileName)

        If Not FileToClose Is Nothing Then
            Close FileToClose.FileHandle

            ' Remove the file info from the collection of open files
            mOpenFiles.Unload FileToClose.Position
        End If
    End If

End Sub

Public Sub CloseOpenFiles()
    Dim lIndex As Long

    If Not mOpenFiles Is Nothing Then
        For lIndex = mOpenFiles.Count - 1 To 0
            CloseFileSM (mOpenFiles(lIndex).FileName)

```

```

        Next lIndex
    End If

End Sub

```

## ParameterCommon.bas

```

Attribute VB_Name = "ParameterCommon"
' FILE:      ParameterCommon.bas
'           Microsoft TPC-H Kit Ver. 1.00
'           Copyright Microsoft, 1999
'           All Rights Reserved
'
' PURPOSE:   Contains functionality common across StepMaster and
'           SMRunOnly, pertaining to parameters
'           Specifically, functions to load parameter records
'           in an array.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

' Used to indicate the source module name when errors
' are raised by this module
Private Const mstrModuleName As String = "ParameterCommon."

Public Sub LoadRecordsetInParameterArray(rstWorkspaceParameters As
Recordset, _
    cParamCol As cArrParameters)

    Dim cNewParameter As cParameter

    On Error GoTo LoadRecordsetInParameterArrayErr

    If rstWorkspaceParameters.RecordCount = 0 Then
        Exit Sub
    End If

    rstWorkspaceParameters.MoveFirst
    While Not rstWorkspaceParameters.EOF

        Set cNewParameter = New cParameter

        ' Initialize parameter values
        cNewParameter.ParameterId = rstWorkspaceParameters.Fields(0)

        ' Call a procedure to raise an error if mandatory fields are
        ' null.
        cNewParameter.ParameterName = CStr( _
            ErrorOnNullField(rstWorkspaceParameters,
                "parameter_name"))
        cNewParameter.ParameterValue = CheckForNullField( _
            rstWorkspaceParameters, "parameter_value")
        cNewParameter.WorkspaceId = CStr( _
            ErrorOnNullField(rstWorkspaceParameters,
                FLD_ID_WORKSPACE))

```

```

    cNewParameter.ParameterType = CStr( _
        ErrorOnNullField(rstWorkspaceParameters,
"parameter_type"))
    cNewParameter.Description = CheckForNullField( _
        rstWorkspaceParameters, "description")

    cParamCol.Load cNewParameter

    Set cNewParameter = Nothing
    rstWorkspaceParameters.MoveNext
Wend

Exit Sub

LoadRecordsetInParameterArrayErr:
    LogErrors Errors
    gstrSource = mstrModuleName & "LoadRecordsetInParameterArray"
    On Error GoTo 0
    Err.Raise vbObjectError + errLoadRsInArrayFailed, gstrSource, _
        LoadResString(errLoadRsInArrayFailed)
End Sub

```

## Public.bas

```

Attribute VB_Name = "Public"
' FILE:      Public.bas
'           Microsoft TPC-H Kit Ver. 1.00
'           Copyright Microsoft, 1999
'           All Rights Reserved
'
' PURPOSE:   This module contains all the public constants for this
project
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

Public Const gsVersion01 As String = "0.1"
Public Const gsVersion10 As String = "1.0"
Public Const gsVersion21 As String = "2.1"
Public Const gsVersion23 As String = "2.3"
Public Const gsVersion24 As String = "2.4"
Public Const gsVersion241 As String = "2.4.1"
Public Const gsVersion242 As String = "2.4.2"
Public Const gsVersion243 As String = "2.4.3"
Public Const gsVersion25 As String = "2.5"
Public Const gsVersion251 As String = "2.5.1"
Public Const gsVersion253 As String = "2.5.3"
Public Const gsVersion254 As String = "2.5.4"
Public Const gsVersion255 As String = "2.5.5"
Public Const gsVersion As String = gsVersion255

' The same form is used for the creation of new nodes and
' updates to existing nodes (where each node can be a parameter,
' global step, etc.) A tag is set on each flag is used to indicate
' whether it is being called in the insert or update mode. The

```

```

' constants for these modes are defined below
Public Const gstrInsertMode = "Insert"
Public Const gstrUpdateMode = "Update"
Public Const gstrPropertiesMode = "View"

Public Const gstrEmptyString = ""
Public Const gstrSQ = ""
Public Const gstrDQ = ""
Public Const gstrVerSeparator = "."
Public Const gstrBlank = " "

' Constants used to indicate type of node being processed
' The constants for the different objects correspond to the
' indexes in the menu control arrays (for both the main and popup
' menus) that are used to create new objects. That way we can
' use the index passed in by the click event to determine the
' type of node being processed
Public Const gintWorkspace = 1

' Decided to leave it here after some debate over whether it
' actually belongs in the cStep class definition
Public Enum gintStepType
    gintGlobalStep = 3
    gintManagerStep
    gintWorkerStep
End Enum

Public Const gintRunManager = 6
Public Const gintRunWorker = 7

Public Enum gintParameterNodeType
    gintParameter = 8
    gintNodeParamConnection
    gintNodeParamExtension
    gintNodeParamBuiltIn
End Enum

' Leave some constants free for newer types of parameters (?)
Public Const gintConnectionDtl = 15

Public Enum gintLabelNodeType
    gintGlobalsLabel = 21
    gintParameterLabel
    gintParamConnectionLabel
    gintParamExtensionLabel
    gintParamBuiltInLabel
    gintConnDtlLabel
    gintGlobalStepLabel
    gintStepLabel
End Enum

Public Enum ConnectionType
    ConnTypeStatic = 1
    ConnTypeDynamic
End Enum

```

```

Public Const giDefaultConnType As Integer = ConnTypeStatic

' The constants defined below are used to identify the different
' tabs. If any more step properties and thereby tabs are added
' to the tabbed dialog on the Step Properties form, they should
' be defined here and accessed in the code only using these
' pre-defined constants
' Note: These constants will mainly be used by the functions that
' initialize, customize and display the Step Properties form
Public Const gintDefinition = 0
Public Const gintExecution = 1
Public Const gintMgrDefinition = 2
Public Const gintPreExecutionSteps = 3
Public Const gintPostExecutionSteps = 4
Public Const gintFileLocations = 5

' These constants correspond to the index values in the imagelist
' associated with the tree view control. The imagelist contains
' the icons that will be displayed for each node.
Public Enum TreeImages
    gintImageWorkspaceClosed = 1
    gintImageWorkspaceOpen
    gintImageLabelClosed
    gintImageLabelOpen
    gintImageManagerClosedDis
    gintImageManagerClosedEn
    gintImageManagerOpenDis
    gintImageManagerOpenEn
    gintImageWorkerDis
    gintImageWorkerEn
    gintImageGlobalClosed
    gintImageGlobalOpen
    gintImageParameter
    gintImageRun
    gintImagePending
    gintImageStop
    gintImageDisabled
    gintImageAborted
    gintImageFailed
End Enum

' Public variable used to indicate the name of the function
' that raises an error
Public gstrSource As String

' Public instances of the different collections
Public gcParameters As cArrParameters
Public gcSteps As cArrSteps
Public gcConstraints As cArrConstraints
Public gcConnections As cConnections
Public gcConnDtls As cConnDtls

' Public constants for the index values of the different toolbar
' options. Will be used while dynamically enabling/disabling
' these options.
Public Const tbNew = 1

Public Const tbOpen = 2
Public Const tbSave = 3

Public Const tbCut = 5
Public Const tbCopy = 6
Public Const tbPaste = 7
Public Const tbDelete = 8

Public Const tbProperties = 10
Public Const tbRun = 11
Public Const tbStop = 12

' The initial version #
Public Const gstrMinVersion As String = "0.0"
Public Const gstrGlobalParallelism As String = "0"
Public Const gintMinParallelism As Integer = 1
Public Const gintMaxParallelism As Integer = 100

' Constant for the minimum identifier, used for all identifier, viz.
' step, workspace, etc.
Public Const glMinId As Long = 1
Public Const glInvalidId As Long = -1

' A parameter that has a special meaning to Stepmaster
' The system time will be substituted wherever it occurs
' (typically as a part of the error, log ... file names
Public Const gstrTimeStamp As String = "TIMESTAMP"
Public Const gstrEnvVarSeparator = "%"
Public Const gstrFileSeparator = "\"
Public Const gstrUnderscore = "_"

' Constants used by date and time formatting functions
Public Const gsTimeSeparator = ":"
Public Const gsDateSeparator = "-"
Public Const gsMsSeparator = "."
Public Const gsDtFormat = "00"
Public Const gsYearFormat = "0000"
Public Const gsTmFormat = "00"
Public Const gsMSecondFormat = "000"

' Default nothing value for a date variable
Public Const gdtmEmpty As Currency = 0

Public Const FMT_WSP_LOG_FILE As String = "yyyymmdd-hhnnss"

Public gsContCriteria() As String
' Note: Update the initialization of gsExecutionStatus in Initialize()
if the
' InstanceStatus values are modified - also the boundary checks
Public gsExecutionStatus() As String

Public Const gsConnTypeStatic As String = "Static"
Public Const gsConnTypeDynamic As String = "Dynamic"

#If RUN_ONLY Then
Public Const gsCaptionRunWsp As String = "Run Workspace"

```

```

#End If

' Valid operations on a cNode object
Public Enum Operation
    QueryOp = 1
    InsertOp = 2
    UpdateOp = 3
    DeleteOp = 4
End Enum

```

## RunCommon.bas

```

Attribute VB_Name = "RunCommon"
' FILE:      RunCommon.bas
'           Microsoft TPC-H Kit Ver. 1.00
'           Copyright Microsoft, 1999
'           All Rights Reserved
'
' PURPOSE:   Contains common functions that are used during the
execution
'           of a workspace.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

' Used to indicate the source module name when errors
' are raised by this class
Private Const mstrModuleName As String = ".RunCommon."

Public Function GetInstanceItValue(cInstanceRec As cInstance) As String

    ' Returns the iterator value for the instance, if an
    ' iterator has been defined for it
    Dim cStepIt As cRunColIt
    Dim cRunIterator As cRunItNode

    On Error GoTo GetInstanceItValueErr

    ' Since we create a dummy instance for Disabled and Pending steps,
    ' doesn't make sense to look at their iterators
    If cInstanceRec.Status <> gintDisabled And cInstanceRec.Status <>
gintPending Then
        Set cStepIt = cInstanceRec.Iterators

        If Not StringEmpty(cInstanceRec.Step.IteratorName) Then
            If cStepIt.Count > 0 Then
                Set cRunIterator = cStepIt(0)
                BugAssert cRunIterator.IteratorName =
cInstanceRec.Step.IteratorName, _
                "The first iterator in the collection is the " &
                "one that has been defined for the step."
            If cRunIterator.IteratorName =
cInstanceRec.Step.IteratorName Then

```

```

        GetInstanceItValue = cRunIterator.Value
    Else
        GetInstanceItValue = gstrEmptyString
    End If
Else
    GetInstanceItValue = gstrEmptyString
End If
Else
    GetInstanceItValue = gstrEmptyString
End If
Else
    GetInstanceItValue = gstrEmptyString
End If

Exit Function

GetInstanceItValueErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
On Error GoTo 0
gstrSource = mstrModuleName & "GetInstanceItValue"
Err.Raise vbObjectError + errProgramError, gstrSource, _
LoadResString(errProgramError)

End Function

```

## RunInstHelper.bas

```

Attribute VB_Name = "RunInstHelper"
' FILE:      RunInstHelper.bas
'           Microsoft TPC-H Kit Ver. 1.00
'           Copyright Microsoft, 1999
'           All Rights Reserved
'
' PURPOSE:   This module contains helper procedures that are called by
cRunInst.cls
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

' Used to indicate the source module name when errors
' are raised by this class
Private Const mstrModuleName As String = "RunInstHelper."

' Should be equal to the number of steps defined in cRunInst.cls
Public Const glngNumConcurrentProcesses As Long = 99
Public Const gintBitsPerByte = 8
Public Function AnyStepRunning(cFreeSteps As cVectorLng, arrFree() As
Byte) As Boolean

    Dim lngIndex As Long
    Dim intPosInByte As Integer
    Dim lngTemp As Long

```



```

' Check if there are any running instances to wait for
If cFreeSteps.Count <> gLngNumConcurrentProcesses Then

    ' For every free step, reset the corresponding element
    ' in the byte array to 0
    For lngIndex = 0 To cFreeSteps.Count - 1

        lngTemp = cFreeSteps(lngIndex) \ gintBitsPerByte
        intPosInByte = cFreeSteps(lngIndex) Mod gintBitsPerByte

        arrFree(lngTemp) = arrFree(lngTemp) Xor 2 ^ intPosInByte
    Next lngIndex

    AnyStepRunning = False

    ' Check if we have a non-zero bit in the byte array
    For lngIndex = LBound(arrFree) To UBound(arrFree) Step 1
        If arrFree(lngIndex) <> 0 Then
            ' We are waiting for a step to complete
            AnyStepRunning = True
            Exit For
        End If
    Next lngIndex

Else
    AnyStepRunning = False
End If

End Function

Public Function OrderConstraints(vntTempCons() As Variant, _
    intConsType As ConstraintType) As Variant
    ' Returns a variant containing all the constraint records in the
order
    ' in which they should be executed

    Dim vntTemp As Variant
    Dim lngOuter As Long
    Dim lngInner As Long
    Dim cTempConstraint As cConstraint
    Dim cConstraints() As cConstraint
    Dim lngConsCount As Long
    Dim lngLbound As Long
    Dim lngUbound As Long
    Dim lngStep As Long

    On Error GoTo OrderConstraintsErr

    If intConsType = gintPreStep Then
        ' Since we are travelling up and we need to execute the
constraints
        ' for the top-level steps first, reverse the order that they
        ' have been stored in the array
        lngLbound = UBound(vntTempCons)
        lngUbound = LBound(vntTempCons)

```

```

        lngStep = -1
    Else
        lngLbound = LBound(vntTempCons)
        lngUbound = UBound(vntTempCons)
        lngStep = 1
    End If

    lngConsCount = 0

    For lngOuter = lngLbound To lngUbound Step lngStep
        vntTemp = vntTempCons(lngOuter)

        If Not IsEmpty(vntTemp) Then
            ' Each of the elements is an array
            For lngInner = LBound(vntTemp) To UBound(vntTemp) Step 1
                If Not IsEmpty(vntTemp(lngInner)) Then
                    Set cTempConstraint = vntTemp(lngInner)

                    If Not cTempConstraint Is Nothing Then
                        ReDim Preserve cConstraints(lngConsCount)
                        Set cConstraints(lngConsCount) = cTempConstraint
                        lngConsCount = lngConsCount + 1
                    End If
                End If
            Next lngInner
        End If
    Next lngOuter

    ' Set the return value of the function to the array of
    ' constraints that has been built above
    If lngConsCount = 0 Then
        OrderConstraints = Empty
    Else
        OrderConstraints = cConstraints()
    End If

    Exit Function

OrderConstraintsErr:
    ' Log the error code raised by Visual Basic
    Call LogErrors(Errors)
    On Error GoTo 0
    Err.Raise vbObjectError + errExecInstanceFailed, _
        mstrModuleName, LoadResString(errExecInstanceFailed)

End Function

```

## ShellSM.bas

```

Attribute VB_Name = "ShellSM"
' FILE:      ShellSM.bas
'           Microsoft TPC-H Kit Ver. 1.00
'           Copyright Microsoft, 1999
'           All Rights Reserved
'
'

```

```

' PURPOSE: This module contains a function that creates a process
and
'         waits for it to complete.
' Contact: Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

Public Function SyncShell(CommandLine As String, Optional Timeout As
Long, _
    Optional WaitForInputIdle As Boolean) As Boolean

    Dim proc As PROCESS_INFORMATION
    Dim Start As STARTUPINFO
    Dim ret As Long
    Dim nMilliseconds As Long

    BugMessage "Executing: " & CommandLine
    If Timeout > 0 Then
        nMilliseconds = Timeout
    Else
        nMilliseconds = INFINITE
    End If

    'Initialize the STARTUPINFO structure:
    Start.cb = Len(Start)
    Start.dwFlags = STARTF_USESHOWWINDOW
    Start.wShowWindow = SW_SHOWMINNOACTIVE

    'Start the shelled application:
    CreateProcessA 0&, CommandLine, 0&, 0&, 1&, _
        NORMAL_PRIORITY_CLASS, 0&, 0&, Start, proc

    If WaitForInputIdle Then
        'Wait for the shelled application to finish setting up its UI:
        ret = InputIdle(proc.hProcess, nMilliseconds)
    Else
        'Wait for the shelled application to terminate:
        ret = WaitForSingleObject(proc.hProcess, nMilliseconds)
    End If

    CloseHandle proc.hProcess

    'Return True if the application finished. Otherwise it timed out or
    erred.
    SyncShell = (ret = WAIT_OBJECT_0)
End Function

```

### **SMErr.bas**

```

Attribute VB_Name = "SMErr"
' FILE: SMErr.bas
' Microsoft TPC-H Kit Ver. 1.00
' Copyright Microsoft, 1999
' All Rights Reserved
'
'

```

```

' PURPOSE: This module contains error code for all the errors that
are
'         raised by StepMaster.
' Contact: Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

' A public enum containing the codes for all the error
' messages that will be displayed by the project - each
' of the codes has the prefix, err
Public Enum errErrorConstants
    errParameterIdInvalid = 1000
    errParameterNameMandatory
    errParameterInsertFailed
    errStepLabelOrTextOrFileRequired
    errMandatoryNodeTextMissing
    errParameterUpdateFailed
    errDupConnDtlName
    errDummy14
    errContCriteriaMandatory
    errContCriteriaNullForGlobal
    errContCriteriaInvalid = 1010
    errParamSeparatorMissing
    errStepTextOrTextFileMandatory
    errStepTextOrFile
    errEnabledFlagFalseForGlobal
    errEnabledFlagLetFailed
    errDegParallelismNullForGlobal
    errInvalidDegParallelism
    errExecutionMechanismInvalid
    errExecutionMechanismLetFailed
    errStepLevelNull = 1020
    errStepLevelZeroForGlobal
    errStepLevelLetFailed
    errRowCountNumeric
    errConnNameInvalid
    errTimeoutNumeric
    errResetConnPropertiesFailed
    errFailureThresholdNumeric
    errConnectionUpdateFailed
    errGlobalRunMethodMandatory
    errGlobalRunMethodNull = 1030
    errGlobalRunMethodInvalid
    errGlobalRunMethodLetFailed
    errNoTrueOption
    errGetOptionFailed
    errSetEnabled
    errStepLabelTextAndFileNull
    errInvalidNodeType
    errSetOptionFailed
    errQueryParameterFailed
    errParamNotFound = 1040
    errQueryStepFailed
    errStepNotFound
    errReadFromScreenFailed
    errCopyPropertiesToFormFailed

```

errMandatoryFieldNull  
errUnableToCheckNull  
errUpgradeFailed  
errFindStepSequenceFailed  
errFindParentStepIdFailed  
errCircularReference = 1050  
errAddStepFailed  
errModifyStepFailed  
errDeleteColumnFailed  
errFindPositionFailed  
errDeleteStepFailed  
errRunExistsForStepFailed  
errCreateNewParentFailed  
errInsertNewStepVersionFailed  
errCreateNewStepFailed  
errDuplicateParameterName = 1060  
errCheckDupParameterNameFailed  
errConstraintTypeInvalid  
errConstraintTypeLetFailed  
errAddConstraintFailed  
errWorkspaceIdMandatory  
errInvalidWorkspaceData  
errGetWorkspaceDetailsFailed  
errNoWorkspaceLoaded  
errWorkspaceAlreadyOpen  
errDuplicateWorkspaceName = 1070  
errWorkspaceNameMandatory  
errWorkspaceNameSetFailed  
errWorkspaceIdInvalid  
errWorkspaceIdSetFailed  
errWorkspaceInsertFailed  
errWorkspaceDeleteFailed  
errWorkspaceUpdateFailed  
errInvalidFile  
errCheckWorkspaceOpenFailed  
errWriteFailed = 1080  
errDeleteParameterRecordFailed  
errUnableToLogOutput  
errDeleteDBRecordFailed  
errRunExistsForWorkspaceFailed  
errClearHistoryFailed  
errCreateDBFailed  
errImportWspFailed  
errStepModifyFailed  
errStepDeleteFailed  
errDummy3 = 1090  
errUnableToGetWorkspace  
errInvalidNode  
errUnableToRemoveSubtree  
errSetFileNameFailed  
errStepTypeInvalid  
errObjectMandatory  
errBuiltInUpdateOnly  
errInvalidStep  
errTypeOfStepFailed  
errGetParentKeyFailed = 1100

errLabelTextAndFileCheckFailed  
errStepTextAndFileNull  
errTextOrFileCheckFailed  
errParentStepManager  
errDeleteSubStepsFailed  
errWorkspaceNameDuplicateFailed  
errNewConstraintVersionFailed  
errDeleteStepConstraintsFailed  
errOldVersionMandatory  
errLoadConstraintsInListFailed = 1110  
errLoadGlobalStepsFailed  
errDeleteConstraintFailed  
errUpdateConstraintFailed  
errConstraintIdInvalid  
errConstraintIdSetFailed  
errGlobalStepIdInvalid  
errGlobalStepIdSetFailed  
errUpdateVersionFailed  
errQueryAdjacentConsFailed  
errConstraintNotFound = 1120  
errQueryConstraintFailed  
errSetDBBeforeLoad  
errLoadDataFailed  
errLoadRsInArrayFailed  
errConstraintsForStepFailed  
errPreConstraintsForStepFailed  
errPostConstraintsForStepFailed  
errExecuteConstraintMethodFailed  
errIdOrKeyMandatory  
errInListFailed = 1130  
errUnableToWriteChanges  
errQuickSortFailed  
errCheckParentValidFailed  
errLogErrorFailed  
errCopyListFailed  
errConnected  
errVersionMismatch  
errStepNodeFailed  
errWorkspaceSelectedFailed  
errIdentifierSelectedFailed = 1140  
errCheckForNullFieldFailed  
errInstanceInUse  
errSetVisiblePropertyFailed  
errExportWspFailed  
errMakeKeyValidFailed  
errDummy16  
errRunApplicationFailed  
errStepLabelUnique  
errDeleteSingleFile  
errMakeIdentifierValidFailed = 1150  
errTypeOfNodeFailed  
errConstraintCommandFailed  
errOpenDbFailed  
errInsertNewConstraintsFailed  
errLoadPostExecuteStepsFailed  
errLoadPreExecutionStepsFailed

errCreateNewNodeFailed  
errDeleteNodeFailed  
errDisplayPopupFailed  
errDisplayPropertiesFailed = 1160  
errUnableToCreateNewObject  
errDiffFailed  
errLoadWorkspaceFailed  
errTerminateProcessFailed  
errCompareFailed  
errCreateConnectionFailed  
errShowFormFailed  
errAbortFailed  
errDeleteParameterFailed  
errUpdateViewFailed = 1170  
errParameterNewFailed  
errCopyNodeFailed  
errCutNodeFailed  
errCheckObjectValidFailed  
errDeleteViewNodeFailed  
errMainFailed  
errNewStepFailed  
errProcessStepModifyFailed  
errCustomizeStepFormFailed  
errInitializeStepFormFailed = 1180  
errInsertStepFailed  
errIncVersionYFailed  
errIncVersionXFailed  
errShowCreateStepFormFailed  
errShowStepFormFailed  
errStepNewFailed  
errUnableToApplyChanges  
errUnableToCommitChanges  
errGetStepNodeTextFailed  
errSelectGlobalRunMethodFailed = 1190  
errConnectionNameMandatory  
errUpdateStepFailed  
errBrowseFailed  
errDummy4  
errDummy1  
errDummy2  
errDummy  
errUnableToPreviewFile  
errCopyWorkspaceFailed  
errCopyParameterFailed = 1200  
errGetStepTypeAndPositionFailed  
errCopyStepFailed  
errMandatoryParameterMissing  
errDeleteWorkspaceRecordsFailed  
errCreateDirectoryFailed  
errConfirmDeleteOrMoveFailed  
errCreateWorkspaceFailed  
errTypeOfObjectFailed  
errCreateNodeFailed  
errCreateParameterFailed = 1210  
errInsertParameterFailed  
errCreateStepFailed

errNoConstraintsCreated  
errCopyFailed  
errCloneFailed  
errCloneGlobalFailed  
errCloneWorkerFailed  
errCloneManagerFailed  
errLetStepTypeFailed  
errUnableToCloseWorkspace = 1220  
errUnableToModifyWorkspace  
errUnableToCreateWorkspace  
errAddArrayElementFailed  
errUpdateSequenceFailed  
errCannotCopySubSteps  
errSubStepsFailed  
errModifyInArrayFailed  
errUpdateParentVersionFailed  
errGetNodeTextFailed  
errAddToArrayFailed = 1230  
errDeleteFromArrayFailed  
errQueryIndexFailed  
errCreateNewConstraintVersionFailed  
errGetRootNodeFailed  
errPopulateWspDetailsFailed  
errLoadRsInTreeFailed  
errAddNodeToTreeFailed  
errMaxTempFiles  
errMoveFailed  
errRootNodeKeyInvalid = 1240  
errNextNodeFailed  
errBranchWillMove  
errMoveBranchInvalid  
errCreateIdRecordsetFailed  
errIdentifierColumnFailed  
errGetIdentifierFailed  
errGetStepTypeFailed  
errUpdateConstraintSeqFailed  
errDelParamsInWspFailed  
errDuplicateConnectionName = 1250  
errOpenWorkspaceFailed  
errShowWorkspaceNewFailed  
errShowWorkspaceModifyFailed  
errPopulateListFailed  
errExploreNodeFailed  
errInitializeListNodeFailed  
errMakeListColumnsFailed  
errRefreshViewFailed  
errExploreFailed  
errCollapseNodeFailed = 1260  
errUnableToProcessListViewClick  
errSetEnabledForStepFailed  
errDisplayStepFormFailed  
errSetEnabledPropertyFailed  
errInvalidDB  
errDeleteConnectionFailed  
errInvalidOperation  
errLetOperationFailed

```

errIdGetFailed
errCommitFailed = 1270
errSaveParametersInWspFailed
errDeleteArrayElementFailed
errSaveWorkspaceFailed
errInitializeFailed
errLoadInArrayFailed
errSaveStepsInWspFailed
errCommitStepFailed
errStepIdGetFailed
errUnloadFromArrayFailed
errValidateFailed = 1280
errTextEnteredFailed
errStepLabelMandatory
errTextAndFileNullForManager
errFailureDetailsNullForMgr
errSetTabOrderFailed
errSaveWspConstraintsFailed
errCommitConstraintFailed
errUnloadStepConstraintsFailed
errUnableToModifyMenu
errConfirmFailed = 1290
errInitSubItemsFailed
errUpdateListNodeFailed
errAddNodeFailed
errLoadListNodeFailed
errAddListNodeFailed
errExecutionFailed
errSetListViewStyleFailed
errSetCheckedFailed
errGetCheckedFailed
errUnableToProcessListViewDb1Click = 1300
errDefaultPosition
errShellFailed
errOpenFileFailed
errSetTBar97Failed
errConnectFailed
errApiFailed
errRegEntryInvalid
errParseStringFailed
errConstraintsForWspFailed
errPostConstraintsForWspFailed = 1310
errPreConstraintsForWspFailed
errLoadWspPostExecStepsFailed
errLoadWspPreExecStepsFailed
errLoadConstraintsOnFormFailed
errQueryFailed
errPasteNodeFailed
errShowAllWorkspacesFailed
errMakeFieldValidFailed
errInitializeTree
errRootNodeFailed = 1320
errDirectionInvalid
errUnableToDetListProperty
errUnableToGetListData
errItemNotFound

```

```

errItemDoesNotExist
errParamNameInvalid
errGetParamValueFailed
errSubValuesFailed
errStringOpFailed
errReadWorkspaceDataFailed = 1330
errUpdateRunDataFailed
errProgramError
errUnableToOpenFile
errLoadRunDataFailed
errExecuteODBCCommandFailed
errRunWorkspaceFailed
errExecuteStepFailed
errUnableToWriteError
errRunStepFailed
errSaveChanges = 1340
errDragDropFailed
errInvalidParameter
errAssignParametersFailed
errLoadLabelsInTreeFailed
errInstrRFailed
errInsertIteratorFailed
errDeleteIteratorFailed
errTypeInvalid
errLoadFailed
errDeleteFailed = 1350
errModifyFailed
errIteratorsFailed
errInsertFailed
errUpdateFailed
errDuplicateIterator
errSaveFailed
errReadDataFailed
errUnloadFailed
errAddFailed
errExecuteBranchFailed = 1360
errRangeNumeric
errRangeInvalid
errNextStepFailed
errUpdateDisplayFailed
errDateToStringFailed
errGetElapsedTimeFailed
errMaxProcessesExceeded
errInvalidProperty
errInvalidChild
errCreateInstanceFailed = 1370
errInvalidForWorker
errInstanceOpFailed
errNavInstancesFailed
errIterateFailed
errExecInstanceFailed
errDupIterator
End Enum

```

**SortSM.bas**

```

Attribute VB_Name = "SortSM"
' FILE:      SortSM.bas
'           Microsoft TPC-H Kit Ver. 1.00
'           Copyright Microsoft, 1999
'           All Rights Reserved
'
' PURPOSE:   This module contains an implementation of QuickSort.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

' Comment out for case-sensitive sorts
Option Compare Text

' Used to indicate the source module name when errors
' are raised by this module
Private Const mstrModuleName As String = "SortSM."

Private Function Compare(ByVal vntToCompare1 As Variant, _
    ByVal vntToCompare2 As Variant) As Integer

    On Error GoTo CompareErr

    Compare = 0

    If vntToCompare1.SequenceNo < vntToCompare2.SequenceNo Then
        Compare = -1
    ElseIf vntToCompare1.SequenceNo > vntToCompare2.SequenceNo Then
        Compare = 1
    End If

    Exit Function

CompareErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
On Error GoTo 0
Err.Raise vbObjectError + errCompareFailed, _
    gstrSource, _
    LoadResString(errCompareFailed)

End Function

Private Sub Swap(ByRef vntToSwap1 As Variant, _
    ByRef vntToSwap2 As Variant)

    Dim vntTemp As Variant

    On Error GoTo SwapErr

    If IsObject(vntToSwap1) And IsObject(vntToSwap2) Then
        Set vntTemp = vntToSwap1
        Set vntToSwap1 = vntToSwap2
        Set vntToSwap2 = vntTemp
    Else
        vntTemp = vntToSwap1
        vntToSwap1 = vntToSwap2
        vntToSwap2 = vntTemp
    End If

    Exit Sub

SwapErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
On Error GoTo 0
Err.Raise vbObjectError + errQuickSortFailed, mstrModuleName &
    "Swap", _
    LoadResString(errQuickSortFailed)

End Sub

Public Sub QuickSort(vntArray As Variant, _
    Optional ByVal intLBound As Integer, _
    Optional ByVal intUBound As Integer)
' Sorts a variant array using Quicksort

    Dim i As Integer
    Dim j As Integer
    Dim vntMid As Variant

    On Error GoTo QuickSortErr

    If IsEmpty(vntArray) Or _
        Not IsArray(vntArray) Then
        Exit Sub
    End If

    ' Set default boundary values for first time through
    If intLBound = 0 And intUBound = 0 Then
        intLBound = LBound(vntArray)
        intUBound = UBound(vntArray)
    End If

    ' BugMessage "Sorting elements " & Str(intLBound) & " and " &
    Str(intUBound)

    If intLBound > intUBound Then
        Exit Sub
    End If

    ' Only two elements in this subdivision; exchange if they
    ' are out of order and end recursive calls
    If (intUBound - intLBound) = 1 Then
        If Compare(vntArray(intLBound), vntArray(intUBound)) > 0 Then
            Call Swap(vntArray(intLBound), vntArray(intUBound))
        End If
        Exit Sub
    End If

    ' Set the pivot point

```

```

Set vntMid = vntArray(intUBound)
i = intLBound
j = intUBound

Do
  ' Move in from both sides towards pivot element
  Do While (i < j) And Compare(vntArray(i), vntMid) <= 0
    i = i + 1
  Loop

  Do While (j > i) And Compare(vntArray(j), vntMid) >= 0
    j = j - 1
  Loop

  If i < j Then
    Call Swap(vntArray(i), vntArray(j))
  End If
Loop While i < j

' Since i has been adjusted, swap element i with element,
' intUBound
Call Swap(vntArray(i), vntArray(intUBound))

' Recursively call sort array - pass smaller subdivision
' first to conserve stack space
If (i - intLBound) < (intUBound - 1) Then
  ' Recursively sort with adjusted values for upper and
  ' lower bounds
  Call QuickSort(vntArray, intLBound, i - 1)
  Call QuickSort(vntArray, i + 1, intUBound)
Else
  Call QuickSort(vntArray, i + 1, intUBound)
  Call QuickSort(vntArray, intLBound, i - 1)
End If
Exit Sub

QuickSortErr:
  Call LogErrors(Errors)
  On Error GoTo 0
  Err.Raise vbObjectError + errQuickSortFailed, mstrModuleName &
"QuickSort", _
  LoadResString(errQuickSortFailed)

End Sub

startup.bas
Attribute VB_Name = "Startup"
' FILE: Startup.bas
' Microsoft TPC-H Kit Ver. 1.00
' Copyright Microsoft, 1999
' All Rights Reserved
'
' PURPOSE: This module contains startup and cleanup functions for
the project.

```

```

' Contact: Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

Public Const LISTVIEW_BUTTON = 14

Public gstrProjectPath As String

' Used to indicate the source module name when errors
' are raised by this module
Private Const mstrModuleName As String = "Startup."

Private Sub Initialize()

  On Error GoTo InitializeErr

  ReDim gsContCriteria(gintOnFailureAbort To gintOnFailureAsk) As
String
  gsContCriteria(gintOnFailureAbort) = "Abort"
  gsContCriteria(gintOnFailureContinue) = "Continue"
  gsContCriteria(gintOnFailureCompleteSiblings) = "Execute sibling
steps and stop"
  gsContCriteria(gintOnFailureAbortSiblings) = "Abort sibling steps
and execute next parent"
  gsContCriteria(gintOnFailureSkipSiblings) = "Skip sibling steps and
execute next parent"
  gsContCriteria(gintOnFailureAsk) = "Ask"

  ReDim gsExecutionStatus(gintDisabled To gintAborted) As String
  gsExecutionStatus(gintDisabled) = "Disabled"
  gsExecutionStatus(gintPending) = "Pending"
  gsExecutionStatus(gintRunning) = "Running"
  gsExecutionStatus(gintComplete) = "Complete"
  gsExecutionStatus(gintFailed) = "Failed"
  gsExecutionStatus(gintAborted) = "Stopped"

#If Not RUN_ONLY Then
  ' Call a procedure to change the style of the toolbar
  ' on the Step Properties form
  Call SetTBar97(frmSteps.tblConstraintCommands)
#End If

  Call InitRunEngine

  Exit Sub

InitializeErr:
  ' Log the error code raised by Visual Basic
  Call LogErrors(Errors)
  gstrSource = mstrModuleName & "Initialize"
  Call ShowError(errInitializeFailed)

End Sub
Sub Main()

```

```

On Error GoTo MainErr

' Mousepointer should indicate busy
Call ShowBusy

' Display the Splash screen while we carry out some initialization
frmSplash.Show
frmSplash.Refresh

gstrProjectPath = App.Path

' Open the database
If OpenDBFile() = False Then
    Unload frmSplash
    Exit Sub
End If

#If Not RUN_ONLY Then
Load frmMain

' Enable the Stop Run menu options only when a workspace is
' actually running
Call EnableStop(False)

' Clear all application extension menu items
Call ClearToolsMenu
#End If

Call Initialize

' Mousepointer - ready to accept user input
Call ShowFree

' Unload the Splash screen and display the main form
Unload frmSplash

#If RUN_ONLY Then
frmWorkspaceOpen.Caption = gsCaptionRunWsp

Call ShowWorkspacesInDb(dbsAttTool)
#else
frmMain.Show
#End If

Exit Sub

MainErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
Call ShowFree
Call ShowError(errMainFailed)

End Sub
Private Function OpenDBFile() As Boolean
Dim sDb As String

```

```

On Error GoTo OpenDBFileErr

#If RUN_ONLY Then
' Always use the registry setting for the run_only mode
sDb = DefaultDBFile()
#else
' Check if the user has specified the workspace defn. file to open
on the command line
' Else, use the registry setting
sDb = IIf(StringEmpty(Command), DefaultDBFile(), Command)

If Len(sDb) > 0 Then
' Trim off the enclosing double-quotes if any
If Mid(sDb, 1, 1) = gstrDQ Then
If Len(sDb) > 1 Then
sDb = Mid(sDb, 2)
Else
sDb = gstrEmptyString
End If
End If
End If

If Len(sDb) > 0 Then
If Mid(sDb, Len(sDb), 1) = gstrDQ Then
If Len(sDb) > 1 Then
sDb = Mid(sDb, 1, Len(sDb) - 1)
Else
sDb = gstrEmptyString
End If
End If
End If
#End If

' Open the database
OpenDBFile = SMOpenDatabase(sDb)

Exit Function

OpenDBFileErr:
Call LogErrors(Errors)
OpenDBFile = False

End Function
Public Sub Cleanup()

On Error GoTo CleanupErr

' Set the mousepointer to indicate Busy
Call ShowBusy

#If Not RUN_ONLY Then
' Close all open workspaces - will also prompt for unsaved
' changes
Call CloseOpenWorkspaces
#End If

```



```

' Close all open files
Call CloseOpenFiles

' Reset the mousepointer
Call ShowFree

Exit Sub

CleanupErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
Resume Next

End Sub

```

## StepCommon.bas

```

Attribute VB_Name = "StepCommon"
' FILE:      StepCommon.bas
'            Microsoft TPC-H Kit Ver. 1.00
'            Copyright Microsoft, 1999
'            All Rights Reserved
'
' PURPOSE:   Contains functionality common across StepMaster and
'            SMRunOnly, pertaining to steps
'            Specifically, functions to load iterators records
'            in an array, determine the type of step, etc.
' Contact:   Reshma Tharamal (reshmat@microsoft.com)
'
Option Explicit

' Used to indicate the source module name when errors
' are raised by this module
Private Const mstrModuleName As String = "StepCommon."

' Step property constants
Private Const mintMinFailureThreshold As Integer = 1
Public Const gintMinSequenceNo As Integer = 1
Public Const gintMinLevel As Integer = 0
Public Function ValidateParallelism(sParallelism As String, lWorkspace
As Long, _
    Optional ParamsInWsp As cArrParameters = Nothing) As String
' Returns the degree of parallelism for the step if the user input
is valid
    Dim sTemp As String

    On Error GoTo ValidateParallelismErr
    gstrSource = mstrModuleName & "ValidateParallelism"

    sTemp = SubstituteParameters(Trim$(sParallelism), lWorkspace,
WspParameters:=ParamsInWsp)

    If Not IsNumeric(sTemp) Then
        ShowError errInvalidDegParallelism
        On Error GoTo 0

```

```

        Err.Raise vbObjectError + errInvalidDegParallelism, gstrSource,
-
        LoadResString(errInvalidDegParallelism)
    Else
        If (CInt(sTemp) < gintMinParallelism) Or (CInt(sTemp) >
gintMaxParallelism) Then
            ShowError errInvalidDegParallelism
            On Error GoTo 0
            Err.Raise vbObjectError + errInvalidDegParallelism,
gstrSource, _
                LoadResString(errInvalidDegParallelism)
        Else
            ValidateParallelism = Trim$(sParallelism)
        End If
    End If

Exit Function

ValidateParallelismErr:
' Log the error code raised by Visual Basic
gstrSource = mstrModuleName & "ValidateParallelism"
If Err.Number = vbObjectError + errSubValuesFailed Then
    ShowError errInvalidDegParallelism
End If

Call LogErrors(Errors)
On Error GoTo 0
Err.Raise vbObjectError + errInvalidDegParallelism, gstrSource, _
    LoadResString(errInvalidDegParallelism)

End Function

Public Function IsGlobal( _
    Optional ByVal StepClass As cStep = Nothing, _
    Optional ByVal StepRecord As Recordset = Nothing, _
    Optional ByVal StepKey As String = gstrEmptyString, _
    Optional ByVal StepId As Long = 0, _
    Optional StepForm As Form = Nothing) As Boolean

' This function contains all the possible checks for whether
' a step is global - The check that will be made depends on
' the parameter passed in

Dim cStepRecord As cStep

If Not StepClass Is Nothing Then
    IsGlobal = StepClass.GlobalFlag
    Exit Function
End If

If Not StepRecord Is Nothing Then
    IsGlobal = StepRecord![global_flag]
    Exit Function
End If

If Not StringEmpty(StepKey) Then

```

```

        IsGlobal = InStr(StepKey, gstrGlobalStepPrefix) > 0
    Exit Function
End If

If StepId <> 0 Then
    Set cStepRecord = gcSteps.QueryStep(StepId)
    IsGlobal = cStepRecord.GlobalFlag
    Set cStepRecord = Nothing
    Exit Function
End If

If Not StepForm Is Nothing Then
    IsGlobal = (StepForm.lblStepType.Caption = Str(gintGlobalStep))
    Exit Function
End If

' Not a single object was passed in! - raise an error
On Error GoTo 0
Err.Raise vbObjectError + errObjectMandatory, _
    mstrModuleName & "IsGlobal", _
    LoadResString(errObjectMandatory)

End Function
Public Function TypeOfStep(Optional ByVal StepClass As cStep = Nothing,
    Optional ByVal StepRecord As Recordset = Nothing, _
    Optional ByVal StepKey As String = gstrEmptyString, _
    Optional ByVal StepId As Long = 0, _
    Optional StepForm As Form = Nothing) As Integer
' Calls functions to determine the type of step
' The check that will be made depends on the parameter passed in

On Error GoTo TypeOfStepErr

' Make the check whether a step is global first - both
' worker and global steps have the step text or file name
' not null - but only the global step will have the global
' flag set
If IsGlobal(StepClass, StepRecord, StepKey, StepId, StepForm) Then
    TypeOfStep = gintGlobalStep
ElseIf IsManager(StepClass, StepRecord, StepKey, StepId, StepForm)
Then
    TypeOfStep = gintManagerStep
ElseIf IsWorker(StepClass, StepRecord, StepKey, StepId, StepForm)
Then
    TypeOfStep = gintWorkerStep
Else
    On Error GoTo 0
    Err.Raise vbObjectError + errInvalidStep, _
        mstrModuleName & "TypeOfStep", _
        LoadResString(errInvalidStep)
End If

Exit Function

TypeOfStepErr:

```

```

' Log the error code raised by Visual Basic
Call LogErrors(Errors)
On Error GoTo 0
Err.Raise vbObjectError + errTypeOfStepFailed, _
    mstrModuleName & "TypeOfStep", _
    LoadResString(errTypeOfStepFailed)

End Function

Public Function IsStep(intNodeType As Integer) As Boolean
' Returns true if the node type corresponds to a global, manager
' or worker step
IsStep = (intNodeType = gintGlobalStep) Or (intNodeType =
gintManagerStep) Or _
    (intNodeType = gintWorkerStep)

End Function

Public Function IsManager(Optional ByVal StepClass As cStep = Nothing, _
    Optional ByVal StepRecord As Recordset = Nothing, _
    Optional ByVal StepKey As String = gstrEmptyString, _
    Optional ByVal StepId As Long = 0, _
    Optional StepForm As Form = Nothing) As Boolean

' This function contains all the possible checks for whether
' a step is a manager step - The check that will be made depends
' on the parameter passed in

Dim cStepRecord As cStep

If Not StepClass Is Nothing Then
    IsManager = (StepClass.StepType = gintManagerStep)
    Exit Function
End If

If Not StepRecord Is Nothing Then
    IsManager = (IsNull(StepRecord![step_text]) And
IsNull(StepRecord![step_file_name]))
    Exit Function
End If

If Not StringEmpty(StepKey) Then
    IsManager = (InStr(StepKey, gstrManagerStepPrefix) > 0)
    Exit Function
End If

If StepId <> 0 Then
    Set cStepRecord = gcSteps.QueryStep(StepId)
    IsManager = (cStepRecord.StepType = gintManagerStep)
    Set cStepRecord = Nothing
    Exit Function
End If

If Not StepForm Is Nothing Then
    IsManager = (StepForm.lblStepType.Caption =
Str(gintManagerStep))

```

```

Exit Function
End If

' Not a single object was passed in! - raise an error
On Error GoTo 0
Err.Raise vbObjectError + errObjectMandatory, _
    "Step.IsManager", _
    LoadResString(errObjectMandatory)

End Function
Public Function IsWorker( _
    Optional ByVal StepClass As cStep = Nothing, _
    Optional ByVal StepRecord As Recordset = Nothing, _
    Optional ByVal StepKey As String = gstrEmptyString, _
    Optional ByVal StepId As Long = 0, _
    Optional StepForm As Form = Nothing) As Boolean

' This function contains all the possible checks for whether
' a step is a Worker step - The check that will be made depends
' on the parameter passed in

Dim cStepRecord As cStep

If Not StepClass Is Nothing Then
    IsWorker = (StepClass.StepType = gintWorkerStep)
    Exit Function
End If

If Not StepRecord Is Nothing Then
    IsWorker = (Not StepRecord![global_flag] And _
        (Not IsNull(StepRecord![step_text]) Or Not
        IsNull(StepRecord![step_file_name])))
    Exit Function
End If

If Not StringEmpty(StepKey) Then
    IsWorker = InStr(StepKey, gstrWorkerStepPrefix) > 0
    Exit Function
End If

If StepId <> 0 Then
    Set cStepRecord = gcSteps.QueryStep(StepId)
    IsWorker = (cStepRecord.StepType = gintWorkerStep)
    Set cStepRecord = Nothing
    Exit Function
End If

If Not StepForm Is Nothing Then
    IsWorker = (StepForm.lblStepType.Caption = Str(gintWorkerStep))
    Exit Function
End If

' Not a single object was passed in! - raise an error
On Error GoTo 0
Err.Raise vbObjectError + errObjectMandatory, _
    "Step.IsWorker", _

```

```

LoadResString(errObjectMandatory)

End Function
Public Function GetStepNodeText(ByVal cStepNode As cStep) As String

On Error GoTo GetStepNodeTextErr

' Returns the string that will be displayed as the text
' in the tree view node to the user
If StringEmpty(cStepNode.StepLabel) Then

    If StringEmpty(cStepNode.StepTextFile) Then

        If StringEmpty(cStepNode.StepText) Then
            ' This should never happen
            On Error GoTo 0
            Err.Raise vbObjectError + errStepLabelTextAndFileNull, _
                gstrSource, _
                LoadResString(errStepLabelTextAndFileNull)
        Else
            GetStepNodeText = cStepNode.StepText
        End If
    Else
        GetStepNodeText = cStepNode.StepTextFile
    End If
Else
    GetStepNodeText = cStepNode.StepLabel
End If

Exit Function

GetStepNodeTextErr:
' Log the error code raised by Visual Basic
Call LogErrors(Errors)
On Error GoTo 0
Err.Raise vbObjectError + errGetStepNodeTextFailed, _
    gstrSource, _
    LoadResString(errGetStepNodeTextFailed)

End Function

Public Function LoadRecordsetInStepsArray(rstSteps As Recordset, _
    cStepCol As cArrSteps) As Boolean

Dim cNewStep As cStep
Dim cNewGlobal As cGlobalStep
Dim cNewManager As cManager
Dim cNewWorker As cWorker

On Error GoTo LoadRecordsetInStepsArrayErr

If rstSteps.RecordCount = 0 Then
    Exit Function
End If

rstSteps.MoveFirst

```

```

While Not rstSteps.EOF
  ' For fields that should not be null, a procedure is first
  ' called to raise an error if the field is null

  Set cNewStep = New cStep

  cNewStep.StepType = TypeOfStep(StepRecord:=rstSteps)

  If cNewStep.StepType = gintGlobalStep Then
    Set cNewGlobal = New cGlobalStep
    Set cNewStep = cNewGlobal
  ElseIf cNewStep.StepType = gintManagerStep Then
    Set cNewManager = New cManager
    Set cNewStep = cNewManager
  Else
    Set cNewWorker = New cWorker
    Set cNewStep = cNewWorker
  End If

  ' Initialize the global flag first, since subsequent
  ' validations might depend on whether the step is global
  cNewStep.GlobalFlag = CBool(ErrorOnNullField(rstSteps,
"global_flag"))

  ' Initialize step values
  cNewStep.StepId = CLng(ErrorOnNullField(rstSteps, "step_id"))
  cNewStep.VersionNo = CStr(ErrorOnNullField(rstSteps,
"version_no"))

  cNewStep.StepLabel = CheckForNullField(rstSteps, "step_label")
  cNewStep.StepTextFile = CheckForNullField(rstSteps,
"step_file_name")
  cNewStep.StepText = CheckForNullField(rstSteps, "step_text")
  cNewStep.StartDir = CheckForNullField(rstSteps,
"start_directory")

  cNewStep.WorkspaceId = CLng(ErrorOnNullField(rstSteps,
FLD_ID_WORKSPACE))
  cNewStep.ParentStepId = CLng(ErrorOnNullField(rstSteps,
"parent_step_id"))
  cNewStep.ParentVersionNo = CStr(ErrorOnNullField(rstSteps,
"parent_version_no"))

  cNewStep.SequenceNo = CInt(ErrorOnNullField(rstSteps,
"sequence_no"))
  cNewStep.StepLevel = CInt(ErrorOnNullField(rstSteps,
"step_level"))
  cNewStep.EnabledFlag = CBool(ErrorOnNullField(rstSteps,
"enabled_flag"))

  ' Initialize the execution details for the step
  cNewStep.DegreeParallelism = CheckForNullField(rstSteps,
"degree_parallelism")
  cNewStep.ExecutionMechanism = CInt(ErrorOnNullField(rstSteps,
"execution_mechanism"))

```

```

  cNewStep.FailureDetails = CheckForNullField(rstSteps,
"failure_details")
  cNewStep.ContinuationCriteria = CInt(ErrorOnNullField(rstSteps,
"continuation_criteria"))

  ' Initialize the output file locations for the step
  cNewStep.OutputFile = CheckForNullField(rstSteps,
"output_file_name")
  ' cNewStep.LogFile = CheckForNullField(rstSteps,
"log_file_name")
  cNewStep.ErrorFile = CheckForNullField(rstSteps,
"error_file_name")

  ' Initialize the iterator name for the step, if any
  cNewStep.IteratorName = CheckForNullField(rstSteps,
"iterator_name")

  ' Add this record to the array of steps
  cStepCol.Load cNewStep

  Set cNewStep = Nothing
  rstSteps.MoveNext
Wend

Exit Function

LoadRecordsetInStepsArrayErr:

  LogErrors Errors
  gstrSource = mstrModuleName & "LoadRecordsetInStepsArray"
  On Error GoTo 0
  Err.Raise vbObjectError + errLoadRsInArrayFailed, gstrSource, _
    LoadResString(errLoadRsInArrayFailed)

End Function

```

## F2. Configuration

### *Att\_workspace*

*workspace\_id workspace\_name*

*archived\_flag*

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0

### *Workspace\_parameters*

<i>workspace_id =</i>	11	<i>parameter_id =</i>	144	<i>parameter_type =</i>	0
<i>parameter_name</i>		DUR_RUN_ID			
<i>parameter_value</i>		180			
<i>workspace_id =</i>	11	<i>parameter_id =</i>	143	<i>parameter_type =</i>	3
<i>parameter_name</i>		OUTPUT_DIR			
<i>parameter_value</i>		E:\MSTPCH~1.101\OUTPUT\181			
<i>workspace_id =</i>	11	<i>parameter_id =</i>	142	<i>parameter_type =</i>	3
<i>parameter_name</i>		RUN_ID			
<i>parameter_value</i>		181			
<i>workspace_id =</i>	11	<i>parameter_id =</i>	141	<i>parameter_type =</i>	0
<i>parameter_name</i>		KIT_DIR			
<i>parameter_value</i>		E:\MSTPCH.101d			
<i>workspace_id =</i>	11	<i>parameter_id =</i>	140	<i>parameter_type =</i>	0
<i>parameter_name</i>		TOOLS_DIR			
<i>parameter_value</i>		%KIT_DIR%\tools			
<i>workspace_id =</i>	11	<i>parameter_id =</i>	139	<i>parameter_type =</i>	0
<i>parameter_name</i>		SERVER_NAME			
<i>parameter_value</i>		asama			
<i>workspace_id =</i>	11	<i>parameter_id =</i>	138	<i>parameter_type =</i>	0
<i>parameter_name</i>		NUM_STREAMS			
<i>parameter_value</i>		8			
<i>workspace_id =</i>	11	<i>parameter_id =</i>	137	<i>parameter_type =</i>	0
<i>parameter_name</i>		DEFAULT_DIR			
<i>parameter_value</i>		%KIT_DIR%\OUTPUT			

<i>workspace_id</i> =	11	<i>parameter_id</i> =	136	<i>parameter_type</i> =	0
<i>parameter_name</i>		DBNAME			
<i>parameter_value</i>		tpch1t			
<i>workspace_id</i> =	11	<i>parameter_id</i> =	135	<i>parameter_type</i> =	0
<i>parameter_name</i>		ACID_DIR			
<i>parameter_value</i>		%KIT_DIR%\ACID			

## *Connection\_dtls*

<i>works pace_id</i>	<i>connectio n_name_id</i>	<i>connection_name</i>	<i>connection_string_nam e</i>	<i>connecti on_type</i>
11	66	Static_Connection_to_DB_10	DBCONNECTION	1
11	65	Static_Connection_to_DB_9	DBCONNECTION	1
11	64	Static_Connection_to_DB_8	DBCONNECTION	1
11	63	Static_Connection_to_DB_7	DBCONNECTION	1
11	62	Static_Connection_to_DB_6	DBCONNECTION	1
11	61	Static_Connection_to_DB_5	DBCONNECTION	1
11	60	Static_Connection_to_DB_4	DBCONNECTION	1
11	59	Static_Connection_to_DB_3	DBCONNECTION	1
11	58	Static_Connection_to_DB_2	DBCONNECTION	1
11	57	Static_Connection_to_DB_1	DBCONNECTION	1
11	56	Dynamic_Connection_to_DB	DBCONNECTION	2

## *Workspace\_connections*

<i>workspace_id</i>	11
<i>connection_i</i>	17
<i>connection_nam</i>	DBCONNECTION
<i>connection_valu</i>	DRIVER=SQL
<i>description</i>	
<i>no_count_displa</i>	0
<i>no_execute</i>	0
<i>parse_query_only</i>	0
<i>ANSI_quoted_identifiers</i>	0
<i>ANSI_nulls</i>	-1
<i>show_query_pla</i>	0
<i>show_stats_time</i>	0
<i>show_stats_io</i>	0
<i>parse_odbc_msg_prefixes</i>	-1
<i>row_count</i>	0
<i>tsql_batch_separator</i>	GO
<i>query_time_out</i>	0
<i>server_language</i>	(Default)
<i>character_translatio</i>	-1
<i>regional_settings</i>	0

## *Att\_steps*

*workspace\_id* 11

<i>step_label</i> =	Setup ACID Tables and Values	<i>step_id</i> =	920	<i>global_flag</i> =	0		
<i>sequence_no</i> =	1	<i>step_level</i> =	0	<i>parent_step_id</i> =	0	<i>enabled_flag</i>	0
<i>iterator_name</i> =		<i>degree_parallelis</i>	1	<i>failure_details</i> =			
<i>execution_mechanism</i> =	0	<i>continuation_criteria</i>	0	<i>version_no</i>	4.0		
<i>step_file_name</i>		<i>parent_version_no</i> =	0.0				
<i>start_directory</i> =							
<i>step_text</i> =							

*step\_label* = TPC-H Atomicity *step\_id* = 921 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 0 *parent\_step\_id* = 0 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 1.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = TPC-H Isolation *step\_id* = 922 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 0 *parent\_step\_id* = 0 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 1.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = TPC-H Consistency *step\_id* = 923 *global\_flag* = 0  
*sequence\_no* = 4 *step\_level* = 0 *parent\_step\_id* = 0 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 1.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = TPC-H Durability (Pre-Test Components) *step\_id* = 924 *global\_flag* = 0  
*sequence\_no* = 5 *step\_level* = 0 *parent\_step\_id* = 0 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 4.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =



*step\_label* = TPC-H Durability (Post-Test Components) *step\_id* = 925 *global\_flag* = 0  
*sequence\_no* = 6 *step\_level* = 0 *parent\_step\_id* = 0 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 3.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Cleanup ACID Tables and Stored Procs *step\_id* = 926 *global\_flag* = 0  
*sequence\_no* = 7 *step\_level* = 0 *parent\_step\_id* = 0 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Create ACID History Tables *step\_id* = 927 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 1 *parent\_step\_id* = 920 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* %ACID\_DIR%\acidproc\acid\_hist.sql *version\_no* = 0.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 4.0  
*step\_text* =

*step\_label* = Create ACID Values Table *step\_id* = 928 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 1 *parent\_step\_id* = 920 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* %ACID\_DIR%\acidproc\acid\_table.sql *version\_no* = 0.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 4.0  
*step\_text* =

*step\_label* = Create ACID Stored Procedures *step\_id* = 929 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 1 *parent\_step\_id* = 920 *enabled\_flag* = -1  
*iterator\_name* = PROC\_NAME *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 1.0  
*start\_directory* = %ACID\_DIR% *parent\_version\_no* = 4.0  
*step\_text* = osql -Usa -P -S%SERVER\_NAME% -d%DBNAME% -iacidproc\%PROC\_NAME%

*step\_label* = Populate ACID Values Table *step\_id* = 930 *global\_flag* = 0  
*sequence\_no* = 4 *step\_level* = 1 *parent\_step\_id* = 920 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 1.0  
*start\_directory* = %ACID\_DIR% *parent\_version\_no* = 4.0  
*step\_text* = osql -Usa -P -S%SERVER\_NAME% -d%DBNAME% -w 128 -Q"tpch\_acid\_values  
 %NUM\_STREAMS%"

*step\_label* = Execute Atomicity Commit Test *step\_id* = 931 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 1 *parent\_step\_id* = 921 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* %ACID\_DIR%\atom\scripts\atom\_c.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB\_1 *parent\_version\_no* = 1.0  
*step\_text* =

*step\_label* = Execute Atomicity Rollback Test *step\_id* = 932 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 1 *parent\_step\_id* = 921 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* %ACID\_DIR%\atom\scripts\atom\_r.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB\_1 *parent\_version\_no* = 1.0  
*step\_text* =

*step\_label* = Copy Output Files to Atomicity Directory *step\_id* = 933 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 1 *parent\_step\_id* = 921 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %ACID\_DIR% *parent\_version\_no* = 1.0  
*step\_text* =  
::  
:: Delete any old files first  
::  
IF EXIST %ACID\_DIR%\atom\atomc.ver DEL %ACID\_DIR%\atom\atomc.ver > nul  
IF EXIST %ACID\_DIR%\atom\atomrb.ver DEL %ACID\_DIR%\atom\atomrb.ver > nul  
::  
:: Now copy the output from the RUN\_ID directory  
::  
copy %OUTPUT\_DIR%\Execute\_Atomicity\_Commit\_Test.out %ACID\_DIR%\atom\atomc.ver  
copy %OUTPUT\_DIR%\Execute\_Atomicity\_Rollback\_Test.out %ACID\_DIR%\atom\atomrb.ver

*step\_label* = Clear any Existing Semaphores *step\_id* = 934 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 1 *parent\_step\_id* = 922 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 1.0  
*step\_text* = %TOOLS\_DIR%\Utility\kill semaphore.exe

*step\_label* = Isolation 1 *step\_id* = 935 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 1 *parent\_step\_id* = 922 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 3  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 1.0  
*step\_text* =

*step\_label* = Isolation 2 *step\_id* = 936 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 1 *parent\_step\_id* = 922 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 3  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 1.0  
*step\_text* =

*step\_label* = Isolation 3 *step\_id* = 937 *global\_flag* = 0  
*sequence\_no* = 4 *step\_level* = 1 *parent\_step\_id* = 922 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 3  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 1.0  
*step\_text* =

*step\_label* = Isolation 4 *step\_id* = 938 *global\_flag* = 0  
*sequence\_no* = 5 *step\_level* = 1 *parent\_step\_id* = 922 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 3  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 1.0  
*step\_text* =

*step\_label* = Isolation 5 *step\_id* = 939 *global\_flag* = 0  
*sequence\_no* = 6 *step\_level* = 1 *parent\_step\_id* = 922 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 3  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 1.0  
*step\_text* =

```

step_label = Isolation 6                                step_id = 940    global_flag = 0
sequence_no = 7 step_level = 1 parent_step_id = 922 enabled_flag -1
iterator_name =                                         degree_parallelis 4
execution_mechanism = 0 continuation_criteria 0 failure_details =
step_file_name                                         version_no 0.0
start_directory =                                     parent_version_no = 1.0
step_text =

```

```

step_label = Clean-Up Consistency Directory            step_id = 941    global_flag = 0
sequence_no = 1 step_level = 1 parent_step_id = 923 enabled_flag -1
iterator_name = COUNTER                               degree_parallelis 1
execution_mechanism = 2 continuation_criteria 2 failure_details =
step_file_name                                         version_no 0.0
start_directory = %ACID_DIR%                          parent_version_no = 1.0
step_text =
::
:: Delete any existing output files for the consistency streams
::
IF EXIST CONS\Stream%COUNTER%.OUT DEL CONS\Stream%COUNTER%.out > nul

```

```

step_label = Setup Consistency Directory              step_id = 942    global_flag = 0
sequence_no = 2 step_level = 1 parent_step_id = 923 enabled_flag -1
iterator_name = STREAM                               degree_parallelis 1
execution_mechanism = 2 continuation_criteria 2 failure_details =
step_file_name                                         version_no 0.0
start_directory = %ACID_DIR%                          parent_version_no = 1.0
step_text =
::
:: Build header for each consistency stream output file
::
ECHO CONSISTENCY STREAM %STREAM% OUTPUT > CONS\Stream%STREAM%.out
ECHO ----- >> CONS\Stream%STREAM%.out

```

*step\_label* = Truncate HISTORY\_ACI Table *step\_id* = 943 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 1 *parent\_step\_id* = 923 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 1.0  
*step\_text* = --  
-- This worker will clear the HISTORY\_ACI table used during the durability process  
--  
TRUNCATE TABLE HISTORY\_ACI

*step\_label* = Execute Consistency Test 1 *step\_id* = 944 *global\_flag* = 0  
*sequence\_no* = 4 *step\_level* = 1 *parent\_step\_id* = 923 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* %ACID\_DIR%\cons\scripts\con1.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB\_1 *parent\_version\_no* = 1.0  
*step\_text* =

*step\_label* = ACID Transaction Streams *step\_id* = 945 *global\_flag* = 0  
*sequence\_no* = 5 *step\_level* = 1 *parent\_step\_id* = 923 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %NUM\_STREAMS%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 1.0  
*step\_text* =

*step\_label* = Execute Consistency Test 2 *step\_id* = 946 *global\_flag* = 0  
*sequence\_no* = 6 *step\_level* = 1 *parent\_step\_id* = 923 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* %ACID\_DIR%\cons\scripts\con2.sql *version\_no* = 0.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 1.0  
*step\_text* =

```

step_label = Post-Process Consistency Output          step_id = 947    global_flag = 0
sequence_no = 7 step_level = 1          parent_step_id = 923 enabled_flag -1
iterator_name =                                degree_parallelis 1
execution_mechanism = 0                    continuation_criteria 0    failure_details =
step_file_name                                version_no 0.0
start_directory =                                parent_version_no = 1.0
step_text =

```

```

step_label = Clean-Up Durability Directory          step_id = 948    global_flag = 0
sequence_no = 1 step_level = 1          parent_step_id = 924 enabled_flag -1
iterator_name = COUNTER                    degree_parallelis 1
execution_mechanism = 2                    continuation_criteria 2    failure_details =
step_file_name                                version_no 0.0
start_directory = %ACID_DIR%                parent_version_no = 4.0
step_text =
::
:: Delete any existing output files for the consistency streams
::
IF EXIST DUR\Stream%COUNTER%.OUT DEL DURS\Stream%COUNTER%.out > nul

```

```

step_label = Setup Durability Directory          step_id = 949    global_flag = 0
sequence_no = 2 step_level = 1          parent_step_id = 924 enabled_flag -1
iterator_name = STREAM                    degree_parallelis 1
execution_mechanism = 2                    continuation_criteria 2    failure_details =
step_file_name                                version_no 0.0
start_directory = %ACID_DIR%                parent_version_no = 4.0
step_text =
::
:: Build header for each durability stream output file
::
ECHO DURABILITY STREAM %STREAM% OUTPUT > DUR\Stream%STREAM%.out
ECHO ----- >> DUR\Stream%STREAM%.out

```

*step\_label* = Truncate HISTORY\_DUR Table *step\_id* = 950 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 1 *parent\_step\_id* = 924 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 4.0  
*step\_text* = --  
-- This worker will clear the HISTORY\_DUR table used during the durability process  
--  
SELECT CONVERT(CHAR,GETDATE(),120)  
TRUNCATE TABLE HISTORY\_DUR  
SELECT COUNT(\*) FROM HISTORY\_DUR

*step\_label* = Execute Durability Verification Test 1 *step\_id* = 951 *global\_flag* = 0  
*sequence\_no* = 4 *step\_level* = 1 *parent\_step\_id* = 924 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* %ACID\_DIR%\dur\scripts\dur\_verify1.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB\_1 *parent\_version\_no* = 4.0  
*step\_text* =

*step\_label* = Durability Streams *step\_id* = 952 *global\_flag* = 0  
*sequence\_no* = 5 *step\_level* = 1 *parent\_step\_id* = 924 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %NUM\_STREAMS%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 4.0  
*step\_text* =



*step\_label* = Execute Durability Verification Test 2 *step\_id* = 953 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 1 *parent\_step\_id* = 925 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %ACID\_DIR%\dur\scripts\dur\_verify2.sql *version\_no* = 0.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 3.0  
*step\_text* =

*step\_label* = Post Process Durability Output *step\_id* = 954 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 1 *parent\_step\_id* = 925 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 3.0  
*step\_text* =

*step\_label* = Drop ACID History Table *step\_id* = 955 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 1 *parent\_step\_id* = 926 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 0.0  
*step\_text* = if exists ( select name from sysobjects where name = 'HISTORY\_ACI' )  
drop table HISTORY\_ACI  
GO  
if exists ( select name from sysobjects where name = 'HISTORY\_DUR' )  
drop table HISTORY\_DUR  
GO

```

step_label = Drop ACID Values Table                step_id = 956    global_flag = 0
sequence_no = 2  step_level = 1  parent_step_id = 926  enabled_flag = -1
iterator_name =                                degree_parallelis 1
execution_mechanism = 1  continuation_criteria 2  failure_details =
step_file_name                                version_no 0.0
start_directory = Dynamic_Connection_to_DB        parent_version_no = 0.0
step_text = if exists ( select name from sysobjects where name = 'acid_values' )
            drop table acid_values

```

```

step_label = Drop ACID Stored Procedures            step_id = 957    global_flag = 0
sequence_no = 3  step_level = 1  parent_step_id = 926  enabled_flag = -1
iterator_name =                                degree_parallelis 1
execution_mechanism = 1  continuation_criteria 2  failure_details =
step_file_name                                version_no 0.0
start_directory = Dynamic_Connection_to_DB        parent_version_no = 0.0
step_text = if exists ( select name from sysobjects where name = 'acid_tran_com' )
            drop procedure acid_tran_com
            GO
            if exists ( select name from sysobjects where name = 'acid_dur_tran_com' )
            drop procedure acid_dur_tran_com
            GO
            if exists ( select name from sysobjects where name = 'tran_w_com' )
            drop procedure tran_w_com
            GO
            if exists ( select name from sysobjects where name = 'tran_w_rb' )
            drop procedure tran_w_rb
            GO
            if exists ( select name from sysobjects where name = 'iso3_ver' )
            drop procedure iso3_ver
            GO
            if exists ( select name from sysobjects where name = 'iso5_parts' )
            drop procedure iso5_parts
            GO
            if exists ( select name from sysobjects where name = 'iso_query' )
            drop procedure iso_query
            GO
            if exists ( select name from sysobjects where name = 'iso6_tran_w_com' )
            drop procedure iso6_tran_w_com
            GO

```

*step\_label* = Prepare Isolation 1 Output *step\_id* = 958 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 2 *parent\_step\_id* = 935 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %ACID\_DIR%\iso\scripts\iso1\_out.cmd *version\_no* = 0.0  
*start\_directory* = %ACID\_DIR% *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Isolation 1\_1 *step\_id* = 959 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 2 *parent\_step\_id* = 935 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Isolation 1\_2 *step\_id* = 960 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 2 *parent\_step\_id* = 935 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Prepare Isolation 2 Output *step\_id* = 961 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 2 *parent\_step\_id* = 936 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %ACID\_DIR%\iso\scripts\iso2\_out.cmd *version\_no* = 0.0  
*start\_directory* = %ACID\_DIR% *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Isolation 2\_1 *step\_id* = 962 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 2 *parent\_step\_id* = 936 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Isolation 2\_2 *step\_id* = 963 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 2 *parent\_step\_id* = 936 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Prepare Isolation 3 Output *step\_id* = 964 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 2 *parent\_step\_id* = 937 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %ACID\_DIR%\iso\scripts\iso3\_out.cmd *version\_no* = 0.0  
*start\_directory* = %ACID\_DIR% *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Isolation 3\_1 *step\_id* = 965 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 2 *parent\_step\_id* = 937 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Isolation 3\_2 *step\_id* = 966 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 2 *parent\_step\_id* = 937 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Prepare Isolation 4 Output *step\_id* = 967 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 2 *parent\_step\_id* = 938 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %ACID\_DIR%\iso\scripts\iso4\_out.cmd *version\_no* = 0.0  
*start\_directory* = %ACID\_DIR% *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Isolation 4\_1 *step\_id* = 968 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 2 *parent\_step\_id* = 938 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Isolation 4\_2 *step\_id* = 969 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 2 *parent\_step\_id* = 938 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Prepare Isolation 5 Output *step\_id* = 970 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 2 *parent\_step\_id* = 939 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %ACID\_DIR%\iso\scripts\iso5\_out.cmd *version\_no* = 0.0  
*start\_directory* = %ACID\_DIR% *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Isolation 5\_1 *step\_id* = 971 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 2 *parent\_step\_id* = 939 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Isolation 5\_2 *step\_id* = 972 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 2 *parent\_step\_id* = 939 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Prepare Isolation 6 Output *step\_id* = 973 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 2 *parent\_step\_id* = 940 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %ACID\_DIR%\iso\scripts\iso6\_out.cmd *version\_no* = 0.0  
*start\_directory* = %ACID\_DIR% *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Isolation 6\_1 *step\_id* = 974 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 2 *parent\_step\_id* = 940 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Isolation 6\_2 *step\_id* = 975 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 2 *parent\_step\_id* = 940 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Isolation 6\_3 *step\_id* = 976 *global\_flag* = 0  
*sequence\_no* = 4 *step\_level* = 2 *parent\_step\_id* = 940 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Consistency Stream 1 *step\_id* = 977 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 2 *parent\_step\_id* = 945 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Consistency Stream 2                                 *step\_id* =       978        *global\_flag* =     0  
*sequence\_no* =        2 *step\_level* =        2        *parent\_step\_id* =     945 *enabled\_flag*        -1  
*iterator\_name* =                                 *degree\_parallelis*     1  
*execution\_mechanism* =     0                         *continuation\_criteria*     0        *failure\_details* =  
*step\_file\_name*   *version\_no*        0.0  
*start\_directory* =   *parent\_version\_no* =     0.0  
*step\_text* =

*step\_label* = Consistency Stream 3                                 *step\_id* =       979        *global\_flag* =     0  
*sequence\_no* =        3 *step\_level* =        2        *parent\_step\_id* =     945 *enabled\_flag*        -1  
*iterator\_name* =                                 *degree\_parallelis*     1  
*execution\_mechanism* =     0                         *continuation\_criteria*     0        *failure\_details* =  
*step\_file\_name*   *version\_no*        0.0  
*start\_directory* =   *parent\_version\_no* =     0.0  
*step\_text* =

*step\_label* = Consistency Stream 4                                 *step\_id* =       980        *global\_flag* =     0  
*sequence\_no* =        4 *step\_level* =        2        *parent\_step\_id* =     945 *enabled\_flag*        -1  
*iterator\_name* =                                 *degree\_parallelis*     1  
*execution\_mechanism* =     0                         *continuation\_criteria*     0        *failure\_details* =  
*step\_file\_name*   *version\_no*        0.0  
*start\_directory* =   *parent\_version\_no* =     0.0  
*step\_text* =

*step\_label* = Consistency Stream 5                                 *step\_id* =       981        *global\_flag* =     0  
*sequence\_no* =        5 *step\_level* =        2        *parent\_step\_id* =     945 *enabled\_flag*        -1  
*iterator\_name* =                                 *degree\_parallelis*     1  
*execution\_mechanism* =     0                         *continuation\_criteria*     0        *failure\_details* =  
*step\_file\_name*   *version\_no*        0.0  
*start\_directory* =   *parent\_version\_no* =     0.0  
*step\_text* =



*step\_label* = Consistency Stream 6 *step\_id* = 982 *global\_flag* = 0  
*sequence\_no* = 6 *step\_level* = 2 *parent\_step\_id* = 945 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Consistency Stream 7 *step\_id* = 983 *global\_flag* = 0  
*sequence\_no* = 7 *step\_level* = 2 *parent\_step\_id* = 945 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Consistency Stream 8 *step\_id* = 984 *global\_flag* = 0  
*sequence\_no* = 8 *step\_level* = 2 *parent\_step\_id* = 945 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Consistency Stream 9 *step\_id* = 985 *global\_flag* = 0  
*sequence\_no* = 9 *step\_level* = 2 *parent\_step\_id* = 945 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Consistency Stream 10 *step\_id* = 986 *global\_flag* = 0  
*sequence\_no* = 10 *step\_level* = 2 *parent\_step\_id* = 945 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Durability Stream 1 *step\_id* = 987 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 2 *parent\_step\_id* = 952 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Durability Stream 2 *step\_id* = 988 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 2 *parent\_step\_id* = 952 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Durability Stream 3 *step\_id* = 989 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 2 *parent\_step\_id* = 952 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Durability Stream 4                                *step\_id* =        990        *global\_flag* =     0  
*sequence\_no* =        4 *step\_level* =        2        *parent\_step\_id* =        952 *enabled\_flag*     -1  
*iterator\_name* =                                *degree\_parallelis*     1  
*execution\_mechanism* =     0        *continuation\_criteria*     0        *failure\_details* =  
*step\_file\_name*    *version\_no*        0.0  
*start\_directory* =    *parent\_version\_no* =    0.0  
*step\_text* =

*step\_label* = Durability Stream 5                                *step\_id* =        991        *global\_flag* =     0  
*sequence\_no* =        5 *step\_level* =        2        *parent\_step\_id* =        952 *enabled\_flag*     -1  
*iterator\_name* =                                *degree\_parallelis*     1  
*execution\_mechanism* =     0        *continuation\_criteria*     0        *failure\_details* =  
*step\_file\_name*    *version\_no*        0.0  
*start\_directory* =    *parent\_version\_no* =    0.0  
*step\_text* =

*step\_label* = Durability Stream 6                                *step\_id* =        992        *global\_flag* =     0  
*sequence\_no* =        6 *step\_level* =        2        *parent\_step\_id* =        952 *enabled\_flag*     -1  
*iterator\_name* =                                *degree\_parallelis*     1  
*execution\_mechanism* =     0        *continuation\_criteria*     0        *failure\_details* =  
*step\_file\_name*    *version\_no*        0.0  
*start\_directory* =    *parent\_version\_no* =    0.0  
*step\_text* =

*step\_label* = Durability Stream 7                                *step\_id* =        993        *global\_flag* =     0  
*sequence\_no* =        7 *step\_level* =        2        *parent\_step\_id* =        952 *enabled\_flag*     -1  
*iterator\_name* =                                *degree\_parallelis*     1  
*execution\_mechanism* =     0        *continuation\_criteria*     0        *failure\_details* =  
*step\_file\_name*    *version\_no*        0.0  
*start\_directory* =    *parent\_version\_no* =    0.0  
*step\_text* =

*step\_label* = Durability Stream 8 *step\_id* = 994 *global\_flag* = 0  
*sequence\_no* = 8 *step\_level* = 2 *parent\_step\_id* = 952 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Durability Stream 9 *step\_id* = 995 *global\_flag* = 0  
*sequence\_no* = 9 *step\_level* = 2 *parent\_step\_id* = 952 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Durability Stream 10 *step\_id* = 996 *global\_flag* = 0  
*sequence\_no* = 10 *step\_level* = 2 *parent\_step\_id* = 952 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

```

step_label = Prepare .VER Durability Output Files          step_id = 997    global_flag = 0
sequence_no = 1 step_level = 2      parent_step_id = 954 enabled_flag -1
iterator_name =          degree_parallelis 1
execution_mechanism = 2      continuation_criteria 2      failure_details =
step_file_name          version_no 0.0
start_directory = %ACID_DIR%          parent_version_no = 0.0
step_text =
::
:: Copy and rename the output files from the 2 Consistency tests
::
COPY %DEFAULT_DIR%\%DUR_RUN_ID%\Execute_Durability_Verification_Test_1.out
DUR\DUR1.Ver
COPY %OUTPUT_DIR%\Execute_Durability_Verification_Test_2.out DUR\DUR2.Ver

```

```

step_label = Dur - Concatenate Stream Output Files        step_id = 998    global_flag = 0
sequence_no = 2 step_level = 2      parent_step_id = 954 enabled_flag -1
iterator_name =          degree_parallelis %NUM_STREAMS%
execution_mechanism = 0      continuation_criteria 0      failure_details =
step_file_name          version_no 0.0
start_directory =          parent_version_no = 0.0
step_text =

```

```

step_label = Prepare .VER Consistency Output Files      step_id = 999    global_flag = 0
sequence_no = 1 step_level = 2      parent_step_id = 947 enabled_flag -1
iterator_name =          degree_parallelis 1
execution_mechanism = 2      continuation_criteria 2      failure_details =
step_file_name          version_no 0.0
start_directory = %ACID_DIR%          parent_version_no = 0.0
step_text =
::
:: Copy and rename the output files from the 2 Consistency tests
::
COPY %OUTPUT_DIR%\Execute_Consistency_Test_1.out CONS\CONS1.Ver
COPY %OUTPUT_DIR%\Execute_Consistency_Test_2.out CONS\CONS2.Ver

```

*step\_label* = Cons - Concatenate Stream Output Files *step\_id* = 1000 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 2 *parent\_step\_id* = 947 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %NUM\_STREAMS%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Execute Isolation 1\_1 *step\_id* = 1001 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 959 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %ACID\_DIR%\iso\scripts\isol1\_1.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB\_1 *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Signal End of ISOL1\_1 *step\_id* = 1002 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 3 *parent\_step\_id* = 959 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = %TOOLS\_DIR%\Utility\semaphore -signal ISO1\_1

*step\_label* = Execute Isolation 1\_2 *step\_id* = 1003 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 960 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %ACID\_DIR%\iso\scripts\isol1\_2.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB\_2 *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Signal End of ISOL1\_2 *step\_id* = 1004 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 3 *parent\_step\_id* = 960 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = %TOOLS\_DIR%\Utility\semaphore -signal ISO1\_2

*step\_label* = Execute Isolation 2\_1 *step\_id* = 1005 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 962 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* %ACID\_DIR%\iso\scripts\isol2\_1.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB\_1 *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Signal End of ISOL2\_1 *step\_id* = 1006 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 3 *parent\_step\_id* = 962 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = %TOOLS\_DIR%\Utility\semaphore -signal ISO2\_1

*step\_label* = Execute Isolation 2\_2 *step\_id* = 1007 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 963 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* %ACID\_DIR%\iso\scripts\isol2\_2.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB\_2 *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Signal End of ISOL2\_2 *step\_id* = 1008 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 3 *parent\_step\_id* = 963 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = %TOOLS\_DIR%\Utility\semaphore -signal ISO2\_2

*step\_label* = Execute Isolation 3\_1 *step\_id* = 1009 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 965 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* %ACID\_DIR%\iso\scripts\isol3\_1.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB\_1 *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Signal End of ISOL3\_1 *step\_id* = 1010 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 3 *parent\_step\_id* = 965 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = %TOOLS\_DIR%\Utility\semaphore -signal ISO3\_1

*step\_label* = Execute Isolation 3\_2 *step\_id* = 1011 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 966 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* %ACID\_DIR%\iso\scripts\isol3\_2.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB\_2 *parent\_version\_no* = 0.0  
*step\_text* =



*step\_label* = Signal End of ISOL3\_2 *step\_id* = 1012 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 3 *parent\_step\_id* = 966 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = %TOOLS\_DIR%\Utility\semaphore -signal ISO3\_2

*step\_label* = Execute Isolation 4\_1 *step\_id* = 1013 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 968 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* %ACID\_DIR%\iso\scripts\isol4\_1.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB\_1 *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Signal End of ISOL4\_1 *step\_id* = 1014 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 3 *parent\_step\_id* = 968 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = %TOOLS\_DIR%\Utility\semaphore -signal ISO4\_1

*step\_label* = Execute Isolation 4\_2 *step\_id* = 1015 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 969 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* %ACID\_DIR%\iso\scripts\isol4\_2.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB\_2 *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Signal End of ISOL4\_2 *step\_id* = 1016 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 3 *parent\_step\_id* = 969 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = %TOOLS\_DIR%\Utility\semaphore -signal ISO4\_2

*step\_label* = Execute Isolation 5\_1 *step\_id* = 1017 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 971 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* %ACID\_DIR%\iso\scripts\isol5\_1.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB\_1 *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Signal End of ISOL5\_1 *step\_id* = 1018 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 3 *parent\_step\_id* = 971 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = %TOOLS\_DIR%\Utility\semaphore -signal ISO5\_1

*step\_label* = Execute Isolation 5\_2 *step\_id* = 1019 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 972 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* %ACID\_DIR%\iso\scripts\isol5\_2.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB\_2 *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Signal End of ISOL5\_2 *step\_id* = 1020 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 3 *parent\_step\_id* = 972 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = %TOOLS\_DIR%\Utility\semaphore -signal ISO5\_2

*step\_label* = Execute Isolation 6\_1 *step\_id* = 1021 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 974 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* %ACID\_DIR%\iso\scripts\isol6\_1.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB\_1 *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Signal End of ISOL6\_1 *step\_id* = 1022 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 3 *parent\_step\_id* = 974 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = %TOOLS\_DIR%\Utility\semaphore -signal ISO6\_1

*step\_label* = Execute Isolation 6\_2 *step\_id* = 1023 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 975 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* %ACID\_DIR%\iso\scripts\isol6\_2.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB\_2 *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Signal End of ISOL6\_2 *step\_id* = 1024 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 3 *parent\_step\_id* = 975 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = %TOOLS\_DIR%\Utility\semaphore -signal ISO6\_2

*step\_label* = Execute Isolation 6\_3 *step\_id* = 1025 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 976 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* %ACID\_DIR%\iso\scripts\isol6\_3.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB\_3 *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Signal End of ISOL6\_3 *step\_id* = 1026 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 3 *parent\_step\_id* = 976 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = %TOOLS\_DIR%\Utility\semaphore -signal ISO6\_3

*step\_label* = Cons - ACID Transactions Stream 1                      *step\_id* = 1027      *global\_flag* = 0  
*sequence\_no* = 1   *step\_level* = 3                      *parent\_step\_id* = 977   *enabled\_flag*   -1  
*iterator\_name* = COUNTER    *degree\_parallelis*   1  
*execution\_mechanism* = 1    *continuation\_criteria*   2                      *failure\_details* =  
*step\_file\_name*    *version\_no*       0.0  
*start\_directory* = Static\_Connection\_to\_DB\_1    *parent\_version\_no* =     0.0  
*step\_text* = EXEC cons\_tran %COUNTER%

*step\_label* = Cons - ACID Transactions Stream 2                      *step\_id* = 1028      *global\_flag* = 0  
*sequence\_no* = 1   *step\_level* = 3                      *parent\_step\_id* = 978   *enabled\_flag*   -1  
*iterator\_name* = COUNTER    *degree\_parallelis*   1  
*execution\_mechanism* = 1    *continuation\_criteria*   2                      *failure\_details* =  
*step\_file\_name*    *version\_no*       0.0  
*start\_directory* = Static\_Connection\_to\_DB\_2    *parent\_version\_no* =     0.0  
*step\_text* = EXEC cons\_tran %COUNTER%

*step\_label* = Cons - ACID Transactions Stream 3                      *step\_id* = 1029      *global\_flag* = 0  
*sequence\_no* = 1   *step\_level* = 3                      *parent\_step\_id* = 979   *enabled\_flag*   -1  
*iterator\_name* = COUNTER    *degree\_parallelis*   1  
*execution\_mechanism* = 1    *continuation\_criteria*   2                      *failure\_details* =  
*step\_file\_name*    *version\_no*       0.0  
*start\_directory* = Static\_Connection\_to\_DB\_3    *parent\_version\_no* =     0.0  
*step\_text* = EXEC cons\_tran %COUNTER%

*step\_label* = Cons - ACID Transactions Stream 4 *step\_id* = 1030 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 980 *enabled\_flag* = -1  
*iterator\_name* = COUNTER *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB\_4 *parent\_version\_no* = 0.0  
*step\_text* = EXEC cons\_tran %COUNTER%

*step\_label* = Cons - ACID Transactions Stream 5 *step\_id* = 1031 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 981 *enabled\_flag* = -1  
*iterator\_name* = COUNTER *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB\_5 *parent\_version\_no* = 0.0  
*step\_text* = EXEC cons\_tran %COUNTER%

*step\_label* = Cons - ACID Transactions Stream 6 *step\_id* = 1032 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 982 *enabled\_flag* = -1  
*iterator\_name* = COUNTER *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB\_6 *parent\_version\_no* = 0.0  
*step\_text* = EXEC cons\_tran %COUNTER%

*step\_label* = Cons - ACID Transactions Stream 7                                      *step\_id* =    1033      *global\_flag* =    0  
*sequence\_no* =      1 *step\_level* =      3                      *parent\_step\_id* =      983 *enabled\_flag*      -1  
*iterator\_name* =      COUNTER    *degree\_parallelis*      1  
*execution\_mechanism* =    1                                      *continuation\_criteria*      2                      *failure\_details* =  
*step\_file\_name*    *version\_no*      0.0  
*start\_directory* =      Static\_Connection\_to\_DB\_7                                      *parent\_version\_no* =      0.0  
*step\_text* =    EXEC cons\_tran %COUNTER%

*step\_label* = Cons - ACID Transactions Stream 8                                      *step\_id* =    1034      *global\_flag* =    0  
*sequence\_no* =      1 *step\_level* =      3                      *parent\_step\_id* =      984 *enabled\_flag*      -1  
*iterator\_name* =      COUNTER    *degree\_parallelis*      1  
*execution\_mechanism* =    1                                      *continuation\_criteria*      2                      *failure\_details* =  
*step\_file\_name*    *version\_no*      0.0  
*start\_directory* =      Static\_Connection\_to\_DB\_8                                      *parent\_version\_no* =      0.0  
*step\_text* =    EXEC cons\_tran %COUNTER%

*step\_label* = Cons - ACID Transactions Stream 9                                      *step\_id* =    1035      *global\_flag* =    0  
*sequence\_no* =      1 *step\_level* =      3                      *parent\_step\_id* =      985 *enabled\_flag*      -1  
*iterator\_name* =      COUNTER    *degree\_parallelis*      1  
*execution\_mechanism* =    1                                      *continuation\_criteria*      2                      *failure\_details* =  
*step\_file\_name*    *version\_no*      0.0  
*start\_directory* =      Static\_Connection\_to\_DB\_9                                      *parent\_version\_no* =      0.0  
*step\_text* =    EXEC cons\_tran %COUNTER%

<i>step_label</i> =	Cons - ACID Transactions Stream 10	<i>step_id</i> =	1036	<i>global_flag</i> =	0
<i>sequence_no</i> =	1	<i>step_level</i> =	3	<i>parent_step_id</i> =	986
<i>iterator_name</i> =	COUNTER	<i>enabled_flag</i>			-1
<i>execution_mechanism</i> =	1	<i>degree_parallelis</i>	1	<i>failure_details</i> =	
<i>step_file_name</i>		<i>continuation_criteria</i>	2	<i>version_no</i>	0.0
<i>start_directory</i> =	Static_Connection_to_DB_10	<i>parent_version_no</i> =			0.0
<i>step_text</i> =	EXEC cons_tran %COUNTER%				

<i>step_label</i> =	Dur - ACID Transactions Stream 1	<i>step_id</i> =	1037	<i>global_flag</i> =	0
<i>sequence_no</i> =	1	<i>step_level</i> =	3	<i>parent_step_id</i> =	987
<i>iterator_name</i> =	COUNTER	<i>enabled_flag</i>			-1
<i>execution_mechanism</i> =	1	<i>degree_parallelis</i>	1	<i>failure_details</i> =	
<i>step_file_name</i>		<i>continuation_criteria</i>	2	<i>version_no</i>	0.0
<i>start_directory</i> =	Static_Connection_to_DB_1	<i>parent_version_no</i> =			0.0
<i>step_text</i> =	EXEC dur_tran %COUNTER%				

<i>step_label</i> =	Dur - ACID Transactions Stream 2	<i>step_id</i> =	1038	<i>global_flag</i> =	0
<i>sequence_no</i> =	1	<i>step_level</i> =	3	<i>parent_step_id</i> =	988
<i>iterator_name</i> =	COUNTER	<i>enabled_flag</i>			-1
<i>execution_mechanism</i> =	1	<i>degree_parallelis</i>	1	<i>failure_details</i> =	
<i>step_file_name</i>		<i>continuation_criteria</i>	2	<i>version_no</i>	0.0
<i>start_directory</i> =	Static_Connection_to_DB_2	<i>parent_version_no</i> =			0.0
<i>step_text</i> =	EXEC dur_tran %COUNTER%				





<i>step_label</i> = Dur - ACID Transactions Stream 6	<i>step_id</i> = 1042	<i>global_flag</i> = 0
<i>sequence_no</i> = 1 <i>step_level</i> = 3	<i>parent_step_id</i> = 992	<i>enabled_flag</i> = -1
<i>iterator_name</i> = COUNTER	<i>degree_parallelis</i> = 1	
<i>execution_mechanism</i> = 1	<i>continuation_criteria</i> = 2	<i>failure_details</i> =
<i>step_file_name</i>		<i>version_no</i> = 0.0
<i>start_directory</i> = Static_Connection_to_DB_6		<i>parent_version_no</i> = 0.0
<i>step_text</i> = EXEC dur_tran %COUNTER%		

<i>step_label</i> = Dur - ACID Transactions Stream 7	<i>step_id</i> = 1043	<i>global_flag</i> = 0
<i>sequence_no</i> = 1 <i>step_level</i> = 3	<i>parent_step_id</i> = 993	<i>enabled_flag</i> = -1
<i>iterator_name</i> = COUNTER	<i>degree_parallelis</i> = 1	
<i>execution_mechanism</i> = 1	<i>continuation_criteria</i> = 2	<i>failure_details</i> =
<i>step_file_name</i>		<i>version_no</i> = 0.0
<i>start_directory</i> = Static_Connection_to_DB_7		<i>parent_version_no</i> = 0.0
<i>step_text</i> = EXEC dur_tran %COUNTER%		

<i>step_label</i> = Dur - ACID Transactions Stream 8	<i>step_id</i> = 1044	<i>global_flag</i> = 0
<i>sequence_no</i> = 1 <i>step_level</i> = 3	<i>parent_step_id</i> = 994	<i>enabled_flag</i> = -1
<i>iterator_name</i> = COUNTER	<i>degree_parallelis</i> = 1	
<i>execution_mechanism</i> = 1	<i>continuation_criteria</i> = 2	<i>failure_details</i> =
<i>step_file_name</i>		<i>version_no</i> = 0.0
<i>start_directory</i> = Static_Connection_to_DB_8		<i>parent_version_no</i> = 0.0
<i>step_text</i> = EXEC dur_tran %COUNTER%		

*step\_label* = Dur - ACID Transactions Stream 9 *step\_id* = 1045 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 995 *enabled\_flag* = -1  
*iterator\_name* = COUNTER *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB\_9 *parent\_version\_no* = 0.0  
*step\_text* = EXEC dur\_tran %COUNTER%

*step\_label* = Dur - ACID Transactions Stream 10 *step\_id* = 1046 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 996 *enabled\_flag* = -1  
*iterator\_name* = COUNTER *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB\_10 *parent\_version\_no* = 0.0  
*step\_text* = EXEC dur\_tran %COUNTER%

*step\_label* = Dur - Stream 1 Output *step\_id* = 1047 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 998 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Dur - Stream 2 Output *step\_id* = 1048 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 3 *parent\_step\_id* = 998 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Dur - Stream 3 Output *step\_id* = 1049 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 3 *parent\_step\_id* = 998 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Dur - Stream 4 Output *step\_id* = 1050 *global\_flag* = 0  
*sequence\_no* = 4 *step\_level* = 3 *parent\_step\_id* = 998 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Dur - Stream 5 Output *step\_id* = 1051 *global\_flag* = 0  
*sequence\_no* = 5 *step\_level* = 3 *parent\_step\_id* = 998 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Dur - Stream 6 Output *step\_id* = 1052 *global\_flag* = 0  
*sequence\_no* = 6 *step\_level* = 3 *parent\_step\_id* = 998 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Dur - Stream 7 Output *step\_id* = 1053 *global\_flag* = 0  
*sequence\_no* = 7 *step\_level* = 3 *parent\_step\_id* = 998 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Dur - Stream 8 Output *step\_id* = 1054 *global\_flag* = 0  
*sequence\_no* = 8 *step\_level* = 3 *parent\_step\_id* = 998 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Dur - Stream 9 Output *step\_id* = 1055 *global\_flag* = 0  
*sequence\_no* = 9 *step\_level* = 3 *parent\_step\_id* = 998 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Dur - Stream 10 Output *step\_id* = 1056 *global\_flag* = 0  
*sequence\_no* = 10 *step\_level* = 3 *parent\_step\_id* = 998 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Cons - Stream 1 Output *step\_id* = 1057 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 1000 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Cons - Stream 2 Output *step\_id* = 1058 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 3 *parent\_step\_id* = 1000 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Cons - Stream 3 Output *step\_id* = 1059 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 3 *parent\_step\_id* = 1000 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Cons - Stream 4 Output *step\_id* = 1060 *global\_flag* = 0  
*sequence\_no* = 4 *step\_level* = 3 *parent\_step\_id* = 1000 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Cons - Stream 5 Output *step\_id* = 1061 *global\_flag* = 0  
*sequence\_no* = 5 *step\_level* = 3 *parent\_step\_id* = 1000 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Cons - Stream 6 Output *step\_id* = 1062 *global\_flag* = 0  
*sequence\_no* = 6 *step\_level* = 3 *parent\_step\_id* = 1000 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Cons - Stream 7 Output *step\_id* = 1063 *global\_flag* = 0  
*sequence\_no* = 7 *step\_level* = 3 *parent\_step\_id* = 1000 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Cons - Stream 8 Output *step\_id* = 1064 *global\_flag* = 0  
*sequence\_no* = 8 *step\_level* = 3 *parent\_step\_id* = 1000 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Cons - Stream 9 Output *step\_id* = 1065 *global\_flag* = 0  
*sequence\_no* = 9 *step\_level* = 3 *parent\_step\_id* = 1000 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Cons - Stream 10 Output *step\_id* = 1066 *global\_flag* = 0  
*sequence\_no* = 10 *step\_level* = 3 *parent\_step\_id* = 1000 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Cons - Concatenate Stream 1 Output Files *step\_id* = 1067 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 4 *parent\_step\_id* = 1057 *enabled\_flag* = -1  
*iterator\_name* = COUNTER *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %ACID\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = IF EXIST CONS\Stream1.out TYPE %OUTPUT\_DIR%\Cons\_-\_ACID\_Transactions\_Stream\_1.%COUNTER%.out >> CONS\Stream1.out



```

step_label = Cons - Concatenate Stream 2 Output Files          step_id = 1068    global_flag = 0
sequence_no = 1 step_level = 4      parent_step_id = 1058 enabled_flag  -1
iterator_name = COUNTER                degree_parallelis 1
execution_mechanism = 2                continuation_criteria 2    failure_details =
step_file_name                                           version_no 0.0
start_directory = %ACID_DIR%                                           parent_version_no = 0.0
step_text = IF EXIST CONS\Stream2.out TYPE %OUTPUT_DIR%\Cons_-
             _ACID_Transactions_Stream_2.%COUNTER%.out >> CONS\Stream2.out

```

```

step_label = Cons - Concatenate Stream 3 Output Files          step_id = 1069    global_flag = 0
sequence_no = 1 step_level = 4      parent_step_id = 1059 enabled_flag  -1
iterator_name = COUNTER                degree_parallelis 1
execution_mechanism = 2                continuation_criteria 2    failure_details =
step_file_name                                           version_no 0.0
start_directory = %ACID_DIR%                                           parent_version_no = 0.0
step_text = IF EXIST CONS\Stream3.out TYPE %OUTPUT_DIR%\Cons_-
             _ACID_Transactions_Stream_3.%COUNTER%.out >> CONS\Stream3.out

```

```

step_label = Cons - Concatenate Stream 4 Output Files          step_id = 1070    global_flag = 0
sequence_no = 1 step_level = 4      parent_step_id = 1060 enabled_flag  -1
iterator_name = COUNTER                degree_parallelis 1
execution_mechanism = 2                continuation_criteria 2    failure_details =
step_file_name                                           version_no 0.0
start_directory = %ACID_DIR%                                           parent_version_no = 0.0
step_text = IF EXIST CONS\Stream4.out TYPE %OUTPUT_DIR%\Cons_-
             _ACID_Transactions_Stream_4.%COUNTER%.out >> CONS\Stream4.out

```

*step\_label* = Cons - Concatenate Stream 5 Output Files *step\_id* = 1071 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 4 *parent\_step\_id* = 1061 *enabled\_flag* = -1  
*iterator\_name* = COUNTER *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %ACID\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = IF EXIST CONS\Stream5.out TYPE %OUTPUT\_DIR%\Cons\_-\_ACID\_Transactions\_Stream\_5.%COUNTER%.out >> CONS\Stream5.out

*step\_label* = Cons - Concatenate Stream 6 Output Files *step\_id* = 1072 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 4 *parent\_step\_id* = 1062 *enabled\_flag* = 0  
*iterator\_name* = COUNTER *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %ACID\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = IF EXIST CONS\Stream6.out TYPE %OUTPUT\_DIR%\Cons\_-\_ACID\_Transactions\_Stream\_6.%COUNTER%.out >> CONS\Stream6.out

*step\_label* = Cons - Concatenate Stream 7 Output Files *step\_id* = 1073 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 4 *parent\_step\_id* = 1063 *enabled\_flag* = 0  
*iterator\_name* = COUNTER *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %ACID\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = IF EXIST CONS\Stream7.out TYPE %OUTPUT\_DIR%\Cons\_-\_ACID\_Transactions\_Stream\_7.%COUNTER%.out >> CONS\Stream7.out

*step\_label* = Cons - Concatenate Stream 8 Output Files *step\_id* = 1074 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 4 *parent\_step\_id* = 1064 *enabled\_flag* = 0  
*iterator\_name* = COUNTER *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %ACID\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = IF EXIST CONS\Stream8.out TYPE %OUTPUT\_DIR%\Cons\_  
\_ACID\_Transactions\_Stream\_8.%COUNTER%.out >> CONS\Stream8.out

*step\_label* = Cons - Concatenate Stream 9 Output Files *step\_id* = 1075 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 4 *parent\_step\_id* = 1065 *enabled\_flag* = 0  
*iterator\_name* = COUNTER *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %ACID\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = IF EXIST CONS\Stream9.out TYPE %OUTPUT\_DIR%\Cons\_  
\_ACID\_Transactions\_Stream\_9.%COUNTER%.out >> CONS\Stream9.out

*step\_label* = Cons - Concatenate Stream 10 Output Files *step\_id* = 1076 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 4 *parent\_step\_id* = 1066 *enabled\_flag* = 0  
*iterator\_name* = COUNTER *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %ACID\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = IF EXIST CONS\Stream10.out TYPE %OUTPUT\_DIR%\Cons\_  
\_ACID\_Transactions\_Stream\_10.%COUNTER%.out >> CONS\Stream10.out

*step\_label* = Dur - Concatenate Stream 1 Output Files *step\_id* = 1077 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 4 *parent\_step\_id* = 1047 *enabled\_flag* = -1  
*iterator\_name* = COUNTER *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %ACID\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = IF EXIST DUR\Stream1.out IF NOT EXIST %DEFAULT\_DIR%\%DUR\_RUN\_ID%\Dur\_-\_ACID\_Transactions\_Stream\_1.%COUNTER%.err TYPE  
%DEFAULT\_DIR%\%DUR\_RUN\_ID%\Dur\_-\_ACID\_Transactions\_Stream\_1.%COUNTER%.out >>  
DUR\Stream1.out

*step\_label* = Dur - Concatenate Stream 2 Output Files *step\_id* = 1078 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 4 *parent\_step\_id* = 1048 *enabled\_flag* = -1  
*iterator\_name* = COUNTER *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %ACID\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = IF EXIST DUR\Stream2.out IF NOT EXIST %DEFAULT\_DIR%\%DUR\_RUN\_ID%\Dur\_-\_ACID\_Transactions\_Stream\_2.%COUNTER%.err TYPE  
%DEFAULT\_DIR%\%DUR\_RUN\_ID%\Dur\_-\_ACID\_Transactions\_Stream\_2.%COUNTER%.out >>  
DUR\Stream2.out

*step\_label* = Dur - Concatenate Stream 3 Output Files *step\_id* = 1079 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 4 *parent\_step\_id* = 1049 *enabled\_flag* = -1  
*iterator\_name* = COUNTER *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %ACID\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = IF EXIST DUR\Stream3.out IF NOT EXIST %DEFAULT\_DIR%\%DUR\_RUN\_ID%\Dur\_-\_ACID\_Transactions\_Stream\_3.%COUNTER%.err TYPE  
%DEFAULT\_DIR%\%DUR\_RUN\_ID%\Dur\_-\_ACID\_Transactions\_Stream\_3.%COUNTER%.out >>  
DUR\Stream3.out

*step\_label* = Dur - Concatenate Stream 4 Output Files *step\_id* = 1080 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 4 *parent\_step\_id* = 1050 *enabled\_flag* = -1  
*iterator\_name* = COUNTER *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %ACID\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = IF EXIST DUR\Stream4.out IF NOT EXIST %DEFAULT\_DIR%\%DUR\_RUN\_ID%\Dur\_-\_ACID\_Transactions\_Stream\_4.%COUNTER%.err TYPE  
%DEFAULT\_DIR%\%DUR\_RUN\_ID%\Dur\_-\_ACID\_Transactions\_Stream\_4.%COUNTER%.out >>  
DUR\Stream4.out

*step\_label* = Dur - Concatenate Stream 5 Output Files *step\_id* = 1081 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 4 *parent\_step\_id* = 1051 *enabled\_flag* = -1  
*iterator\_name* = COUNTER *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %ACID\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = IF EXIST DUR\Stream5.out IF NOT EXIST %DEFAULT\_DIR%\%DUR\_RUN\_ID%\Dur\_-\_ACID\_Transactions\_Stream\_5.%COUNTER%.err TYPE  
%DEFAULT\_DIR%\%DUR\_RUN\_ID%\Dur\_-\_ACID\_Transactions\_Stream\_5.%COUNTER%.out >>  
DUR\Stream5.out

*step\_label* = Dur - Concatenate Stream 6 Output Files *step\_id* = 1082 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 4 *parent\_step\_id* = 1052 *enabled\_flag* = -1  
*iterator\_name* = COUNTER *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %ACID\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = IF EXIST DUR\Stream6.out IF NOT EXIST %DEFAULT\_DIR%\%DUR\_RUN\_ID%\Dur\_-\_ACID\_Transactions\_Stream\_6.%COUNTER%.err TYPE  
%DEFAULT\_DIR%\%DUR\_RUN\_ID%\Dur\_-\_ACID\_Transactions\_Stream\_6.%COUNTER%.out >>  
DUR\Stream6.out

*step\_label* = Dur - Concatenate Stream 7 Output Files *step\_id* = 1083 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 4 *parent\_step\_id* = 1053 *enabled\_flag* = -1  
*iterator\_name* = COUNTER *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %ACID\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = IF EXIST DUR\Stream7.out IF NOT EXIST %DEFAULT\_DIR%\%DUR\_RUN\_ID%\Dur\_-\_ACID\_Transactions\_Stream\_7.%COUNTER%.err TYPE  
%DEFAULT\_DIR%\%DUR\_RUN\_ID%\Dur\_-\_ACID\_Transactions\_Stream\_7.%COUNTER%.out >>  
DUR\Stream7.out

*step\_label* = Dur - Concatenate Stream 8 Output Files *step\_id* = 1084 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 4 *parent\_step\_id* = 1054 *enabled\_flag* = -1  
*iterator\_name* = COUNTER *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %ACID\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = IF EXIST DUR\Stream8.out IF NOT EXIST %DEFAULT\_DIR%\%DUR\_RUN\_ID%\Dur\_-\_ACID\_Transactions\_Stream\_8.%COUNTER%.err TYPE  
%DEFAULT\_DIR%\%DUR\_RUN\_ID%\Dur\_-\_ACID\_Transactions\_Stream\_8.%COUNTER%.out >>  
DUR\Stream8.out

*step\_label* = Dur - Concatenate Stream 9 Output Files *step\_id* = 1085 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 4 *parent\_step\_id* = 1055 *enabled\_flag* = -1  
*iterator\_name* = COUNTER *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %ACID\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = IF EXIST DUR\Stream9.out IF NOT EXIST %DEFAULT\_DIR%\%DUR\_RUN\_ID%\Dur\_-\_ACID\_Transactions\_Stream\_9.%COUNTER%.err TYPE  
%DEFAULT\_DIR%\%DUR\_RUN\_ID%\Dur\_-\_ACID\_Transactions\_Stream\_9.%COUNTER%.out >>  
DUR\Stream9.out

```

step_label = Dur - Concatenate Stream 10 Output Files          step_id = 1086    global_flag = 0
sequence_no = 1 step_level = 4          parent_step_id = 1056 enabled_flag = -1
iterator_name = COUNTER          degree_parallelis 1
execution_mechanism = 2          continuation_criteria 2    failure_details =
step_file_name          version_no 0.0
start_directory = %ACID_DIR%          parent_version_no = 0.0
step_text = IF EXIST DUR\Stream10.out IF NOT EXIST %DEFAULT_DIR%\%DUR_RUN_ID%\Dur_-
           _ACID_Transactions_Stream_10.%COUNTER%.err TYPE
           %DEFAULT_DIR%\%DUR_RUN_ID%\Dur_-_ACID_Transactions_Stream_10.%COUNTER%.out
           >> DUR\Stream10.out

```

## *Iterator\_values*

<i>workspac e_id</i>	<i>step_id</i>	<i>version _no</i>	<i>type iterator_value</i>	<i>sequence _no</i>
11	1040	0.0	1 611	0
11	1043	0.0	2 1410	0
11	1042	0.0	1 1011	0
11	1042	0.0	3 1	0
11	1042	0.0	2 1210	0
11	1041	0.0	2 1010	0
11	1041	0.0	3 1	0
11	941	0.0	1 1	0
11	1040	0.0	2 810	0
11	1044	0.0	3 1	0
11	1040	0.0	3 1	0
11	1039	0.0	2 610	0
11	1039	0.0	1 411	0

11	1039	0.0	3 1	0
11	1038	0.0	2 410	0
11	1038	0.0	1 211	0
11	1041	0.0	1 811	0
11	1046	0.0	1 1811	0
11	949	0.0	2 %NUM_STREAMS%	0
11	948	0.0	1 1	0
11	948	0.0	2 10	0
11	948	0.0	3 1	0
11	942	0.0	3 1	0
11	942	0.0	2 %NUM_STREAMS%	0
11	1043	0.0	3 1	0
11	1046	0.0	3 1	0
11	1043	0.0	1 1211	0
11	1046	0.0	2 2010	0
11	1045	0.0	1 1611	0
11	1045	0.0	2 1810	0
11	1045	0.0	3 1	0
11	1044	0.0	1 1411	0
11	1044	0.0	2 1610	0
11	1037	0.0	1 11	0
11	942	0.0	1 1	0
11	1028	0.0	3 1	0
11	1038	0.0	3 1	0
11	1031	0.0	3 1	0
11	1030	0.0	3 1	0
11	1030	0.0	2 250	0
11	1030	0.0	1 151	0
11	1029	0.0	3 1	0
11	1031	0.0	2 300	0
11	1029	0.0	1 101	0



11	1032	0.0	1 251	0
11	1028	0.0	2 150	0
11	1028	0.0	1 51	0
11	1027	0.0	1 11	0
11	1027	0.0	2 110	0
11	1027	0.0	3 1	0
11	941	0.0	3 1	0
11	941	0.0	2 10	0
11	1029	0.0	2 200	0
11	1034	0.0	1 351	0
11	1067	0.0	1 11	0
11	1037	0.0	2 210	0
11	1036	0.0	1 451	0
11	1036	0.0	2 550	0
11	1036	0.0	3 1	0
11	1035	0.0	1 401	0
11	1031	0.0	1 201	0
11	1035	0.0	3 1	0
11	1037	0.0	3 1	0
11	1034	0.0	2 450	0
11	1034	0.0	3 1	0
11	1033	0.0	1 301	0
11	1033	0.0	2 400	0
11	1033	0.0	3 1	0
11	1032	0.0	2 350	0
11	1032	0.0	3 1	0
11	1035	0.0	2 500	0
11	1081	0.0	1 811	0
11	1078	0.0	1 211	0
11	1083	0.0	1 1211	0
11	1083	0.0	2 1410	0

11	1083	0.0	3 1	0
11	1082	0.0	2 1210	0
11	1082	0.0	1 1011	0
11	1084	0.0	2 1610	0
11	1081	0.0	3 1	0
11	1084	0.0	1 1411	0
11	1081	0.0	2 1010	0
11	1080	0.0	3 1	0
11	1080	0.0	2 810	0
11	1080	0.0	1 611	0
11	1079	0.0	1 411	0
11	1079	0.0	2 610	0
11	949	0.0	3 1	0
11	1082	0.0	3 1	0
11	929	1.0	4 dur_tran.sql	8
11	929	1.0	4 iso34_tran_w_com.sql	10
11	929	1.0	4 acid_dur_tran.sql	6
11	929	1.0	4 iso6_tran_w_com.sql	9
11	929	1.0	4 acid_values.sql	0
11	929	1.0	4 acid_tran.sql	1
11	929	1.0	4 tran_w_rb.sql	3
11	1084	0.0	3 1	0
11	929	1.0	4 iso5_parts.sql	5
11	1078	0.0	2 410	0
11	929	1.0	4 cons_tran.sql	7
11	1086	0.0	2 2010	0
11	1086	0.0	3 1	0
11	1086	0.0	1 1811	0
11	1085	0.0	1 1611	0
11	1085	0.0	2 1810	0
11	1085	0.0	3 1	0

11	929	1.0	4 iso_query.sql	4
11	1069	0.0	3 1	0
11	1079	0.0	3 1	0
11	1071	0.0	1 201	0
11	1071	0.0	2 300	0
11	1071	0.0	3 1	0
11	1070	0.0	1 151	0
11	1070	0.0	2 250	0
11	1072	0.0	1 251	0
11	1069	0.0	1 101	0
11	1072	0.0	3 1	0
11	1069	0.0	2 200	0
11	1068	0.0	2 150	0
11	1068	0.0	1 51	0
11	1068	0.0	3 1	0
11	1067	0.0	2 110	0
11	1067	0.0	3 1	0
11	929	1.0	4 tran_w_com.sql	2
11	1070	0.0	3 1	0
11	1075	0.0	3 1	0
11	1078	0.0	3 1	0
11	1077	0.0	1 11	0
11	1077	0.0	3 1	0
11	1077	0.0	2 210	0
11	1076	0.0	1 451	0
11	1076	0.0	2 550	0
11	1072	0.0	2 350	0
11	1075	0.0	1 401	0
11	949	0.0	1 1	0
11	1075	0.0	2 500	0
11	1074	0.0	2 450	0

11	1074	0.0	1 351	0
11	1074	0.0	3 1	0
11	1073	0.0	1 301	0
11	1073	0.0	3 1	0
11	1073	0.0	2 400	0
11	1076	0.0	3 1	0

## *Workspace\_parameters*

<i>workspace_id =</i>	12	<i>parameter_id =</i>	202	<i>parameter_type =</i>	0
<i>parameter_name</i>		FLATFILE_DIR_16			
<i>parameter_value</i>		Z:\dev\b16\flat_files_16			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	204	<i>parameter_type =</i>	0
<i>parameter_name</i>		BCP_ROWS			
<i>parameter_value</i>		10000			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	203	<i>parameter_type =</i>	0
<i>parameter_name</i>		FLAT_FILE_PARALLELISM			
<i>parameter_value</i>		4			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	195	<i>parameter_type =</i>	0
<i>parameter_name</i>		FLATFILE_DIR_9			
<i>parameter_value</i>		Z:\dev\b09\flat_files_9			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	196	<i>parameter_type =</i>	0
<i>parameter_name</i>		FLATFILE_DIR_10			
<i>parameter_value</i>		Z:\dev\b10\flat_files_10			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	197	<i>parameter_type =</i>	0
<i>parameter_name</i>		FLATFILE_DIR_11			
<i>parameter_value</i>		Z:\dev\b11\flat_files_11			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	198	<i>parameter_type =</i>	0
<i>parameter_name</i>		FLATFILE_DIR_12			
<i>parameter_value</i>		Z:\dev\b12\flat_files_12			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	199	<i>parameter_type =</i>	0
<i>parameter_name</i>		FLATFILE_DIR_13			
<i>parameter_value</i>		Z:\dev\b13\flat_files_13			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	168	<i>parameter_type =</i>	0
<i>parameter_name</i>		FLATFILE_DIR_1			
<i>parameter_value</i>		Z:\dev\b01\flat_files_1			

<i>workspace_id =</i>	12	<i>parameter_id =</i>	201	<i>parameter_type =</i>	0
<i>parameter_name</i>		FLATFILE_DIR_15			
<i>parameter_value</i>		Z:\dev\b15\flat_files_15			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	147	<i>parameter_type =</i>	0
<i>parameter_name</i>		SETUP_DIR			
<i>parameter_value</i>		%KIT_DIR%\Setup			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	191	<i>parameter_type =</i>	0
<i>parameter_name</i>		FLATFILE_DIR_5			
<i>parameter_value</i>		Z:\dev\b05\flat_files_5			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	192	<i>parameter_type =</i>	0
<i>parameter_name</i>		FLATFILE_DIR_6			
<i>parameter_value</i>		Z:\dev\b06\flat_files_6			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	193	<i>parameter_type =</i>	0
<i>parameter_name</i>		FLATFILE_DIR_7			
<i>parameter_value</i>		Z:\dev\b07\flat_files_7			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	194	<i>parameter_type =</i>	0
<i>parameter_name</i>		FLATFILE_DIR_8			
<i>parameter_value</i>		Z:\dev\b08\flat_files_8			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	190	<i>parameter_type =</i>	0
<i>parameter_name</i>		TOTAL_LOAD_FILES_PER_TABLE			
<i>parameter_value</i>		64			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	189	<i>parameter_type =</i>	0
<i>parameter_name</i>		FILES_PER_UPDATE_SET			
<i>parameter_value</i>		64			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	185	<i>parameter_type =</i>	0
<i>parameter_name</i>		SERVER			
<i>parameter_value</i>		asama			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	200	<i>parameter_type =</i>	0
<i>parameter_name</i>		FLATFILE_DIR_14			
<i>parameter_value</i>		Z:\dev\b14\flat_files_14			

<i>workspace_id =</i>	12	<i>parameter_id =</i>	157	<i>parameter_type =</i>	3
<i>parameter_name</i>		DEFAULT_DIR			
<i>parameter_value</i>		%KIT_DIR%\OUTPUT			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	166	<i>parameter_type =</i>	0
<i>parameter_name</i>		FLATFILE_DIR_3			
<i>parameter_value</i>		Z:\dev\b03\flat_files_3			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	165	<i>parameter_type =</i>	0
<i>parameter_name</i>		FLATFILE_DIR_4			
<i>parameter_value</i>		Z:\dev\b04\flat_files_4			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	164	<i>parameter_type =</i>	3
<i>parameter_name</i>		RUN_ID			
<i>parameter_value</i>		182			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	163	<i>parameter_type =</i>	0
<i>parameter_name</i>		KIT_DIR			
<i>parameter_value</i>		E:\mstpch.101d			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	162	<i>parameter_type =</i>	0
<i>parameter_name</i>		RUN_DIR			
<i>parameter_value</i>		%KIT_DIR%\run			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	161	<i>parameter_type =</i>	0
<i>parameter_name</i>		QUERY_DIR			
<i>parameter_value</i>		%RUN_DIR%\Queries			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	160	<i>parameter_type =</i>	0
<i>parameter_name</i>		TEMPLATE_DIR			
<i>parameter_value</i>		%RUN_DIR%\templates			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	145	<i>parameter_type =</i>	0
<i>parameter_name</i>		TRACEFLAGS			
<i>parameter_value</i>		-c -x -E -T3502			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	158	<i>parameter_type =</i>	0
<i>parameter_name</i>		TOOLS_DIR			
<i>parameter_value</i>		%KIT_DIR%\tools			

<i>workspace_id =</i>	12	<i>parameter_id =</i>	146	<i>parameter_type =</i>	0
<i>parameter_name</i>		DBNAME			
<i>parameter_value</i>		tpch1t			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	156	<i>parameter_type =</i>	0
<i>parameter_name</i>		RF_FLATFILE_DIR			
<i>parameter_value</i>		Z:\dev\b17\tpch1t_RF_FlatFile_DIR			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	155	<i>parameter_type =</i>	0
<i>parameter_name</i>		TABLE_LOAD_PARALLELISM			
<i>parameter_value</i>		16			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	154	<i>parameter_type =</i>	0
<i>parameter_name</i>		INDEX_CREATE_PARALLELISM			
<i>parameter_value</i>		3			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	153	<i>parameter_type =</i>	0
<i>parameter_name</i>		VALIDATION_DIR			
<i>parameter_value</i>		%SETUP_DIR%\Validation			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	150	<i>parameter_type =</i>	0
<i>parameter_name</i>		UPDATE_SETS			
<i>parameter_value</i>		40			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	149	<i>parameter_type =</i>	0
<i>parameter_name</i>		SCALEFACTOR			
<i>parameter_value</i>		1000			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	148	<i>parameter_type =</i>	3
<i>parameter_name</i>		OUTPUT_DIR			
<i>parameter_value</i>		E:\MSTPCH~1.101\OUTPUT\182			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	167	<i>parameter_type =</i>	0
<i>parameter_name</i>		FLATFILE_DIR_2			
<i>parameter_value</i>		Z:\dev\b02\flat_files_2			
<i>workspace_id =</i>	12	<i>parameter_id =</i>	159	<i>parameter_type =</i>	0
<i>parameter_name</i>		MAX_STREAMS			
<i>parameter_value</i>		7			



## Connection\_dtls

<i>works pace_id</i>	<i>connectio n_name_id</i>	<i>connection_name</i>	<i>connection_string_nam e</i>	<i>connecti on_type</i>
12	88	Dynamic_connection_to_MASTER_Node1	MASTERDBCONNECTION_NO DE1	2
12	89	Dynamic_connection_to_MASTER_Node2	MASTERDBCONNECTION_NO DE2	2
12	90	Dynamic_connection_to_MASTER_Node3	MASTERDBCONNECTION_NO DE3	2
12	91	Dynamic_connection_to_MASTER_Node4	MASTERDBCONNECTION_NO DE4	2
12	70	Static_Connection_to_Master	MASTERDBCONNECTION	1
12	69	Static_Connection_to_DB	DBCONNECTION	1
12	68	Dynamic_Connection_to_Master	MASTERDBCONNECTION	2
12	67	Dynamic_Connection_to_DB	DBCONNECTION	2

## Workspace\_connections

<i>workspace_id</i>	12
<i>connection_i</i>	19
<i>connection_nam</i>	MASTERDBCONNECTION
<i>connection_valu</i>	DRIVER=SQL Server;SERVER=%SERVER%;UID=sa;PWD=;
<i>description</i>	
<i>no_count_displa</i>	0
<i>no_execute</i>	0
<i>parse_query_only</i>	0
<i>ANSI_quoted_identifiers</i>	0
<i>ANSI_nulls</i>	-1
<i>show_query_pla</i>	0
<i>show_stats_time</i>	0
<i>show_stats_io</i>	0
<i>parse_odbc_msg_prefixes</i>	-1
<i>row_count</i>	0
<i>tsql_batch_separator</i>	GO
<i>query_time_out</i>	1
<i>server_language</i>	(Default)
<i>character_translatio</i>	-1
<i>regional_settings</i>	0
<i>workspace_id</i>	12
<i>connection_i</i>	18

<i>connection_name</i>	DBCONNECTION
<i>connection_value</i>	DRIVER=SQL Server;SERVER=%SERVER%;UID=sa;PWD=;DATABASE=%DBNAME%;
<i>description</i>	
<i>no_count_display</i>	0
<i>no_execute</i>	0
<i>parse_query_only</i>	0
<i>ANSI_quoted_identifiers</i>	0
<i>ANSI_nulls</i>	-1
<i>show_query_plan</i>	0
<i>show_stats_time</i>	0
<i>show_stats_io</i>	0
<i>parse_odbc_msg_prefixes</i>	-1
<i>row_count</i>	0
<i>tsql_batch_separator</i>	GO
<i>query_time_out</i>	1
<i>server_language</i>	(Default)
<i>character_translatio</i>	-1
<i>regional_settings</i>	0

## *Att\_steps*

*workspace\_id* 12

<i>step_label</i> =	SqlServer Startup	<i>step_id</i> =	1087	<i>global_flag</i> =	-1
<i>sequence_no</i> =	1	<i>step_level</i> =	0	<i>parent_step_id</i> =	0
<i>iterator_name</i> =		<i>degree_parallelis</i>	0	<i>enabled_flag</i>	0
<i>execution_mechanism</i> =	2	<i>continuation_criteria</i>	0	<i>failure_details</i> =	
<i>step_file_name</i>		<i>version_no</i>	4.0	<i>parent_version_no</i> =	0.0
<i>start_directory</i> =					
<i>step_text</i> =	start /D "C:\Program Files\Microsoft SQL Server\MSSQL.1\MSSQL\Binn" sqlservr %TRACEFLAGS%				
	%TOOLS_DIR%\Utility\wait4sql 900000				

*step\_label* = SqlServer Shutdown *step\_id* = 1088 *global\_flag* = -1  
*sequence\_no* = 2 *step\_level* = 0 *parent\_step\_id* = 0 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 0  
*execution\_mechanism* = 2 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 3.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* = osql -Usa -P -t10 -Q"shutdown"  
%TOOLS\_DIR%\Utility\wait4sql 10000

*step\_label* = Wait For SQL Server *step\_id* = 1089 *global\_flag* = -1  
*sequence\_no* = 3 *step\_level* = 0 *parent\_step\_id* = 0 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 0  
*execution\_mechanism* = 2 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = %TOOLS\_DIR%\Utility\wait4sql.exe 60000

*step\_label* = Generate FlatFiles *step\_id* = 1090 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 0 *parent\_step\_id* = 0 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 20.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Start SqlServer *step\_id* = 1091 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 0 *parent\_step\_id* = 0 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 15.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Create database *step\_id* = 1092 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 0 *parent\_step\_id* = 0 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 84.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Configure SqlServer *step\_id* = 1093 *global\_flag* = 0  
*sequence\_no* = 4 *step\_level* = 0 *parent\_step\_id* = 0 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 57.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Create and Load Tables *step\_id* = 1094 *global\_flag* = 0  
*sequence\_no* = 5 *step\_level* = 0 *parent\_step\_id* = 0 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 91.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Create Indexes and Statistics *step\_id* = 1095 *global\_flag* = 0  
*sequence\_no* = 6 *step\_level* = 0 *parent\_step\_id* = 0 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 42.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Prep Database, End of Load *step\_id* = 1096 *global\_flag* = 0  
*sequence\_no* = 7 *step\_level* = 0 *parent\_step\_id* = 0 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 74.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Backup TPC-H Database (If not used for ACID) *step\_id* = 1097 *global\_flag* = 0  
*sequence\_no* = 8 *step\_level* = 0 *parent\_step\_id* = 0 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 21.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Capture Database and Table Space Used (Do Not Use) *step\_id* = 1098 *global\_flag* = 0  
*sequence\_no* = 9 *step\_level* = 0 *parent\_step\_id* = 0 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 5.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Generate Queries via QGen *step\_id* = 1099 *global\_flag* = 0  
*sequence\_no* = 10 *step\_level* = 0 *parent\_step\_id* = 0 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 12.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Validation (for SCALEFACTOR=1 Only) *step\_id* = 1100 *global\_flag* = 0  
*sequence\_no* = 11 *step\_level* = 0 *parent\_step\_id* = 0 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 1.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Generate Query Plans *step\_id* = 1101 *global\_flag* = 0  
*sequence\_no* = 12 *step\_level* = 0 *parent\_step\_id* = 0 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 12.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Generate FlatFiles in Parallel *step\_id* = 1102 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 1 *parent\_step\_id* = 1090 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %TOTAL\_LOAD\_FILES\_PER\_TABLE%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 7.0  
*start\_directory* = *parent\_version\_no* = 20.0  
*step\_text* =

*step\_label* = Generate Update Files *step\_id* = 1103 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 1 *parent\_step\_id* = 1090 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 4.0  
*start\_directory* = %RF\_FLATFILE\_DIR% *parent\_version\_no* = 20.0  
*step\_text* = %TOOLS\_DIR%\DBGEN\dbgen -q -b %TOOLS\_DIR%\dists.dss -U %UPDATE\_SETS% -s  
 %SCALEFACTOR% -f -C %UPDATE\_SETS% -i %FILES\_PER\_UPDATE\_SET% -d  
 %FILES\_PER\_UPDATE\_SET%

*step\_label* = Start SqlServer *step\_id* = 1104 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 1 *parent\_step\_id* = 1091 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 1 *failure\_details* =  
*step\_file\_name* *version\_no* = 4.0  
*start\_directory* = C:\Program Files\Microsoft SQL Server\MSSQL.1\MSSQL\Binn *parent\_version\_no* = 15.0  
*step\_text* = start /D "C:\Program Files\Microsoft SQL Server\MSSQL.1\MSSQL\Binn" sqlservr %TRACEFLAGS%  
%TOOLS\_DIR%\Utility\wait4sql 900000

*step\_label* = Create TPC-H Database *step\_id* = 1105 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 1 *parent\_step\_id* = 1092 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 1 *failure\_details* =  
*step\_file\_name* %SETUP\_DIR%\%DBNAME%\CreateDatabase.sql *version\_no* = 17.0  
*start\_directory* = Static\_Connection\_to\_Master *parent\_version\_no* = 84.0  
*step\_text* =

*step\_label* = Set Database Options *step\_id* = 1106 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 1 *parent\_step\_id* = 1092 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 1 *failure\_details* =  
*step\_file\_name* *version\_no* = 4.0  
*start\_directory* = Static\_Connection\_to\_Master *parent\_version\_no* = 84.0  
*step\_text* = sp\_dboption %DBNAME%, 'trunc. log on chkpt.', true  
GO  
sp\_dboption '%DBNAME%', 'auto create statistics', 'OFF'  
GO  
sp\_dboption '%DBNAME%', 'auto update statistics', 'OFF'  
GO  
alter database %DBNAME% set PAGE\_VERIFY NONE  
GO

*step\_label* = Move TempDB *step\_id* = 1108 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 1 *parent\_step\_id* = 1093 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %SETUP\_DIR%\%DBNAME%\tempdb\MoveTempDB.sql *version\_no* = 21.0  
*start\_directory* = Dynamic\_Connection\_to\_Master *parent\_version\_no* = 57.0  
*step\_text* =

*step\_label* = ReSize TempDB *step\_id* = 1109 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 1 *parent\_step\_id* = 1093 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %SETUP\_DIR%\%DBNAME%\tempdb\ReSizeTempDB.sql *version\_no* = 19.0  
*start\_directory* = Dynamic\_Connection\_to\_Master *parent\_version\_no* = 57.0  
*step\_text* =

*step\_label* = (Drop/)Create Tables *step\_id* = 1111 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 1 *parent\_step\_id* = 1094 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 12.0  
*start\_directory* = *parent\_version\_no* = 91.0  
*step\_text* =

*step\_label* = Parallel Partitioned Table Load *step\_id* = 1112 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 1 *parent\_step\_id* = 1094 *enabled\_flag* = -1  
*iterator\_name* = TABLE *degree\_parallelis* = %TABLE\_LOAD\_PARALLELISM%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 32.0  
*start\_directory* = *parent\_version\_no* = 91.0  
*step\_text* =



*step\_label* = Parallel Load Simple Tables *step\_id* = 1113 *global\_flag* = 0  
*sequence\_no* = 4 *step\_level* = 1 *parent\_step\_id* = 1094 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %TABLE\_LOAD\_PARALLELISM%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 13.0  
*start\_directory* = *parent\_version\_no* = 91.0  
*step\_text* =

*step\_label* = Create NC Indexes in Parallel *step\_id* = 1116 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 1 *parent\_step\_id* = 1095 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %INDEX\_CREATE\_PARALLELISM%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 7.2  
*start\_directory* = *parent\_version\_no* = 42.0  
*step\_text* =

*step\_label* = Reset DB\_Option *step\_id* = 1119 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 1 *parent\_step\_id* = 1096 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 1 *failure\_details* =  
*step\_file\_name* *version\_no* = 8.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 74.0  
*step\_text* = sp\_dboption %DBNAME%, 'trunc. log on chkpt.',false  
 GO

*step\_label* = Install Refresh Function Stored Procedures *step\_id* = 1120 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 1 *parent\_step\_id* = 1096 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %MAX\_STREAMS%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 5.1  
*start\_directory* = *parent\_version\_no* = 74.0  
*step\_text* =

*step\_label* = Backup TPC-H Database (Only if using backup to *step\_id* = 1121 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 1 *parent\_step\_id* = 1096 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 2.0  
*start\_directory* = *parent\_version\_no* = 74.0  
*step\_text* =

*step\_label* = End of Load *step\_id* = 1122 *global\_flag* = 0  
*sequence\_no* = 4 *step\_level* = 1 *parent\_step\_id* = 1096 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 1 *failure\_details* =  
*step\_file\_name* *version\_no* = 7.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 74.0  
*step\_text* = UPDATE TPCH\_AUX\_TABLE SET LoadFinish = getdate()  
GO  
  
SELECT LoadStart AS 'Load Start TimeStamp',  
LoadFinish AS 'Load Finish TimeStamp',  
QgenSeed AS 'Generated QGen Seed'  
FROM TPCH\_AUX\_TABLE  
GO

*step\_label* = Verify TPC-H Load *step\_id* = 1123 *global\_flag* = 0  
*sequence\_no* = 5 *step\_level* = 1 *parent\_step\_id* = 1096 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* %SETUP\_DIR%\Utility\VerifyTpchLoad.sql *version\_no* = 4.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 74.0  
*step\_text* =

<i>step_label</i> =	Generate QGEN Seed	<i>step_id</i> =	1124	<i>global_flag</i> =	0
<i>sequence_no</i> =	6	<i>step_level</i> =	1	<i>parent_step_id</i> =	1096
				<i>enabled_flag</i>	-1
<i>iterator_name</i> =		<i>degree_parallelis</i>	1		
<i>execution_mechanism</i> =	1	<i>continuation_criteria</i>	2	<i>failure_details</i> =	
<i>step_file_name</i>				<i>version_no</i>	6.0
<i>start_directory</i> =	Dynamic_Connection_to_DB			<i>parent_version_no</i> =	74.0
<i>step_text</i> =	DECLARE @Finish datetime DECLARE @seed0 integer  -- -- Get ending time of database load -- SELECT @Finish=LoadFinish FROM TPCH_AUX_TABLE  -- -- Calculate seed per clause 2.1.3.3 -- SET @seed0 = CONVERT(integer,100000000*DATEPART(MM,@Finish)+1000000*DATEPART(DD,@Finish)+1000 0*DATEPART(HH,@Finish)+100*DATEPART(MI,@Finish)+DATEPART(SS,@Finish))  -- -- Update the benchmark auxillary table -- UPDATE TPCH_AUX_TABLE SET QgenSeed=@seed0  SELECT * from TPCH_AUX_TABLE				

<i>step_label</i> =	Create Backup Device(s)	<i>step_id</i> =	1125	<i>global_flag</i> =	0
<i>sequence_no</i> =	1	<i>step_level</i> =	1	<i>parent_step_id</i> =	1097
				<i>enabled_flag</i>	-1
<i>iterator_name</i> =		<i>degree_parallelis</i>	1		
<i>execution_mechanism</i> =	1	<i>continuation_criteria</i>	2	<i>failure_details</i> =	
<i>step_file_name</i>	%SETUP_DIR%%\%DBNAME%\CreateBackupDevices.sql			<i>version_no</i>	3.0
<i>start_directory</i> =	Dynamic_Connection_to_Master			<i>parent_version_no</i> =	21.0
<i>step_text</i> =					

```

step_label = Execute the backup                step_id = 1126    global_flag = 0
sequence_no = 2 step_level = 1                parent_step_id = 1097 enabled_flag = -1
iterator_name =                                degree_parallelis 1
execution_mechanism = 1                       continuation_criteria 2    failure_details =
step_file_name  %SETUP_DIR%\%DBNAME%\BackupDatabase.sql          version_no 3.0
start_directory = Dynamic_Connection_to_Master                    parent_version_no = 21.0
step_text =

```

```

step_label = Execute DBCC UPDATEUSAGE          step_id = 1127    global_flag = 0
sequence_no = 1 step_level = 1                parent_step_id = 1098 enabled_flag = -1
iterator_name =                                degree_parallelis 1
execution_mechanism = 1                       continuation_criteria 2    failure_details =
step_file_name                                version_no 1.0
start_directory = Dynamic_Connection_to_DB                    parent_version_no = 5.0
step_text = --
-- Correct any potential inaccuracies in the system tables before running sp_spaceused
--

dbcc updateusage (%DBNAME%)
GO

dbcc updateusage (tempdb)
GO

```

```

step_label = Execute SpaceUsed Procedure          step_id = 1128    global_flag = 0
sequence_no = 2  step_level = 1  parent_step_id = 1098  enabled_flag = -1
iterator_name =                                degree_parallelis 1
execution_mechanism = 1  continuation_criteria 2  failure_details =
step_file_name                                version_no 1.0
start_directory = Dynamic_Connection_to_DB      parent_version_no = 5.0
step_text = sp_spaceused
            GO
            sp_spaceused 'REGION'
            GO
            sp_spaceused 'NATION'
            GO
            sp_spaceused 'PART'
            GO
            sp_spaceused 'SUPPLIER'
            GO
            sp_spaceused 'PARTSUPP'
            GO
            sp_spaceused 'CUSTOMER'
            GO
            sp_spaceused 'ORDERS'
            GO
            sp_spaceused 'LINEITEM'
            GO

```

*step\_label* = Execute Table Row Counts *step\_id* = 1129 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 1 *parent\_step\_id* = 1098 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 1.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 5.0  
*step\_text* = print 'Count of REGION Table'  
GO  
select count(\*) from REGION  
GO  
print 'Count of NATION Table'  
GO  
select count(\*) from NATION  
GO  
print 'Count of PART Table'  
GO  
select count(\*) from PART  
GO  
print 'Count of SUPPLIER Table'  
GO  
select count(\*) from SUPPLIER  
GO  
print 'Count of PARTSUPP Table'  
GO  
select count(\*) from PARTSUPP  
GO  
print 'Count of CUSTOMER Table'  
GO  
select count(\*) from CUSTOMER  
GO  
print 'Count of ORDERS Table'  
GO  
select count(\*) from ORDERS  
GO  
print 'Count of LINEITEM Table'  
GO  
select count\_big(\*) from LINEITEM  
GO

*step\_label* = Execute Log File Spaceused *step\_id* = 1130 *global\_flag* = 0  
*sequence\_no* = 4 *step\_level* = 1 *parent\_step\_id* = 1098 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 1.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 5.0  
*step\_text* = dbcc sqlperf(logspace)

*step\_label* = Execute TempDB spaceused *step\_id* = 1131 *global\_flag* = 0  
*sequence\_no* = 5 *step\_level* = 1 *parent\_step\_id* = 1098 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 1.0  
*start\_directory* = Dynamic\_Connection\_to\_Master *parent\_version\_no* = 5.0  
*step\_text* = use tempdb  
GO  
  
sp\_spaceused  
GO  
  
use %DBNAME%  
GO

*step\_label* = Generate Power Queries *step\_id* = 1132 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 1 *parent\_step\_id* = 1099 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 2.2  
*start\_directory* = *parent\_version\_no* = 12.0  
*step\_text* =

*step\_label* = Generate Stream Queries *step\_id* = 1133 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 1 *parent\_step\_id* = 1099 *enabled\_flag* = -1  
*iterator\_name* = STREAM\_NUM *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 2.1  
*start\_directory* = *parent\_version\_no* = 12.0  
*step\_text* =

```

step_label = Generate Validation Queries via QGEN                step_id = 1134    global_flag = 0
sequence_no = 1 step_level = 1    parent_step_id = 1100 enabled_flag -1
iterator_name =                degree_parallelis %MAX_STREAMS%
execution_mechanism = 0        continuation_criteria 0    failure_details =
step_file_name                version_no 0.0
start_directory =                parent_version_no = 1.0
step_text =

```

```

step_label = Execute Validation Queries                step_id = 1135    global_flag = 0
sequence_no = 2 step_level = 1    parent_step_id = 1100 enabled_flag -1
iterator_name =                degree_parallelis 1
execution_mechanism = 0        continuation_criteria 0    failure_details =
step_file_name                version_no 0.0
start_directory =                parent_version_no = 1.0
step_text =

```

```

step_label = Relocate Validation Query Output Files    step_id = 1136    global_flag = 0
sequence_no = 3 step_level = 1    parent_step_id = 1100 enabled_flag -1
iterator_name = QUERY                degree_parallelis 1
execution_mechanism = 2        continuation_criteria 2    failure_details =
step_file_name                version_no 0.0
start_directory = %VALIDATION_DIR%    parent_version_no = 1.0
step_text =
::
:: Copy the StepMaster Query output file to the Validation\Run_Output directory
::
copy %OUTPUT_DIR%\Validation_Query_%QUERY%.out
%VALIDATION_DIR%\RUN_OUTPUT\Validation_Query_%QUERY%.out

```



```

step_label = Execute SHOWPLAN ALL for Each Query          step_id = 1137    global_flag = 0
sequence_no = 1 step_level = 1    parent_step_id = 1101 enabled_flag = -1
iterator_name = QUERY                degree_parallelis 1
execution_mechanism = 2              continuation_criteria 2    failure_details =
step_file_name                                version_no 1.0
start_directory = %SETUP_DIR%                parent_version_no = 12.0
step_text =
::
:: First Build the query with the appropriate SQL ShowPlan commands
::
copy %SETUP_DIR%\showplan_sql\set_showplan_all_on.sql
%SETUP_DIR%\showplan_queries\SP_ALL_%QUERY%.SQL
type %QUERY_DIR%\Power\%QUERY%.SQL >>
%SETUP_DIR%\showplan_queries\SP_ALL_%QUERY%.SQL
type %SETUP_DIR%\showplan_sql\set_showplan_all_off.sql >>
%SETUP_DIR%\showplan_queries\SP_ALL_%QUERY%.SQL

::
:: Now execute the query, placing the output in %SETUP_DIR%\Showplan_Out
::
osql -I -t600 -Usa -P -w1000 -S%SERVER% -d %DBNAME% -e -i
%SETUP_DIR%\showplan_queries\SP_ALL_%QUERY%.sql -w 4096 -o
%SETUP_DIR%\showplan_Out\SP_ALL_%QUERY%.out

```

```

step_label = Execute SHOWPLAN TEXT for Each Query        step_id = 1138    global_flag = 0
sequence_no = 2 step_level = 1    parent_step_id = 1101 enabled_flag = -1
iterator_name = QUERY                degree_parallelis 1
execution_mechanism = 2              continuation_criteria 2    failure_details =
step_file_name                                version_no 1.0
start_directory = %SETUP_DIR%                parent_version_no = 12.0
step_text =
::
:: First Build the query with the appropriate SQL ShowPlan commands
::
copy %SETUP_DIR%\showplan_sql\set_showplan_text_on.sql
%SETUP_DIR%\showplan_queries\SP_TEXT_%QUERY%.SQL
type %QUERY_DIR%\Power\%QUERY%.SQL >>
%SETUP_DIR%\showplan_queries\SP_TEXT_%QUERY%.SQL
type %SETUP_DIR%\showplan_sql\set_showplan_text_off.sql >>
%SETUP_DIR%\showplan_queries\SP_TEXT_%QUERY%.SQL

::
:: Now execute the query, placing the output in %SETUP_DIR%\Showplan_Out
::
osql -I -t600 -Usa -P -w1000 -S%SERVER% -d %DBNAME% -e -i
%SETUP_DIR%\showplan_queries\SP_TEXT_%QUERY%.sql -w 4096 -o
%SETUP_DIR%\showplan_Out\SP_TEXT_%QUERY%.out

```

```

step_label = Generate Flat Files to FlatFile_Dir_1          step_id = 1140    global_flag = 0
sequence_no = 1 step_level = 2          parent_step_id = 1102  enabled_flag = -1
iterator_name = PARALLEL_PROCESS          degree_parallelis = 4
execution_mechanism = 2          continuation_criteria = 2          failure_details =
step_file_name          version_no = 10.0
start_directory = %FLATFILE_DIR_1%          parent_version_no = 7.0
step_text = :: Generate Data for REGION and NATION Tables
             %TOOLS_DIR%\DBGen\dbgen -T l -fF -q -b %TOOLS_DIR%\dists.dss -s%SCALEFACTOR% -
             C%TOTAL_LOAD_FILES_PER_TABLE% -S%PARALLEL_PROCESS%

             :: Generate Data for CUSTOMER Table
             %TOOLS_DIR%\DBGen\dbgen -T c -fF -q -b %TOOLS_DIR%\dists.dss -s%SCALEFACTOR% -
             C%TOTAL_LOAD_FILES_PER_TABLE% -S%PARALLEL_PROCESS%

             :: Generate Data for ORDERS and LINEITEM Tables
             %TOOLS_DIR%\DBGen\dbgen -T o -fF -q -b %TOOLS_DIR%\dists.dss -s%SCALEFACTOR% -
             C%TOTAL_LOAD_FILES_PER_TABLE% -S%PARALLEL_PROCESS%

             :: Generate Data for PARTS/PARTSUPP Table
             %TOOLS_DIR%\DBGen\dbgen -T p -fF -q -b %TOOLS_DIR%\dists.dss -s%SCALEFACTOR% -
             C%TOTAL_LOAD_FILES_PER_TABLE% -S%PARALLEL_PROCESS%

             :: Generate Data for SUPPLIER Table
             %TOOLS_DIR%\DBGen\dbgen -T s -fF -q -b %TOOLS_DIR%\dists.dss -s%SCALEFACTOR% -
             C%TOTAL_LOAD_FILES_PER_TABLE% -S%PARALLEL_PROCESS%

```

*step\_label* = Generate Flat Files to FlatFile\_Dir\_2 *step\_id* = 1141 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 2 *parent\_step\_id* = 1102 *enabled\_flag* = -1  
*iterator\_name* = PARALLEL\_PROCESS *degree\_parallelis* = 4  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 8.0  
*start\_directory* = %FLATFILE\_DIR\_2% *parent\_version\_no* = 7.0  
*step\_text* = :: Generate Data for CUSTOMER Table  
%TOOLS\_DIR%\DBGen\dbgen -T c -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for ORDERS and LINEITEM Tables  
%TOOLS\_DIR%\DBGen\dbgen -T o -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for PARTS/PARTSUPP Table  
%TOOLS\_DIR%\DBGen\dbgen -T p -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for SUPPLIER Table  
%TOOLS\_DIR%\DBGen\dbgen -T s -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%

*step\_label* = Generate Flat Files to FlatFile\_Dir\_3 *step\_id* = 1142 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 2 *parent\_step\_id* = 1102 *enabled\_flag* = -1  
*iterator\_name* = PARALLEL\_PROCESS *degree\_parallelis* = 4  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 9.0  
*start\_directory* = %FLATFILE\_DIR\_3% *parent\_version\_no* = 7.0  
*step\_text* = :: Generate Data for CUSTOMER Table  
%TOOLS\_DIR%\DBGen\dbgen -T c -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for ORDERS and LINEITEM Tables  
%TOOLS\_DIR%\DBGen\dbgen -T o -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for PARTS/PARTSUPP Table  
%TOOLS\_DIR%\DBGen\dbgen -T p -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for SUPPLIER Table  
%TOOLS\_DIR%\DBGen\dbgen -T s -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%

*step\_label* = Generate Flat Files to FlatFile\_Dir\_4 *step\_id* = 1143 *global\_flag* = 0  
*sequence\_no* = 4 *step\_level* = 2 *parent\_step\_id* = 1102 *enabled\_flag* = -1  
*iterator\_name* = PARALLEL\_PROCESS *degree\_parallelis* = 4  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 7.0  
*start\_directory* = %FLATFILE\_DIR\_4% *parent\_version\_no* = 7.0  
*step\_text* = :: Generate Data for CUSTOMER Table  
%TOOLS\_DIR%\DBGen\dbgen -T c -ff -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for ORDERS and LINEITEM Tables  
%TOOLS\_DIR%\DBGen\dbgen -T o -ff -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for PARTS/PARTSUPP Table  
%TOOLS\_DIR%\DBGen\dbgen -T p -ff -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for SUPPLIER Table  
%TOOLS\_DIR%\DBGen\dbgen -T s -ff -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%

*step\_label* = Create Auxilliary Table *step\_id* = 1145 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 2 *parent\_step\_id* = 1111 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* %SETUP\_DIR%\Utility\CreateBuildTimer.sql *version\_no* = 8.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 12.0  
*step\_text* =

*step\_label* = Create Base Tables *step\_id* = 1146 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 2 *parent\_step\_id* = 1111 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 1 *failure\_details* =  
*step\_file\_name* %SETUP\_DIR%\%DBNAME%\CreateTables.sql *version\_no* = 6.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 12.0  
*step\_text* =

*step\_label* = Load Nation Table *step\_id* = 1155 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 2 *parent\_step\_id* = 1113 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 1 *failure\_details* =  
*step\_file\_name* *version\_no* = 1.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 13.0  
*step\_text* = bulk insert %DBNAME%..NATION  
from '%FLATFILE\_DIR\_1%\nation.tbl'  
with (FieldTerminator = '|', RowTerminator = '\\n',tablock)

*step\_label* = Load Region Table *step\_id* = 1156 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 2 *parent\_step\_id* = 1113 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 1 *failure\_details* =  
*step\_file\_name* *version\_no* = 1.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 13.0  
*step\_text* = bulk insert %DBNAME%..REGION  
from '%FLATFILE\_DIR\_1%\region.tbl'  
with (FieldTerminator = '|', RowTerminator = '\\n',tablock)

*step\_label* = CreateIndexStream1 *step\_id* = 1157 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 2 *parent\_step\_id* = 1116 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 1 *failure\_details* =  
*step\_file\_name* %SETUP\_DIR%%DBNAME%\CreateIndexesStream1.sql *version\_no* = 6.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 7.2  
*step\_text* =

*step\_label* = CreateIndexStream2 *step\_id* = 1158 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 2 *parent\_step\_id* = 1116 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 1 *failure\_details* =  
*step\_file\_name* = %SETUP\_DIR%\%DBNAME%\CreateIndexesStream2.sql *version\_no* = 6.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 7.2  
*step\_text* =

*step\_label* = CreateIndexStream3 *step\_id* = 1159 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 2 *parent\_step\_id* = 1116 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 1 *failure\_details* =  
*step\_file\_name* = %SETUP\_DIR%\%DBNAME%\CreateIndexesStream3.sql *version\_no* = 5.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 7.2  
*step\_text* =

*step\_label* = Create Backup Device(s) (For ACID) *step\_id* = 1164 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 2 *parent\_step\_id* = 1121 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %SETUP\_DIR%\%DBNAME%\CreateBackupDevices.sql *version\_no* = 0.0  
*start\_directory* = Dynamic\_Connection\_to\_Master *parent\_version\_no* = 2.0  
*step\_text* =

*step\_label* = Execute the backup (For ACID) *step\_id* = 1165 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 2 *parent\_step\_id* = 1121 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %SETUP\_DIR%\%DBNAME%\BackupDatabase.sql *version\_no* = 0.0  
*start\_directory* = Dynamic\_Connection\_to\_Master *parent\_version\_no* = 2.0  
*step\_text* =

*step\_label* = Install RF1 Stored Procedure(s) *step\_id* = 1166 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 2 *parent\_step\_id* = 1120 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %SETUP\_DIR%\RF\_Procs\CreateRF1Proc.sql *version\_no* = 7.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 5.1  
*step\_text* =

*step\_label* = Install RF2 Stored Procedure(s) *step\_id* = 1167 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 2 *parent\_step\_id* = 1120 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %SETUP\_DIR%\RF\_Procs\CreateRF2Proc.sql *version\_no* = 7.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 5.1  
*step\_text* =

*step\_label* = Generate Power Query Directory *step\_id* = 1168 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 2 *parent\_step\_id* = 1132 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 1 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %RUN\_DIR% *parent\_version\_no* = 2.2  
*step\_text* = if not exist %QUERY\_DIR%\Power mkdir %QUERY\_DIR%\Power

```

step_label = Generate QGen Command File                step_id = 1169    global_flag = 0
sequence_no = 2 step_level = 2 parent_step_id = 1132 enabled_flag -1
iterator_name = degree_parallelis 1
execution_mechanism = 2 continuation_criteria 1 failure_details =
step_file_name version_no 2.0
start_directory = %TEMPLATE_DIR% parent_version_no = 2.2
step_text =
::
:: First use OSQL to grab the QgenSeed value from TPCH_AUX_TABLE
::
osql -Usa -P -n -S%SERVER% -d%DBNAME% -w 255 -
i%SETUP_DIR%\Generate\GenQGENcmd.sql > %SETUP_DIR%\Generate\QgenCmd.cmd

```

```

step_label = Parallel Power Query Generation          step_id = 1170    global_flag = 0
sequence_no = 3 step_level = 2 parent_step_id = 1132 enabled_flag -1
iterator_name = degree_parallelis %MAX_STREAMS%
execution_mechanism = 0 continuation_criteria 0 failure_details =
step_file_name version_no 0.0
start_directory = parent_version_no = 2.2
step_text =

```

```

step_label = Set Seed Value for Stream                step_id = 1171    global_flag = 0
sequence_no = 1 step_level = 2 parent_step_id = 1133 enabled_flag -1
iterator_name = degree_parallelis 1
execution_mechanism = 1 continuation_criteria 1 failure_details =
step_file_name version_no 0.0
start_directory = Dynamic_Connection_to_DB parent_version_no = 2.1
step_text =
--
-- Increment QGen Seed in TPCH_AUX_TABLE
--
UPDATE TPCH_AUX_TABLE
SET QgenSeed = QgenSeed + %STREAM_NUM%

```



*step\_label* = Create Query Stream Directories *step\_id* = 1172 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 2 *parent\_step\_id* = 1133 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %QUERY\_DIR% *parent\_version\_no* = 2.1  
*step\_text* = if not exist %QUERY\_DIR%\STREAM%STREAM\_NUM% mkdir  
%QUERY\_DIR%\STREAM%STREAM\_NUM%

*step\_label* = Generate QGen Stream Command File *step\_id* = 1173 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 2 *parent\_step\_id* = 1133 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 1.0  
*start\_directory* = %TEMPLATE\_DIR% *parent\_version\_no* = 2.1  
*step\_text* = ::  
:: First use OSQL to grab the QgenSeed value from TPCH\_AUX\_TABLE  
::  
osql -Usa -P -n -S%SERVER% -d%DBNAME% -w 255 -  
i%SETUP\_DIR%\Generate\GenQgenStreamCmd.sql >  
%SETUP\_DIR%\Generate\QgenStreamCmd.cmd

*step\_label* = Parallel Stream Query Generation *step\_id* = 1174 *global\_flag* = 0  
*sequence\_no* = 4 *step\_level* = 2 *parent\_step\_id* = 1133 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %MAX\_STREAMS%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 2.1  
*step\_text* =

*step\_label* = Re-set QGen Seed Value *step\_id* = 1175 *global\_flag* = 0  
*sequence\_no* = 5 *step\_level* = 2 *parent\_step\_id* = 1133 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 2.1  
*step\_text* = --  
-- Resets the QGen seed kept in the temporary table  
--  
UPDATE TPC\_H\_AUX\_TABLE  
SET QgenSeed = QgenSeed - %STREAM\_NUM%

*step\_label* = Generate Validation Queries *step\_id* = 1176 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 2 *parent\_step\_id* = 1134 *enabled\_flag* = -1  
*iterator\_name* = QUERY *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %TEMPLATE\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = %TOOLS\_DIR%\QGen\qgen -d -b %TOOLS\_DIR%\dists.dss %QUERY% >  
%VALIDATION\_DIR%\Queries\v%QUERY%.sql

*step\_label* = Validation Query 1 *step\_id* = 1177 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 2 *parent\_step\_id* = 1135 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* %VALIDATION\_DIR%\Queries\v1.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Validation Query 2 *step\_id* = 1178 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 2 *parent\_step\_id* = 1135 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %VALIDATION\_DIR%\Queries\v2.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Validation Query 3 *step\_id* = 1179 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 2 *parent\_step\_id* = 1135 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %VALIDATION\_DIR%\Queries\v3.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Validation Query 4 *step\_id* = 1180 *global\_flag* = 0  
*sequence\_no* = 4 *step\_level* = 2 *parent\_step\_id* = 1135 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %VALIDATION\_DIR%\Queries\v4.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Validation Query 5 *step\_id* = 1181 *global\_flag* = 0  
*sequence\_no* = 5 *step\_level* = 2 *parent\_step\_id* = 1135 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %VALIDATION\_DIR%\Queries\v5.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Validation Query 6 *step\_id* = 1182 *global\_flag* = 0  
*sequence\_no* = 6 *step\_level* = 2 *parent\_step\_id* = 1135 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* 1  
*execution\_mechanism* = 1 *continuation\_criteria* 2 *failure\_details* =  
*step\_file\_name* %VALIDATION\_DIR%\Queries\v6.sql *version\_no* 0.0  
*start\_directory* = Static\_Connection\_to\_DB *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Validation Query 7 *step\_id* = 1183 *global\_flag* = 0  
*sequence\_no* = 7 *step\_level* = 2 *parent\_step\_id* = 1135 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* 1  
*execution\_mechanism* = 1 *continuation\_criteria* 2 *failure\_details* =  
*step\_file\_name* %VALIDATION\_DIR%\Queries\v7.sql *version\_no* 0.0  
*start\_directory* = Static\_Connection\_to\_DB *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Validation Query 8 *step\_id* = 1184 *global\_flag* = 0  
*sequence\_no* = 8 *step\_level* = 2 *parent\_step\_id* = 1135 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* 1  
*execution\_mechanism* = 1 *continuation\_criteria* 2 *failure\_details* =  
*step\_file\_name* %VALIDATION\_DIR%\Queries\v8.sql *version\_no* 0.0  
*start\_directory* = Static\_Connection\_to\_DB *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Validation Query 9 *step\_id* = 1185 *global\_flag* = 0  
*sequence\_no* = 9 *step\_level* = 2 *parent\_step\_id* = 1135 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* 1  
*execution\_mechanism* = 1 *continuation\_criteria* 2 *failure\_details* =  
*step\_file\_name* %VALIDATION\_DIR%\Queries\v9.sql *version\_no* 0.0  
*start\_directory* = Static\_Connection\_to\_DB *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Validation Query 10 *step\_id* = 1186 *global\_flag* = 0  
*sequence\_no* = 10 *step\_level* = 2 *parent\_step\_id* = 1135 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %VALIDATION\_DIR%\Queries\v10.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Validation Query 11 *step\_id* = 1187 *global\_flag* = 0  
*sequence\_no* = 11 *step\_level* = 2 *parent\_step\_id* = 1135 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %VALIDATION\_DIR%\Queries\v11.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Validation Query 12 *step\_id* = 1188 *global\_flag* = 0  
*sequence\_no* = 12 *step\_level* = 2 *parent\_step\_id* = 1135 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %VALIDATION\_DIR%\Queries\v12.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Validation Query 13 *step\_id* = 1189 *global\_flag* = 0  
*sequence\_no* = 13 *step\_level* = 2 *parent\_step\_id* = 1135 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %VALIDATION\_DIR%\Queries\v13.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Validation Query 14 *step\_id* = 1190 *global\_flag* = 0  
*sequence\_no* = 14 *step\_level* = 2 *parent\_step\_id* = 1135 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %VALIDATION\_DIR%\Queries\v14.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Validation Query 15 *step\_id* = 1191 *global\_flag* = 0  
*sequence\_no* = 15 *step\_level* = 2 *parent\_step\_id* = 1135 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %VALIDATION\_DIR%\Queries\v15.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Validation Query 16 *step\_id* = 1192 *global\_flag* = 0  
*sequence\_no* = 16 *step\_level* = 2 *parent\_step\_id* = 1135 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %VALIDATION\_DIR%\Queries\v16.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Validation Query 17 *step\_id* = 1193 *global\_flag* = 0  
*sequence\_no* = 17 *step\_level* = 2 *parent\_step\_id* = 1135 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %VALIDATION\_DIR%\Queries\v17.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Validation Query 18 *step\_id* = 1194 *global\_flag* = 0  
*sequence\_no* = 18 *step\_level* = 2 *parent\_step\_id* = 1135 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %VALIDATION\_DIR%\Queries\v18.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Validation Query 19 *step\_id* = 1195 *global\_flag* = 0  
*sequence\_no* = 19 *step\_level* = 2 *parent\_step\_id* = 1135 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %VALIDATION\_DIR%\Queries\v19.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Validation Query 20 *step\_id* = 1196 *global\_flag* = 0  
*sequence\_no* = 20 *step\_level* = 2 *parent\_step\_id* = 1135 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %VALIDATION\_DIR%\Queries\v20.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Validation Query 21 *step\_id* = 1197 *global\_flag* = 0  
*sequence\_no* = 21 *step\_level* = 2 *parent\_step\_id* = 1135 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %VALIDATION\_DIR%\Queries\v21.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Validation Query 22 *step\_id* = 1198 *global\_flag* = 0  
*sequence\_no* = 22 *step\_level* = 2 *parent\_step\_id* = 1135 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %VALIDATION\_DIR%\Queries\v22.sql *version\_no* = 0.0  
*start\_directory* = Static\_Connection\_to\_DB *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Power - Execute Generated QGen Command File *step\_id* = 1199 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 1170 *enabled\_flag* = -1  
*iterator\_name* = QUERY *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 1 *failure\_details* =  
*step\_file\_name* = %SETUP\_DIR%\Generate\QgenCmd.cmd *version\_no* = 0.0  
*start\_directory* = %TEMPLATE\_DIR% *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Throughput - Execute Generated QGen Command File *step\_id* = 1200 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 1174 *enabled\_flag* = -1  
*iterator\_name* = QUERY *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %SETUP\_DIR%\Generate\QgenStreamCmd.cmd *version\_no* = 0.0  
*start\_directory* = %TEMPLATE\_DIR% *parent\_version\_no* = 0.0  
*step\_text* =



*step\_label* = Set SEED to AsAmA/9921.2 seed *step\_id* = 1277 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 1 *parent\_step\_id* = 1099 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 1.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 12.0  
*step\_text* = -- Update the benchmark auxillary table  
-- Use the AsAmA seed for the 9921.2 QphH result (load end at 2005-04-23 04:09:54.130)  
--  
UPDATE TPCH\_AUX\_TABLE SET QgenSeed=423040954  
  
SELECT \* from TPCH\_AUX\_TABLE

*step\_label* = Set Correlation *step\_id* = 1343 *global\_flag* = 0  
*sequence\_no* = 5 *step\_level* = 1 *parent\_step\_id* = 1095 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 3.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 42.0  
*step\_text* = alter database %DBNAME% set date\_correlation\_optimization ON

*step\_label* = Create Statistics *step\_id* = 1358 *global\_flag* = 0  
*sequence\_no* = 4 *step\_level* = 1 *parent\_step\_id* = 1095 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 2.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 42.0  
*step\_text* = sp\_createstats

*step\_label* = Generate Flat Files to FlatFile\_Dir\_5 *step\_id* = 1359 *global\_flag* = 0  
*sequence\_no* = 5 *step\_level* = 2 *parent\_step\_id* = 1102 *enabled\_flag* = -1  
*iterator\_name* = PARALLEL\_PROCESS *degree\_parallelis* = 4  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 8.0  
*start\_directory* = %FLATFILE\_DIR\_5% *parent\_version\_no* = 7.0  
*step\_text* = :: Generate Data for CUSTOMER Table  
%TOOLS\_DIR%\DBGen\dbgen -T c -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for ORDERS and LINEITEM Tables  
%TOOLS\_DIR%\DBGen\dbgen -T o -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for PARTS/PARTSUPP Table  
%TOOLS\_DIR%\DBGen\dbgen -T p -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for SUPPLIER Table  
%TOOLS\_DIR%\DBGen\dbgen -T s -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%

*step\_label* = Generate Flat Files to FlatFile\_Dir\_6 *step\_id* = 1360 *global\_flag* = 0  
*sequence\_no* = 6 *step\_level* = 2 *parent\_step\_id* = 1102 *enabled\_flag* = -1  
*iterator\_name* = PARALLEL\_PROCESS *degree\_parallelis* = 4  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 8.0  
*start\_directory* = %FLATFILE\_DIR\_6% *parent\_version\_no* = 7.0  
*step\_text* = :: Generate Data for CUSTOMER Table  
%TOOLS\_DIR%\DBGen\dbgen -T c -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for ORDERS and LINEITEM Tables  
%TOOLS\_DIR%\DBGen\dbgen -T o -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for PARTS/PARTSUPP Table  
%TOOLS\_DIR%\DBGen\dbgen -T p -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for SUPPLIER Table  
%TOOLS\_DIR%\DBGen\dbgen -T s -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%

*step\_label* = Generate Flat Files to FlatFile\_Dir\_7 *step\_id* = 1361 *global\_flag* = 0  
*sequence\_no* = 7 *step\_level* = 2 *parent\_step\_id* = 1102 *enabled\_flag* = -1  
*iterator\_name* = PARALLEL\_PROCESS *degree\_parallelis* = 4  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 8.0  
*start\_directory* = %FLATFILE\_DIR\_7% *parent\_version\_no* = 7.0  
*step\_text* = :: Generate Data for CUSTOMER Table  
%TOOLS\_DIR%\DBGen\dbgen -T c -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for ORDERS and LINEITEM Tables  
%TOOLS\_DIR%\DBGen\dbgen -T o -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for PARTS/PARTSUPP Table  
%TOOLS\_DIR%\DBGen\dbgen -T p -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for SUPPLIER Table  
%TOOLS\_DIR%\DBGen\dbgen -T s -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%

*step\_label* = Generate Flat Files to FlatFile\_Dir\_8 *step\_id* = 1362 *global\_flag* = 0  
*sequence\_no* = 8 *step\_level* = 2 *parent\_step\_id* = 1102 *enabled\_flag* = -1  
*iterator\_name* = PARALLEL\_PROCESS *degree\_parallelis* = 4  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 8.0  
*start\_directory* = %FLATFILE\_DIR\_8% *parent\_version\_no* = 7.0  
*step\_text* = :: Generate Data for CUSTOMER Table  
%TOOLS\_DIR%\DBGen\dbgen -T c -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for ORDERS and LINEITEM Tables  
%TOOLS\_DIR%\DBGen\dbgen -T o -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for PARTS/PARTSUPP Table  
%TOOLS\_DIR%\DBGen\dbgen -T p -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for SUPPLIER Table  
%TOOLS\_DIR%\DBGen\dbgen -T s -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%















*step\_label* = Generate Flat Files to FlatFile\_Dir\_10 *step\_id* = 1380 *global\_flag* = 0  
*sequence\_no* = 10 *step\_level* = 2 *parent\_step\_id* = 1102 *enabled\_flag* = -1  
*iterator\_name* = PARALLEL\_PROCESS *degree\_parallelis* = 4  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 8.0  
*start\_directory* = %FLATFILE\_DIR\_10% *parent\_version\_no* = 7.0  
*step\_text* = :: Generate Data for CUSTOMER Table  
%TOOLS\_DIR%\DBGen\dbgen -T c -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for ORDERS and LINEITEM Tables  
%TOOLS\_DIR%\DBGen\dbgen -T o -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for PARTS/PARTSUPP Table  
%TOOLS\_DIR%\DBGen\dbgen -T p -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for SUPPLIER Table  
%TOOLS\_DIR%\DBGen\dbgen -T s -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%

*step\_label* = Generate Flat Files to FlatFile\_Dir\_11 *step\_id* = 1381 *global\_flag* = 0  
*sequence\_no* = 11 *step\_level* = 2 *parent\_step\_id* = 1102 *enabled\_flag* = -1  
*iterator\_name* = PARALLEL\_PROCESS *degree\_parallelis* = 4  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 8.0  
*start\_directory* = %FLATFILE\_DIR\_11% *parent\_version\_no* = 7.0  
*step\_text* = :: Generate Data for CUSTOMER Table  
%TOOLS\_DIR%\DBGen\dbgen -T c -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for ORDERS and LINEITEM Tables  
%TOOLS\_DIR%\DBGen\dbgen -T o -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for PARTS/PARTSUPP Table  
%TOOLS\_DIR%\DBGen\dbgen -T p -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for SUPPLIER Table  
%TOOLS\_DIR%\DBGen\dbgen -T s -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%

*step\_label* = Generate Flat Files to FlatFile\_Dir\_12 *step\_id* = 1382 *global\_flag* = 0  
*sequence\_no* = 12 *step\_level* = 2 *parent\_step\_id* = 1102 *enabled\_flag* = -1  
*iterator\_name* = PARALLEL\_PROCESS *degree\_parallelis* = 4  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 8.0  
*start\_directory* = %FLATFILE\_DIR\_12% *parent\_version\_no* = 7.0  
*step\_text* = :: Generate Data for CUSTOMER Table  
%TOOLS\_DIR%\DBGen\dbgen -T c -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for ORDERS and LINEITEM Tables  
%TOOLS\_DIR%\DBGen\dbgen -T o -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for PARTS/PARTSUPP Table  
%TOOLS\_DIR%\DBGen\dbgen -T p -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for SUPPLIER Table  
%TOOLS\_DIR%\DBGen\dbgen -T s -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%

*step\_label* = Generate Flat Files to FlatFile\_Dir\_13 *step\_id* = 1383 *global\_flag* = 0  
*sequence\_no* = 13 *step\_level* = 2 *parent\_step\_id* = 1102 *enabled\_flag* = -1  
*iterator\_name* = PARALLEL\_PROCESS *degree\_parallelis* = 4  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 8.0  
*start\_directory* = %FLATFILE\_DIR\_13% *parent\_version\_no* = 7.0  
*step\_text* = :: Generate Data for CUSTOMER Table  
%TOOLS\_DIR%\DBGen\dbgen -T c -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for ORDERS and LINEITEM Tables  
%TOOLS\_DIR%\DBGen\dbgen -T o -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for PARTS/PARTSUPP Table  
%TOOLS\_DIR%\DBGen\dbgen -T p -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for SUPPLIER Table  
%TOOLS\_DIR%\DBGen\dbgen -T s -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%

*step\_label* = Generate Flat Files to FlatFile\_Dir\_14 *step\_id* = 1384 *global\_flag* = 0  
*sequence\_no* = 14 *step\_level* = 2 *parent\_step\_id* = 1102 *enabled\_flag* = -1  
*iterator\_name* = PARALLEL\_PROCESS *degree\_parallelis* = 4  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 8.0  
*start\_directory* = %FLATFILE\_DIR\_14% *parent\_version\_no* = 7.0  
*step\_text* = :: Generate Data for CUSTOMER Table  
%TOOLS\_DIR%\DBGen\dbgen -T c -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for ORDERS and LINEITEM Tables  
%TOOLS\_DIR%\DBGen\dbgen -T o -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for PARTS/PARTSUPP Table  
%TOOLS\_DIR%\DBGen\dbgen -T p -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for SUPPLIER Table  
%TOOLS\_DIR%\DBGen\dbgen -T s -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%

*step\_label* = Generate Flat Files to FlatFile\_Dir\_15 *step\_id* = 1385 *global\_flag* = 0  
*sequence\_no* = 15 *step\_level* = 2 *parent\_step\_id* = 1102 *enabled\_flag* = -1  
*iterator\_name* = PARALLEL\_PROCESS *degree\_parallelis* = 4  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 8.0  
*start\_directory* = %FLATFILE\_DIR\_15% *parent\_version\_no* = 7.0  
*step\_text* = :: Generate Data for CUSTOMER Table  
%TOOLS\_DIR%\DBGen\dbgen -T c -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for ORDERS and LINEITEM Tables  
%TOOLS\_DIR%\DBGen\dbgen -T o -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for PARTS/PARTSUPP Table  
%TOOLS\_DIR%\DBGen\dbgen -T p -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%  
  
:: Generate Data for SUPPLIER Table  
%TOOLS\_DIR%\DBGen\dbgen -T s -fF -q -b %TOOLS\_DIR%\dists.dss -s%SCALEFACTOR% -  
C%TOTAL\_LOAD\_FILES\_PER\_TABLE% -S%PARALLEL\_PROCESS%



*step\_label* = Files 3 *step\_id* = 1390 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 2 *parent\_step\_id* = 1112 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %FLAT\_FILE\_PARALLELISM%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 4.0  
*start\_directory* = *parent\_version\_no* = 32.0  
*step\_text* =

*step\_label* = Files 4 *step\_id* = 1391 *global\_flag* = 0  
*sequence\_no* = 4 *step\_level* = 2 *parent\_step\_id* = 1112 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %FLAT\_FILE\_PARALLELISM%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 4.0  
*start\_directory* = *parent\_version\_no* = 32.0  
*step\_text* =

*step\_label* = Files 5 *step\_id* = 1392 *global\_flag* = 0  
*sequence\_no* = 5 *step\_level* = 2 *parent\_step\_id* = 1112 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %FLAT\_FILE\_PARALLELISM%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 4.0  
*start\_directory* = *parent\_version\_no* = 32.0  
*step\_text* =

*step\_label* = Files 6 *step\_id* = 1393 *global\_flag* = 0  
*sequence\_no* = 6 *step\_level* = 2 *parent\_step\_id* = 1112 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %FLAT\_FILE\_PARALLELISM%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 4.0  
*start\_directory* = *parent\_version\_no* = 32.0  
*step\_text* =

*step\_label* = Files 7 *step\_id* = 1394 *global\_flag* = 0  
*sequence\_no* = 7 *step\_level* = 2 *parent\_step\_id* = 1112 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %FLAT\_FILE\_PARALLELISM%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 4.0  
*start\_directory* = *parent\_version\_no* = 32.0  
*step\_text* =

*step\_label* = Files 8 *step\_id* = 1395 *global\_flag* = 0  
*sequence\_no* = 8 *step\_level* = 2 *parent\_step\_id* = 1112 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %FLAT\_FILE\_PARALLELISM%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 4.0  
*start\_directory* = *parent\_version\_no* = 32.0  
*step\_text* =

*step\_label* = Files 9 *step\_id* = 1396 *global\_flag* = 0  
*sequence\_no* = 9 *step\_level* = 2 *parent\_step\_id* = 1112 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %FLAT\_FILE\_PARALLELISM%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 4.0  
*start\_directory* = *parent\_version\_no* = 32.0  
*step\_text* =

*step\_label* = Files 10 *step\_id* = 1397 *global\_flag* = 0  
*sequence\_no* = 10 *step\_level* = 2 *parent\_step\_id* = 1112 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %FLAT\_FILE\_PARALLELISM%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 4.0  
*start\_directory* = *parent\_version\_no* = 32.0  
*step\_text* =

*step\_label* = Files 11 *step\_id* = 1398 *global\_flag* = 0  
*sequence\_no* = 11 *step\_level* = 2 *parent\_step\_id* = 1112 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %FLAT\_FILE\_PARALLELISM%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 4.0  
*start\_directory* = *parent\_version\_no* = 32.0  
*step\_text* =

*step\_label* = Files 12 *step\_id* = 1399 *global\_flag* = 0  
*sequence\_no* = 12 *step\_level* = 2 *parent\_step\_id* = 1112 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %FLAT\_FILE\_PARALLELISM%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 4.0  
*start\_directory* = *parent\_version\_no* = 32.0  
*step\_text* =

*step\_label* = Files 13 *step\_id* = 1400 *global\_flag* = 0  
*sequence\_no* = 13 *step\_level* = 2 *parent\_step\_id* = 1112 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %FLAT\_FILE\_PARALLELISM%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 4.0  
*start\_directory* = *parent\_version\_no* = 32.0  
*step\_text* =

*step\_label* = Files 14 *step\_id* = 1401 *global\_flag* = 0  
*sequence\_no* = 14 *step\_level* = 2 *parent\_step\_id* = 1112 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %FLAT\_FILE\_PARALLELISM%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 4.0  
*start\_directory* = *parent\_version\_no* = 32.0  
*step\_text* =



*step\_label* = Files 15 *step\_id* = 1402 *global\_flag* = 0  
*sequence\_no* = 15 *step\_level* = 2 *parent\_step\_id* = 1112 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %FLAT\_FILE\_PARALLELISM%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 4.0  
*start\_directory* = *parent\_version\_no* = 32.0  
*step\_text* =

*step\_label* = Files 16 *step\_id* = 1403 *global\_flag* = 0  
*sequence\_no* = 16 *step\_level* = 2 *parent\_step\_id* = 1112 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %FLAT\_FILE\_PARALLELISM%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 4.0  
*start\_directory* = *parent\_version\_no* = 32.0  
*step\_text* =

*step\_label* = Set sp\_configure Options *step\_id* = 1439 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 1 *parent\_step\_id* = 1093 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %SETUP\_DIR%\Utility\conf\_tpch.sql *version\_no* = 17.0  
*start\_directory* = Dynamic\_Connection\_to\_Master *parent\_version\_no* = 57.0  
*step\_text* =

*step\_label* = Create FK Constraints *step\_id* = 1441 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 1 *parent\_step\_id* = 1095 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %SETUP\_DIR%\%DBNAME%\createFK.sql *version\_no* = 3.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 42.0  
*step\_text* =

```

step_label = Load Start Timestamp                step_id = 1442    global_flag = 0
sequence_no = 1 step_level = 1 parent_step_id = 1094 enabled_flag = -1
iterator_name = degree_parallelis 1
execution_mechanism = 1 continuation_criteria 2 failure_details =
step_file_name version_no 14.0
start_directory = Dynamic_Connection_to_Master parent_version_no = 91.0
step_text = -- Create temporary table for timing in the Master Database
--
-- This is just temporary until we build the TPCH_AUX_TABLE later
--
--
-- Delete any existing tpch_temp_timer table
--
if exists ( select name from sysobjects where name = 'tpch_temp_timer' )
drop table tpch_temp_timer

--
-- Create the temporary table
--
create table tpch_temp_timer
(
load_start_time datetime
)

--
-- Store the starting time in the temporary table
--
insert into tpch_temp_timer values (getdate())

```

```

step_label = Create Clustered Indexes in Parallel                step_id = 1444    global_flag = 0
sequence_no = 1 step_level = 1 parent_step_id = 1095 enabled_flag = -1
iterator_name = degree_parallelis %INDEX_CREATE_PARALLELISM%
execution_mechanism = 0 continuation_criteria 0 failure_details =
step_file_name version_no 5.0
start_directory = parent_version_no = 42.0
step_text =

```

```

step_label = Create Clustered Indexes1                step_id = 1445    global_flag = 0
sequence_no = 1 step_level = 2    parent_step_id = 1444 enabled_flag = -1
iterator_name =                                degree_parallelis 1
execution_mechanism = 1    continuation_criteria 1    failure_details =
step_file_name %SETUP_DIR%\%DBNAME%\CreateClusteredIndexes1.sql    version_no 8.0
start_directory = Dynamic_Connection_to_DB    parent_version_no = 5.0
step_text =

```

```

step_label = Create Clustered Indexes2                step_id = 1446    global_flag = 0
sequence_no = 2 step_level = 2    parent_step_id = 1444 enabled_flag = -1
iterator_name =                                degree_parallelis 1
execution_mechanism = 1    continuation_criteria 1    failure_details =
step_file_name %SETUP_DIR%\%DBNAME%\CreateClusteredIndexes2.sql    version_no 8.0
start_directory = Dynamic_Connection_to_DB    parent_version_no = 5.0
step_text =

```

## Step\_constraints

workspac e_id	constraint _id	step_id	version_n o	constraint _type	global _step_id	global_ver sion_no	sequence _no
12	37	1104	4.0	2	1089	0.0	0
12	33	1108	21.0	2	1087	4.0	1
12	33	1108	21.0	2	1087	3.0	1
12	33	1108	21.0	2	1087	2.0	1
12	35	1108	21.0	2	1088	3.0	0
12	38	1108	21.0	2	1089	0.0	2

## Iterator\_values

workspac e_id	step_id	version _no	type	iterator_value	sequence _no
12	1375	19.0	2	52	0
12	1383	8.0	2	52	0

12	1382	8.0	3 1	0
12	1382	8.0	2 48	0
12	1382	8.0	1 45	0
12	1378	19.0	3 1	0
12	1378	19.0	2 64	0
12	1378	19.0	1 61	0
12	1377	19.0	1 57	0
12	1377	19.0	3 1	0
12	1377	19.0	2 60	0
12	1376	20.0	3 1	0
12	1376	20.0	1 53	0
12	1136	0.0	2 22	0
12	1375	19.0	3 1	0
12	1384	8.0	1 53	0
12	1375	19.0	1 49	0
12	1374	19.0	3 1	0
12	1374	19.0	2 48	0
12	1374	19.0	1 45	0
12	1373	19.0	1 41	0
12	1373	19.0	3 1	0
12	1373	19.0	2 44	0
12	1372	19.0	3 1	0
12	1372	19.0	2 40	0
12	1372	19.0	1 37	0
12	1371	19.0	3 1	0
12	1371	19.0	2 36	0
12	1371	19.0	1 33	0
12	1376	20.0	2 56	0
12	1380	8.0	2 40	0
12	1136	0.0	3 1	0
12	1136	0.0	1 1	0

12	1176	0.0	2 22	0
12	1176	0.0	3 1	0
12	1176	0.0	1 1	0
12	1199	0.0	3 1	0
12	1199	0.0	1 1	0
12	1199	0.0	2 22	0
12	1200	0.0	3 1	0
12	1200	0.0	1 1	0
12	1200	0.0	2 22	0
12	1381	8.0	3 1	0
12	1381	8.0	2 44	0
12	1383	8.0	3 1	0
12	1386	8.0	1 61	0
12	1370	19.0	1 29	0
12	1384	8.0	3 1	0
12	1384	8.0	2 56	0
12	1385	8.0	3 1	0
12	1385	8.0	2 60	0
12	1381	8.0	1 41	0
12	1386	8.0	3 1	0
12	1380	8.0	3 1	0
12	1386	8.0	2 64	0
12	1379	8.0	1 33	0
12	1379	8.0	2 36	0
12	1379	8.0	3 1	0
12	1380	8.0	1 37	0
12	1383	8.0	1 49	0
12	1385	8.0	1 57	0
12	1112	32.0	4 PARTSUPP	5
12	1370	19.0	3 1	0
12	1140	10.0	2 4	0

12	1140	10.0	1 1	0
12	1362	8.0	3 1	0
12	1362	8.0	2 32	0
12	1362	8.0	1 29	0
12	1361	8.0	3 1	0
12	1361	8.0	2 28	0
12	1361	8.0	1 25	0
12	1360	8.0	1 21	0
12	1360	8.0	2 24	0
12	1360	8.0	3 1	0
12	1359	8.0	2 20	0
12	1141	8.0	3 1	0
12	1138	1.0	1 1	0
12	1133	2.1	2 %MAX_STREAMS%	0
12	1133	2.1	3 1	0
12	1137	1.0	3 1	0
12	1137	1.0	2 22	0
12	1137	1.0	1 1	0
12	1359	8.0	3 1	0
12	1138	1.0	3 1	0
12	1359	8.0	1 17	0
12	1112	32.0	4 PART	3
12	1112	32.0	4 LINEITEM	0
12	1112	32.0	4 SUPPLIER	2
12	1112	32.0	4 ORDERS	1
12	1112	32.0	4 CUSTOMER	4
12	1141	8.0	1 5	0
12	1138	1.0	2 22	0
12	1365	19.0	3 1	0
12	1133	2.1	1 1	0
12	1369	19.0	3 1	0

12	1369	19.0	2 28	0
12	1369	19.0	1 25	0
12	1368	19.0	3 1	0
12	1368	19.0	2 24	0
12	1368	19.0	1 21	0
12	1367	19.0	3 1	0
12	1367	19.0	2 20	0
12	1367	19.0	1 17	0
12	1366	19.0	1 13	0
12	1366	19.0	2 16	0
12	1366	19.0	3 1	0
12	1140	10.0	3 1	0
12	1363	21.0	2 4	0
12	1141	8.0	2 8	0
12	1142	9.0	3 1	0
12	1142	9.0	1 9	0
12	1142	9.0	2 12	0
12	1143	7.0	3 1	0
12	1365	19.0	1 9	0
12	1143	7.0	1 13	0
12	1365	19.0	2 12	0
12	1363	21.0	1 1	0
12	1363	21.0	3 1	0
12	1364	21.0	3 1	0
12	1364	21.0	2 8	0
12	1364	21.0	1 5	0
12	1370	19.0	2 32	0
12	1143	7.0	2 16	0

## *Workspace\_parameters*

<i>workspace_id =</i>	13	<i>parameter_id =</i>	180	<i>parameter_type =</i>	0
<i>parameter_name</i>		TOOLS_DIR			
<i>parameter_value</i>		%KIT_DIR%\Tools			
<i>workspace_id =</i>	13	<i>parameter_id =</i>	170	<i>parameter_type =</i>	3
<i>parameter_name</i>		OUTPUT_DIR			
<i>parameter_value</i>		E:\MSTPCH~1.101\output\184			
<i>workspace_id =</i>	13	<i>parameter_id =</i>	171	<i>parameter_type =</i>	0
<i>parameter_name</i>		QUERY_DIR			
<i>parameter_value</i>		%RUN_DIR%\Queries			
<i>workspace_id =</i>	13	<i>parameter_id =</i>	172	<i>parameter_type =</i>	0
<i>parameter_name</i>		DBNAME			
<i>parameter_value</i>		tpch1t			
<i>workspace_id =</i>	13	<i>parameter_id =</i>	173	<i>parameter_type =</i>	0
<i>parameter_name</i>		DELETE_PARALLELISM			
<i>parameter_value</i>		32			
<i>workspace_id =</i>	13	<i>parameter_id =</i>	174	<i>parameter_type =</i>	0
<i>parameter_name</i>		INSERT_PARALLELISM			
<i>parameter_value</i>		64			
<i>workspace_id =</i>	13	<i>parameter_id =</i>	175	<i>parameter_type =</i>	0
<i>parameter_name</i>		DELETE_EXECUTIONS			
<i>parameter_value</i>		192			
<i>workspace_id =</i>	13	<i>parameter_id =</i>	176	<i>parameter_type =</i>	0
<i>parameter_name</i>		INSERT_EXECUTIONS			
<i>parameter_value</i>		192			
<i>workspace_id =</i>	13	<i>parameter_id =</i>	169	<i>parameter_type =</i>	0
<i>parameter_name</i>		RUN_DIR			
<i>parameter_value</i>		%KIT_DIR%\Run			



<i>workspace_id =</i>	13	<i>parameter_id =</i>	178	<i>parameter_type =</i>	3
<i>parameter_name</i>		DEFAULT_DIR			
<i>parameter_value</i>		%KIT_DIR%\output			
<i>workspace_id =</i>	13	<i>parameter_id =</i>	208	<i>parameter_type =</i>	0
<i>parameter_name</i>		SERVER			
<i>parameter_value</i>		asama			
<i>workspace_id =</i>	13	<i>parameter_id =</i>	181	<i>parameter_type =</i>	0
<i>parameter_name</i>		BATCH_SIZE			
<i>parameter_value</i>		10			
<i>workspace_id =</i>	13	<i>parameter_id =</i>	182	<i>parameter_type =</i>	0
<i>parameter_name</i>		KIT_DIR			
<i>parameter_value</i>		E:\mstpch.101d			
<i>workspace_id =</i>	13	<i>parameter_id =</i>	183	<i>parameter_type =</i>	3
<i>parameter_name</i>		RUN_ID			
<i>parameter_value</i>		184			
<i>workspace_id =</i>	13	<i>parameter_id =</i>	184	<i>parameter_type =</i>	0
<i>parameter_name</i>		TRACEFLAGS			
<i>parameter_value</i>		-c -x -E -T3502			
<i>workspace_id =</i>	13	<i>parameter_id =</i>	186	<i>parameter_type =</i>	0
<i>parameter_name</i>		SETUP_DIR			
<i>parameter_value</i>		%KIT_DIR%\Setup			
<i>workspace_id =</i>	13	<i>parameter_id =</i>	206	<i>parameter_type =</i>	0
<i>parameter_name</i>		RF_FLATFILE_DIR			
<i>parameter_value</i>		Z:\dev\b17\tpch1t_RF_FlatFile_DIR			
<i>workspace_id =</i>	13	<i>parameter_id =</i>	207	<i>parameter_type =</i>	0
<i>parameter_name</i>		FILES_PER_UPDATE_SET			
<i>parameter_value</i>		64			
<i>workspace_id =</i>	13	<i>parameter_id =</i>	177	<i>parameter_type =</i>	0
<i>parameter_name</i>		MAX_STREAMS			
<i>parameter_value</i>		7			

## *Connection\_dtls*

<i>works pace_id</i>	<i>connectio n_name_id</i>	<i>connection_name</i>	<i>connection_string_nam e</i>	<i>connecti on_type</i>
13	84	Power_Dynamic_DB_Connection	DBCONNECTION	2
13	87	Dynamic_Connection_to_Master	MASTERCONNECTION	2
13	83	Throughput_Static_Stream_10_Connection	DBCONNECTION	1
13	82	Throughput_Static_Stream_9_Connection	DBCONNECTION	1
13	81	Throughput_Static_Stream_8_Connection	DBCONNECTION	1
13	80	Throughput_Static_Stream_7_Connection	DBCONNECTION	1
13	79	Throughput_Static_Stream_6_Connection	DBCONNECTION	1
13	78	Throughput_Static_Stream_5_Connection	DBCONNECTION	1
13	77	Throughput_Static_Stream_4_Connection	DBCONNECTION	1
13	76	Throughput_Static_Stream_3_Connection	DBCONNECTION	1
13	75	Throughput_Static_Stream_2_Connection	DBCONNECTION	1
13	74	Throughput_Static_Stream_1_Connection	DBCONNECTION	1
13	73	Throughput_RF_Connection	DBCONNECTION	2
13	72	Dynamic_Connection_to_DB	DBCONNECTION	2
13	71	Power_Static_DB_Connection	DBCONNECTION	1

# Workspace\_connections

<i>workspace_id</i>	13
<i>connection_i</i>	21
<i>connection_nam</i>	MASTERCONNECTION
<i>connection_valu</i>	DRIVER=SQL Server;SERVER=%SERVER%;UID=sa;PWD=;
<i>description</i>	
<i>no_count_displa</i>	0
<i>no_execute</i>	0
<i>parse_query_only</i>	0
<i>ANSI_quoted_identifiers</i>	0
<i>ANSI_nulls</i>	-1
<i>show_query_pla</i>	0
<i>show_stats_time</i>	0
<i>show_stats_io</i>	0
<i>parse_odbc_msg_prefixes</i>	-1
<i>row_count</i>	0
<i>tsql_batch_separator</i>	GO
<i>query_time_out</i>	0
<i>server_language</i>	(Default)
<i>character_translatio</i>	-1
<i>regional_settings</i>	0
<i>workspace_id</i>	13
<i>connection_i</i>	20
<i>connection_nam</i>	DBCONNECTION
<i>connection_valu</i>	DRIVER=SQL Server;SERVER=%SERVER%;UID=sa;PWD=;DATABASE=%DBNAME%;
<i>description</i>	
<i>no_count_displa</i>	0
<i>no_execute</i>	0
<i>parse_query_only</i>	0
<i>ANSI_quoted_identifiers</i>	0
<i>ANSI_nulls</i>	-1
<i>show_query_pla</i>	0
<i>show_stats_time</i>	0
<i>show_stats_io</i>	0
<i>parse_odbc_msg_prefixes</i>	-1
<i>row_count</i>	0
<i>tsql_batch_separator</i>	GO
<i>query_time_out</i>	0
<i>server_language</i>	(Default)

*character\_translatio* -1  
*regional\_settings* 0

## *Att\_steps*

*workspace\_id* 13

*step\_label* = Clear any Outstanding Semaphores *step\_id* = 1201 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 0 *parent\_step\_id* = 0 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* 1  
*execution\_mechanism* = 2 *continuation\_criteria* 2 *failure\_details* =  
*step\_file\_name* *version\_no* 70.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 0.0  
*step\_text* =  
::  
:: This step must always be run to insure that a semaphore.exe was not left open by a  
:: previous run  
::  
:: If there are no open semaphore.exe's then the 'KILL' will do nothing.  
::  
:: %TOOLS\_DIR%\Utility\KILL.EXE SEMAPHORE.EXE

*step\_label* = Execute Power Run *step\_id* = 1202 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 0 *parent\_step\_id* = 0 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* 1  
*execution\_mechanism* = 0 *continuation\_criteria* 0 *failure\_details* =  
*step\_file\_name* *version\_no* 125.6  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Execute Throughput Run *step\_id* = 1203 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 0 *parent\_step\_id* = 0 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* 2  
*execution\_mechanism* = 0 *continuation\_criteria* 0 *failure\_details* =  
*step\_file\_name* *version\_no* 45.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Power - Sequential Query Execution *step\_id* = 1205 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 1 *parent\_step\_id* = 1202 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 23.1  
*start\_directory* = *parent\_version\_no* = 125.6  
*step\_text* =

*step\_label* = Power - Increment Update Set *step\_id* = 1207 *global\_flag* = 0  
*sequence\_no* = 4 *step\_level* = 1 *parent\_step\_id* = 1202 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 47.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 125.6  
*step\_text* = UPDATE TPCH\_AUX\_TABLE SET updateset=updateset+1

*step\_label* = Sequential Refresh Stream Execution *step\_id* = 1208 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 1 *parent\_step\_id* = 1203 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 4.8  
*start\_directory* = *parent\_version\_no* = 45.0  
*step\_text* =

*step\_label* = Parallel Stream Execution *step\_id* = 1209 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 1 *parent\_step\_id* = 1203 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %MAX\_STREAMS%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 5.0  
*start\_directory* = *parent\_version\_no* = 45.0  
*step\_text* =

*step\_label* = Power - Execute Query 14 *step\_id* = 1211 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 2 *parent\_step\_id* = 1205 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\Power\14.sql *version\_no* = 21.0  
*start\_directory* = Power\_Static\_DB\_Connection *parent\_version\_no* = 23.1  
*step\_text* =

*step\_label* = Power - Execute Query 02 *step\_id* = 1212 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 2 *parent\_step\_id* = 1205 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\Power\2.sql *version\_no* = 22.0  
*start\_directory* = Power\_Static\_DB\_Connection *parent\_version\_no* = 23.1  
*step\_text* =

*step\_label* = Power - Execute Query 09 *step\_id* = 1213 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 2 *parent\_step\_id* = 1205 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\Power\9.sql *version\_no* = 20.0  
*start\_directory* = Power\_Static\_DB\_Connection *parent\_version\_no* = 23.1  
*step\_text* =

*step\_label* = Power - Execute Query 20 *step\_id* = 1214 *global\_flag* = 0  
*sequence\_no* = 4 *step\_level* = 2 *parent\_step\_id* = 1205 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\Power\20.sql *version\_no* = 19.0  
*start\_directory* = Power\_Static\_DB\_Connection *parent\_version\_no* = 23.1  
*step\_text* =

*step\_label* = Power - Execute Query 06 *step\_id* = 1215 *global\_flag* = 0  
*sequence\_no* = 5 *step\_level* = 2 *parent\_step\_id* = 1205 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\Power\6.sql *version\_no* = 15.0  
*start\_directory* = Power\_Static\_DB\_Connection *parent\_version\_no* = 23.1  
*step\_text* =

*step\_label* = Power - Execute Query 17 *step\_id* = 1216 *global\_flag* = 0  
*sequence\_no* = 6 *step\_level* = 2 *parent\_step\_id* = 1205 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\Power\17.sql *version\_no* = 19.0  
*start\_directory* = Power\_Static\_DB\_Connection *parent\_version\_no* = 23.1  
*step\_text* =

*step\_label* = Power - Execute Query 18 *step\_id* = 1217 *global\_flag* = 0  
*sequence\_no* = 7 *step\_level* = 2 *parent\_step\_id* = 1205 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\Power\18.sql *version\_no* = 18.0  
*start\_directory* = Power\_Static\_DB\_Connection *parent\_version\_no* = 23.1  
*step\_text* =

*step\_label* = Power - Execute Query 08 *step\_id* = 1218 *global\_flag* = 0  
*sequence\_no* = 8 *step\_level* = 2 *parent\_step\_id* = 1205 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\Power\8.sql *version\_no* = 19.0  
*start\_directory* = Power\_Static\_DB\_Connection *parent\_version\_no* = 23.1  
*step\_text* =

*step\_label* = Power - Execute Query 21 *step\_id* = 1219 *global\_flag* = 0  
*sequence\_no* = 9 *step\_level* = 2 *parent\_step\_id* = 1205 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\Power\21.sql *version\_no* = 19.0  
*start\_directory* = Power\_Static\_DB\_Connection *parent\_version\_no* = 23.1  
*step\_text* =

*step\_label* = Power - Execute Query 13 *step\_id* = 1220 *global\_flag* = 0  
*sequence\_no* = 10 *step\_level* = 2 *parent\_step\_id* = 1205 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\Power\13.sql *version\_no* = 19.0  
*start\_directory* = Power\_Static\_DB\_Connection *parent\_version\_no* = 23.1  
*step\_text* =

*step\_label* = Power - Execute Query 03 *step\_id* = 1221 *global\_flag* = 0  
*sequence\_no* = 11 *step\_level* = 2 *parent\_step\_id* = 1205 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\Power\3.sql *version\_no* = 20.0  
*start\_directory* = Power\_Static\_DB\_Connection *parent\_version\_no* = 23.1  
*step\_text* =

*step\_label* = Power - Execute Query 22 *step\_id* = 1222 *global\_flag* = 0  
*sequence\_no* = 12 *step\_level* = 2 *parent\_step\_id* = 1205 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\Power\22.sql *version\_no* = 19.0  
*start\_directory* = Power\_Static\_DB\_Connection *parent\_version\_no* = 23.1  
*step\_text* =



*step\_label* = Power - Execute Query 16 *step\_id* = 1223 *global\_flag* = 0  
*sequence\_no* = 13 *step\_level* = 2 *parent\_step\_id* = 1205 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\Power\16.sql *version\_no* = 19.0  
*start\_directory* = Power\_Static\_DB\_Connection *parent\_version\_no* = 23.1  
*step\_text* =

*step\_label* = Power - Execute Query 04 *step\_id* = 1224 *global\_flag* = 0  
*sequence\_no* = 14 *step\_level* = 2 *parent\_step\_id* = 1205 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\Power\4.sql *version\_no* = 20.0  
*start\_directory* = Power\_Static\_DB\_Connection *parent\_version\_no* = 23.1  
*step\_text* =

*step\_label* = Power - Execute Query 11 *step\_id* = 1225 *global\_flag* = 0  
*sequence\_no* = 15 *step\_level* = 2 *parent\_step\_id* = 1205 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\Power\11.sql *version\_no* = 20.0  
*start\_directory* = Power\_Static\_DB\_Connection *parent\_version\_no* = 23.1  
*step\_text* =

*step\_label* = Power - Execute Query 15 *step\_id* = 1226 *global\_flag* = 0  
*sequence\_no* = 16 *step\_level* = 2 *parent\_step\_id* = 1205 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\Power\15.sql *version\_no* = 19.0  
*start\_directory* = Power\_Static\_DB\_Connection *parent\_version\_no* = 23.1  
*step\_text* =

*step\_label* = Power - Execute Query 01 *step\_id* = 1227 *global\_flag* = 0  
*sequence\_no* = 17 *step\_level* = 2 *parent\_step\_id* = 1205 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\Power\1.sql *version\_no* = 18.0  
*start\_directory* = Power\_Static\_DB\_Connection *parent\_version\_no* = 23.1  
*step\_text* =

*step\_label* = Power - Execute Query 10 *step\_id* = 1228 *global\_flag* = 0  
*sequence\_no* = 18 *step\_level* = 2 *parent\_step\_id* = 1205 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\Power\10.sql *version\_no* = 19.0  
*start\_directory* = Power\_Static\_DB\_Connection *parent\_version\_no* = 23.1  
*step\_text* =

*step\_label* = Power - Execute Query 19 *step\_id* = 1229 *global\_flag* = 0  
*sequence\_no* = 19 *step\_level* = 2 *parent\_step\_id* = 1205 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\Power\19.sql *version\_no* = 19.0  
*start\_directory* = Power\_Static\_DB\_Connection *parent\_version\_no* = 23.1  
*step\_text* =

*step\_label* = Power - Execute Query 05 *step\_id* = 1230 *global\_flag* = 0  
*sequence\_no* = 20 *step\_level* = 2 *parent\_step\_id* = 1205 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\Power\5.sql *version\_no* = 19.0  
*start\_directory* = Power\_Static\_DB\_Connection *parent\_version\_no* = 23.1  
*step\_text* =

*step\_label* = Power - Execute Query 07 *step\_id* = 1231 *global\_flag* = 0  
*sequence\_no* = 21 *step\_level* = 2 *parent\_step\_id* = 1205 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\Power\7.sql *version\_no* = 19.0  
*start\_directory* = Power\_Static\_DB\_Connection *parent\_version\_no* = 23.1  
*step\_text* =

*step\_label* = Power - Execute Query 12 *step\_id* = 1232 *global\_flag* = 0  
*sequence\_no* = 22 *step\_level* = 2 *parent\_step\_id* = 1205 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\Power\12.sql *version\_no* = 19.0  
*start\_directory* = Power\_Static\_DB\_Connection *parent\_version\_no* = 23.1  
*step\_text* =

*step\_label* = Throughput - Semaphore Loop for RF Delay *step\_id* = 1234 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 2 *parent\_step\_id* = 1208 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 4.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 4.8  
*step\_text* = %TOOLS\_DIR%\Utility\semaphore -waitgroup S -count %MAX\_STREAMS%

*step\_label* = Throughput - Refresh Streams *step\_id* = 1235 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 2 *parent\_step\_id* = 1208 *enabled\_flag* = -1  
*iterator\_name* = STREAM\_NUM *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 4.0  
*start\_directory* = *parent\_version\_no* = 4.8  
*step\_text* =

*step\_label* = Stream 1 Manager *step\_id* = 1236 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 2 *parent\_step\_id* = 1209 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 1.3  
*start\_directory* = *parent\_version\_no* = 5.0  
*step\_text* =

*step\_label* = Stream 2 Manager *step\_id* = 1237 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 2 *parent\_step\_id* = 1209 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 1.3  
*start\_directory* = *parent\_version\_no* = 5.0  
*step\_text* =

*step\_label* = Stream 3 Manager *step\_id* = 1238 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 2 *parent\_step\_id* = 1209 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.8  
*start\_directory* = *parent\_version\_no* = 5.0  
*step\_text* =

*step\_label* = Stream 4 Manager *step\_id* = 1239 *global\_flag* = 0  
*sequence\_no* = 4 *step\_level* = 2 *parent\_step\_id* = 1209 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 1.3  
*start\_directory* = *parent\_version\_no* = 5.0  
*step\_text* =

*step\_label* = Stream 5 Manager *step\_id* = 1240 *global\_flag* = 0  
*sequence\_no* = 5 *step\_level* = 2 *parent\_step\_id* = 1209 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 1.3  
*start\_directory* = *parent\_version\_no* = 5.0  
*step\_text* =

*step\_label* = Stream 6 Manager *step\_id* = 1241 *global\_flag* = 0  
*sequence\_no* = 6 *step\_level* = 2 *parent\_step\_id* = 1209 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 3.3  
*start\_directory* = *parent\_version\_no* = 5.0  
*step\_text* =

*step\_label* = Stream 7 Manager *step\_id* = 1242 *global\_flag* = 0  
*sequence\_no* = 7 *step\_level* = 2 *parent\_step\_id* = 1209 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 2.3  
*start\_directory* = *parent\_version\_no* = 5.0  
*step\_text* =

*step\_label* = Stream 8 Manager *step\_id* = 1243 *global\_flag* = 0  
*sequence\_no* = 8 *step\_level* = 2 *parent\_step\_id* = 1209 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 1.0  
*start\_directory* = *parent\_version\_no* = 5.0  
*step\_text* =

*step\_label* = Stream 9 Manager *step\_id* = 1244 *global\_flag* = 0  
*sequence\_no* = 9 *step\_level* = 2 *parent\_step\_id* = 1209 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 1.0  
*start\_directory* = *parent\_version\_no* = 5.0  
*step\_text* =

*step\_label* = Stream 10 Manager *step\_id* = 1245 *global\_flag* = 0  
*sequence\_no* = 10 *step\_level* = 2 *parent\_step\_id* = 1209 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 1.0  
*start\_directory* = *parent\_version\_no* = 5.0  
*step\_text* =

*step\_label* = Throughput - RF1 - Stream%STREAM\_NUM% *step\_id* = 1246 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 3 *parent\_step\_id* = 1235 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %INSERT\_PARALLELISM%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 2.0  
*start\_directory* = *parent\_version\_no* = 4.0  
*step\_text* =

*step\_label* = Throughput - RF2 - Stream%STREAM\_NUM% *step\_id* = 1247 *global\_flag* = 0  
*sequence\_no* = 4 *step\_level* = 3 *parent\_step\_id* = 1235 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %DELETE\_PARALLELISM%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 1.0  
*start\_directory* = *parent\_version\_no* = 4.0  
*step\_text* =

*step\_label* = Throughput - Stream - Increment Update Set *step\_id* = 1248 *global\_flag* = 0  
*sequence\_no* = 5 *step\_level* = 3 *parent\_step\_id* = 1235 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 1.0  
*start\_directory* = Throughput\_RF\_Connection *parent\_version\_no* = 4.0  
*step\_text* = UPDATE TPCH\_AUX\_TABLE SET updateset=updateset+1

*step\_label* = Throughput - Query Stream 1 *step\_id* = 1249 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 1236 *enabled\_flag* = -1  
*iterator\_name* = QUERY *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* %QUERY\_DIR%\STREAM1\Stream1Q%QUERY%.sql *version\_no* = 1.0  
*start\_directory* = Throughput\_Static\_Stream\_1\_Connection *parent\_version\_no* = 1.3  
*step\_text* =

*step\_label* = Throughput - Post to Semaphore (S1) *step\_id* = 1250 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 3 *parent\_step\_id* = 1236 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 4.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 1.3  
*step\_text* = %TOOLS\_DIR%\Utility\semaphore -signal S.1

*step\_label* = Throughput - Query Stream 2 *step\_id* = 1251 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 1237 *enabled\_flag* = -1  
*iterator\_name* = QUERY *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\STREAM2\Stream2Q%QUERY%.sql *version\_no* = 1.0  
*start\_directory* = Throughput\_Static\_Stream\_2\_Connection *parent\_version\_no* = 1.3  
*step\_text* =

*step\_label* = Throughput - Post to Semaphore (S2) *step\_id* = 1252 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 3 *parent\_step\_id* = 1237 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 3.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 1.3  
*step\_text* = %TOOLS\_DIR%\Utility\semaphore -signal S.2

*step\_label* = Throughput - Query Stream 3 *step\_id* = 1253 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 1238 *enabled\_flag* = -1  
*iterator\_name* = QUERY *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\STREAM3\Stream3Q%QUERY%.sql *version\_no* = 4.0  
*start\_directory* = Throughput\_Static\_Stream\_3\_Connection *parent\_version\_no* = 0.8  
*step\_text* =



*step\_label* = Throughput - Post to Semaphore (S3) *step\_id* = 1254 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 3 *parent\_step\_id* = 1238 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 2.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 0.8  
*step\_text* = %TOOLS\_DIR%\Utility\semaphore -signal S.3

*step\_label* = Throughput - Query Stream 4 *step\_id* = 1255 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 1239 *enabled\_flag* = -1  
*iterator\_name* = QUERY *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* %QUERY\_DIR%\STREAM4\Stream4Q\QUERY%.sql *version\_no* = 2.0  
*start\_directory* = Throughput\_Static\_Stream\_4\_Connection *parent\_version\_no* = 1.3  
*step\_text* =

*step\_label* = Throughput - Post to Semaphore (S4) *step\_id* = 1256 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 3 *parent\_step\_id* = 1239 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 3.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 1.3  
*step\_text* = %TOOLS\_DIR%\Utility\semaphore -signal S.4

*step\_label* = Throughput - Query Stream 5 *step\_id* = 1257 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 1240 *enabled\_flag* = -1  
*iterator\_name* = QUERY *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\STREAM5\Stream5Q%QUERY%.sql *version\_no* = 1.0  
*start\_directory* = Throughput\_Static\_Stream\_5\_Connection *parent\_version\_no* = 1.3  
*step\_text* =

*step\_label* = Throughput - Post to Semaphore (S5) *step\_id* = 1258 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 3 *parent\_step\_id* = 1240 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 3.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 1.3  
*step\_text* = %TOOLS\_DIR%\Utility\semaphore -signal S.5

*step\_label* = Throughput - Query Stream 6 *step\_id* = 1259 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 1241 *enabled\_flag* = -1  
*iterator\_name* = QUERY *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\STREAM6\Stream6Q%QUERY%.sql *version\_no* = 1.0  
*start\_directory* = Throughput\_Static\_Stream\_6\_Connection *parent\_version\_no* = 3.3  
*step\_text* =

*step\_label* = Throughput - Post to Semaphore (S6) *step\_id* = 1260 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 3 *parent\_step\_id* = 1241 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 2.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 3.3  
*step\_text* = %TOOLS\_DIR%\Utility\semaphore -signal S.6

*step\_label* = Throughput - Query Stream 7 *step\_id* = 1261 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 1242 *enabled\_flag* = -1  
*iterator\_name* = QUERY *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* %QUERY\_DIR%\STREAM7\Stream7Q\QUERY%.sql *version\_no* = 1.0  
*start\_directory* = Throughput\_Static\_Stream\_7\_Connection *parent\_version\_no* = 2.3  
*step\_text* =

*step\_label* = Throughput - Post to Semaphore (S7) *step\_id* = 1262 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 3 *parent\_step\_id* = 1242 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 2.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 2.3  
*step\_text* = %TOOLS\_DIR%\Utility\semaphore -signal S.7

*step\_label* = Throughput - Query Stream 8 *step\_id* = 1263 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 1243 *enabled\_flag* = -1  
*iterator\_name* = QUERY *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\STREAM8\Stream8Q\QUERY%.sql *version\_no* = 0.0  
*start\_directory* = Throughput\_Static\_Stream\_8\_Connection *parent\_version\_no* = 1.0  
*step\_text* =

*step\_label* = Throughput - Post to Semaphore (S8) *step\_id* = 1264 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 3 *parent\_step\_id* = 1243 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 1.0  
*step\_text* = %TOOLS\_DIR%\Utility\semaphore -signal S.8

*step\_label* = Throughput - Query Stream 9 *step\_id* = 1265 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 1244 *enabled\_flag* = -1  
*iterator\_name* = QUERY *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %QUERY\_DIR%\STREAM9\Stream9Q\QUERY%.sql *version\_no* = 0.0  
*start\_directory* = Throughput\_Static\_Stream\_9\_Connection *parent\_version\_no* = 1.0  
*step\_text* =

*step\_label* = Throughput - Post to Semaphore (S9) *step\_id* = 1266 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 3 *parent\_step\_id* = 1244 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 1.0  
*step\_text* = %TOOLS\_DIR%\Utility\semaphore -signal S.9

*step\_label* = Throughput - Query Stream 10 *step\_id* = 1267 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 1245 *enabled\_flag* = -1  
*iterator\_name* = QUERY *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* %QUERY\_DIR%\STREAM10\Stream10Q%QUERY%.sql *version\_no* = 0.0  
*start\_directory* = Throughput\_Static\_Stream\_10\_Connection *parent\_version\_no* = 1.0  
*step\_text* =

*step\_label* = Throughput - Post to Semaphore (S10) *step\_id* = 1268 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 3 *parent\_step\_id* = 1245 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 2 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 1.0  
*step\_text* = %TOOLS\_DIR%\Utility\semaphore -signal S.10

*step\_label* = Throughput - Execute Stream%STREAM\_NUM% RF1      *step\_id* = 1269      *global\_flag* = 0  
*sequence\_no* = 1   *step\_level* = 4      *parent\_step\_id* = 1246   *enabled\_flag* = -1  
*iterator\_name* = INSERT\_SEGMENT      *degree\_parallelis* = 1  
*execution\_mechanism* = 1      *continuation\_criteria* = 2      *failure\_details* =  
*step\_file\_name*      *version\_no* = 5.0  
*start\_directory* = Throughput\_RF\_Connection      *parent\_version\_no* = 2.0  
*step\_text* = --  
-- Execute the Refresh RF1 Stored Procedure  
--  
EXEC RF1 %INSERT\_SEGMENT%, %BATCH\_SIZE%, %INSERT\_PARALLELISM%,  
%INSERT\_EXECUTIONS%

*step\_label* = Throughput - Execute Stream%STREAM\_NUM% RF2      *step\_id* = 1270      *global\_flag* = 0  
*sequence\_no* = 1   *step\_level* = 4      *parent\_step\_id* = 1247   *enabled\_flag* = -1  
*iterator\_name* = DELETE\_SEGMENT      *degree\_parallelis* = 1  
*execution\_mechanism* = 1      *continuation\_criteria* = 2      *failure\_details* =  
*step\_file\_name*      *version\_no* = 4.0  
*start\_directory* = Throughput\_RF\_Connection      *parent\_version\_no* = 1.0  
*step\_text* = --  
-- Execute the Refresh RF2 Stored Procedure  
--  
EXEC RF2 %DELETE\_SEGMENT%, %BATCH\_SIZE%, %DELETE\_PARALLELISM%,  
%DELETE\_EXECUTIONS%

*step\_label* = SqlServer Startup      *step\_id* = 1294      *global\_flag* = -1  
*sequence\_no* = 1   *step\_level* = 0      *parent\_step\_id* = 0   *enabled\_flag* = 0  
*iterator\_name* =      *degree\_parallelis* = 0  
*execution\_mechanism* = 2      *continuation\_criteria* = 0      *failure\_details* =  
*step\_file\_name*      *version\_no* = 0.0  
*start\_directory* =      *parent\_version\_no* = 0.0  
*step\_text* = start "SqlServer" sqlservr %TRACEFLAGS%  
%TOOLS\_DIR%\Utility\wait4sql 40000

*step\_label* = SqlServer Shutdown *step\_id* = 1295 *global\_flag* = -1  
*sequence\_no* = 2 *step\_level* = 0 *parent\_step\_id* = 0 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 0  
*execution\_mechanism* = 2 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.0  
*step\_text* = osql -Usa -P -t10 -Q"shutdown"  
%TOOLS\_DIR%\Utility\wait4sql 10000

*step\_label* = Wait For SQL Server *step\_id* = 1296 *global\_flag* = -1  
*sequence\_no* = 3 *step\_level* = 0 *parent\_step\_id* = 0 *enabled\_flag* = 0  
*iterator\_name* = *degree\_parallelis* = 0  
*execution\_mechanism* = 2 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = %TOOLS\_DIR% *parent\_version\_no* = 0.0  
*step\_text* = %TOOLS\_DIR%\Utility\wait4sql.exe 60000

*step\_label* = Power - Execute RF1 *step\_id* = 1405 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 1 *parent\_step\_id* = 1202 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 14.0  
*start\_directory* = *parent\_version\_no* = 125.6  
*step\_text* =

*step\_label* = Parallel RF1 Execution *step\_id* = 1406 *global\_flag* = 0  
*sequence\_no* = 4 *step\_level* = 2 *parent\_step\_id* = 1405 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %INSERT\_PARALLELISM%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 3.0  
*start\_directory* = *parent\_version\_no* = 14.0  
*step\_text* =

*step\_label* = Execute RF1 *step\_id* = 1407 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 1406 *enabled\_flag* = -1  
*iterator\_name* = INSERT\_SEGMENT *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* *version\_no* = 9.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 3.0  
*step\_text* = --  
-- Execute the Refresh RF1 Stored Procedure  
--  
  
EXEC RF1 %INSERT\_SEGMENT%, %BATCH\_SIZE%, %INSERT\_PARALLELISM%,  
%INSERT\_EXECUTIONS%

*step\_label* = Create RF1 Tables *step\_id* = 1411 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 2 *parent\_step\_id* = 1405 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 1 *failure\_details* =  
*step\_file\_name* %SETUP\_DIR%\RF\_Procs\RF1\_init.sql *version\_no* = 9.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 14.0  
*step\_text* =

*step\_label* = Parallel Load RF1 Input *step\_id* = 1414 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 2 *parent\_step\_id* = 1405 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %FILES\_PER\_UPDATE\_SET%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 1.0  
*start\_directory* = *parent\_version\_no* = 14.0  
*step\_text* =



*step\_label* = Throughput - Load RF1 Input *step\_id* = 1415 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 5 *parent\_step\_id* = 1431 *enabled\_flag* = -1  
*iterator\_name* = SEGMENT *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %SETUP\_DIR%\RF\_Procs\RF1\_load.sql *version\_no* = 3.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Create RF1 Indices *step\_id* = 1417 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 2 *parent\_step\_id* = 1405 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %SETUP\_DIR%\RF\_Procs\RF1\_index.sql *version\_no* = 3.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 14.0  
*step\_text* =

*step\_label* = Power - Execute RF2 *step\_id* = 1419 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 1 *parent\_step\_id* = 1202 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 15.0  
*start\_directory* = *parent\_version\_no* = 125.6  
*step\_text* =

*step\_label* = Create RF2 Tables *step\_id* = 1420 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 2 *parent\_step\_id* = 1419 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %SETUP\_DIR%\RF\_Procs\RF2\_init.sql *version\_no* = 4.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 15.0  
*step\_text* =

*step\_label* = Parallel Load RF2 Input *step\_id* = 1421 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 2 *parent\_step\_id* = 1419 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %FILES\_PER\_UPDATE\_SET%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 1.0  
*start\_directory* = *parent\_version\_no* = 15.0  
*step\_text* =

*step\_label* = Load RF2 Input *step\_id* = 1422 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 1421 *enabled\_flag* = -1  
*iterator\_name* = SEGMENT *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %SETUP\_DIR%\RF\_Procs\RF2\_load.sql *version\_no* = 2.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 1.0  
*step\_text* =

*step\_label* = Create RF2 Indices *step\_id* = 1424 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 2 *parent\_step\_id* = 1419 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %SETUP\_DIR%\RF\_Procs\RF2\_index.sql *version\_no* = 4.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 15.0  
*step\_text* =

*step\_label* = Parallel RF2 Execution *step\_id* = 1425 *global\_flag* = 0  
*sequence\_no* = 4 *step\_level* = 2 *parent\_step\_id* = 1419 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %DELETE\_PARALLELISM%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 3.0  
*start\_directory* = *parent\_version\_no* = 15.0  
*step\_text* =

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step_label = Execute RF2                                step_id = 1426    global_flag = 0
sequence_no = 1 step_level = 3                        parent_step_id = 1425  enabled_flag = -1
iterator_name = DELETE_SEGMENT                        degree_parallelis 1
execution_mechanism = 1                             continuation_criteria 2    failure_details =
step_file_name                                         version_no 8.0
start_directory = Power_Dynamic_DB_Connection        parent_version_no = 3.0
step_text = --
-- Execute the Refresh RF2 Stored Procedure
--

EXEC RF2 %DELETE_SEGMENT%, %BATCH_SIZE%, %DELETE_PARALLELISM%,
%DELETE_EXECUTIONS%

```

```

step_label = Throughput - Init RF1 Input              step_id = 1428    global_flag = 0
sequence_no = 1 step_level = 3                        parent_step_id = 1235  enabled_flag = -1
iterator_name =                                         degree_parallelis 1
execution_mechanism = 0                             continuation_criteria 0    failure_details =
step_file_name                                         version_no 2.0
start_directory =                                     parent_version_no = 4.0
step_text =

```

```

step_label = Throughput - Init RF2 Input              step_id = 1429    global_flag = 0
sequence_no = 3 step_level = 3                        parent_step_id = 1235  enabled_flag = -1
iterator_name =                                         degree_parallelis 1
execution_mechanism = 0                             continuation_criteria 0    failure_details =
step_file_name                                         version_no 0.1
start_directory =                                     parent_version_no = 4.0
step_text =

```

*step\_label* = Throughput - Create RF1 Tables *step\_id* = 1430 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 4 *parent\_step\_id* = 1428 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 1 *failure\_details* =  
*step\_file\_name* = %SETUP\_DIR%\RF\_Procs\RF1\_init.sql *version\_no* = 7.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 2.0  
*step\_text* =

*step\_label* = Throughput - Parallel Load RF1 Input *step\_id* = 1431 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 4 *parent\_step\_id* = 1428 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %FILES\_PER\_UPDATE\_SET%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 2.0  
*step\_text* =

*step\_label* = Load RF1 Input *step\_id* = 1432 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 3 *parent\_step\_id* = 1414 *enabled\_flag* = -1  
*iterator\_name* = SEGMENT *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %SETUP\_DIR%\RF\_Procs\RF1\_load.sql *version\_no* = 3.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 1.0  
*step\_text* =

*step\_label* = Throughput - Create RF1 Indices *step\_id* = 1434 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 4 *parent\_step\_id* = 1428 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %SETUP\_DIR%\RF\_Procs\RF1\_index.sql *version\_no* = 1.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 2.0  
*step\_text* =

*step\_label* = Throughput - Create RF2 Tables *step\_id* = 1435 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 4 *parent\_step\_id* = 1429 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %SETUP\_DIR%\RF\_Procs\RF2\_init.sql *version\_no* = 4.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 0.1  
*step\_text* =

*step\_label* = Throughput - Parallel Load RF2 Input *step\_id* = 1436 *global\_flag* = 0  
*sequence\_no* = 2 *step\_level* = 4 *parent\_step\_id* = 1429 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = %FILES\_PER\_UPDATE\_SET%  
*execution\_mechanism* = 0 *continuation\_criteria* = 0 *failure\_details* =  
*step\_file\_name* *version\_no* = 0.0  
*start\_directory* = *parent\_version\_no* = 0.1  
*step\_text* =

*step\_label* = Throughput - Load RF2 Input *step\_id* = 1437 *global\_flag* = 0  
*sequence\_no* = 1 *step\_level* = 5 *parent\_step\_id* = 1436 *enabled\_flag* = -1  
*iterator\_name* = SEGMENT *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %SETUP\_DIR%\RF\_Procs\RF2\_load.sql *version\_no* = 2.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 0.0  
*step\_text* =

*step\_label* = Throughput - Create RF2 Indices *step\_id* = 1438 *global\_flag* = 0  
*sequence\_no* = 3 *step\_level* = 4 *parent\_step\_id* = 1429 *enabled\_flag* = -1  
*iterator\_name* = *degree\_parallelis* = 1  
*execution\_mechanism* = 1 *continuation\_criteria* = 2 *failure\_details* =  
*step\_file\_name* = %SETUP\_DIR%\RF\_Procs\RF2\_index.sql *version\_no* = 3.0  
*start\_directory* = Dynamic\_Connection\_to\_DB *parent\_version\_no* = 0.1  
*step\_text* =

## *Iterator\_values*

<i>workspace_id</i>	<i>step_id</i>	<i>version_no</i>	<i>type</i>	<i>iterator_value</i>	<i>sequence_no</i>
13	1432	3.0	2	%FILES_PER_UPDATE_SET%	0
13	1422	2.0	3	1	0
13	1422	2.0	1	1	0
13	1422	2.0	2	%FILES_PER_UPDATE_SET%	0
13	1270	4.0	3	1	0
13	1270	4.0	2	%DELETE_EXECUTIONS%	0
13	1270	4.0	1	1	0
13	1437	2.0	2	%FILES_PER_UPDATE_SET%	0
13	1437	2.0	1	1	0
13	1437	2.0	3	1	0
13	1415	3.0	3	1	0
13	1415	3.0	2	%FILES_PER_UPDATE_SET%	0
13	1267	0.0	2	22	0
13	1432	3.0	1	1	0
13	1426	8.0	1	1	0
13	1432	3.0	3	1	0
13	1407	9.0	2	%INSERT_EXECUTIONS%	0
13	1407	9.0	3	1	0
13	1407	9.0	1	1	0
13	1265	0.0	3	1	0
13	1265	0.0	2	22	0
13	1265	0.0	1	1	0
13	1263	0.0	3	1	0

13	1263	0.0	2 22	0
13	1263	0.0	1 1	0
13	1267	0.0	3 1	0
13	1267	0.0	1 1	0
13	1415	3.0	1 1	0
13	1257	1.0	3 1	0
13	1235	4.0	3 1	0
13	1235	4.0	1 1	0
13	1249	1.0	3 1	0
13	1249	1.0	2 22	0
13	1249	1.0	1 1	0
13	1251	1.0	3 1	0
13	1251	1.0	1 1	0
13	1251	1.0	2 22	0
13	1253	4.0	1 1	0
13	1253	4.0	2 22	0
13	1253	4.0	3 1	0
13	1255	2.0	3 1	0
13	1426	8.0	3 1	0
13	1255	2.0	1 1	0
13	1426	8.0	2 %DELETE_EXECUTIONS%	0
13	1257	1.0	1 1	0
13	1257	1.0	2 22	0
13	1259	1.0	1 1	0
13	1259	1.0	3 1	0
13	1259	1.0	2 22	0
13	1261	1.0	3 1	0
13	1261	1.0	2 22	0
13	1261	1.0	1 1	0
13	1269	5.0	1 1	0
13	1269	5.0	2 %INSERT_EXECUTIONS%	0

13	1269	5.0	3 1	0
13	1235	4.0	2 %MAX_STREAMS%	0
13	1255	2.0	2 22	0



# Appendix G : Disk Configuration

HBA#	storage system#	SP#	DEU#	# of Disks	RAID Level	Capacity (GB)	Disk Partition1	
Partitions for DB Log								
0	0	0	0	7	5	199	#1(50GB) z: for junction point	#2(149GB) templog
			1	15	5	466	#1(466GB) Log for tpch1t	

HBA#	storage system#	SP#	DEU#	# of Disks	RAID Level	Capacity (GB)	Partition		
1	1	0	0	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
2		1	1	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
3	2	0	0	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
4		1	1	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
5	3	0	0	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
6		1	1	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
7	4	0	0	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
8		1	1	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
9	5	0	0	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
10		1	1	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
11	6	0	0	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
12		1	1	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
		2	15	5	466	#1(466GB): backup			
13	7	0	0	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
14		1	1	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
		2	15	5	466	#1(466GB): backup			
15	8	0	0	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
16		1	1	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
		2	15	5	466	#1(466GB): backup			
17	9	0	0	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
		1	13	5	399	#1(399GB):RF FlatFile			
		2	15	5	466	#1(466GB): backup			
18	10	1	3	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
19		0	0	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
20		1	1	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
21	11	0	0	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
22		1	1	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
23	12	0	0	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
24		1	1	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
25	13	0	0	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
26		1	1	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
27	14	0	0	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
28		1	1	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
29	15	0	0	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
30		1	1	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
31	16	0	0	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
32		1	1	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
33	17	0	0	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
34		1	1	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
35	18	0	0	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp
36		1	1	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp

37	19	0	0	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp	
38		1	1	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp	
39	20	0	0	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp	
40		1	1	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp	
41	21	0	0	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp	
42		1	1	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp	
43	22	0	0	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp	
44		1	1	15	0	499	#1(80GB):General	#2(40GB):LinItem	#3(40GB):temp	

## Appendix H : Price Quotation

1Microsoft Corporation  
One Microsoft Way  
Redmond, WA 98052-6399

Tel 425 882 8080  
Fax 425 936 7329  
<http://www.microsoft.com/>

**Microsoft**

October 13, 2005

NEC Corporation  
Keiichi Yamada  
1-10 Nisshin-cho, Fuchu-shi  
Tokyo, JP 1830035

Yamada-san:

Here is the information you requested regarding pricing for several Microsoft products to be used in conjunction with your TPC-H benchmark testing.

All pricing shown is in US Dollars (\$).

<b>Part Number</b>	<b>Description</b>	<b>Unit Price</b>	<b>Quantity</b>	<b>Price</b>
810-04793	<b>SQL Server 2005 Enterprise Edition</b> <i>Server License with 25 CALs</i> <i>Discount Schedule: Open Program - No Level</i> <i>Unit Price reflects a 39% discount from the</i> <i>retail unit price of \$13,969.</i>	\$8,487	1	\$8,487
359-01911	<b>SQL Server 2005 Client License</b> <i>Discount Schedule: Open Program - No Level</i> <i>Unit Price reflects a 4% discount from the</i> <i>retail unit price of \$163.</i>	\$156	45	\$7,020
P73-00295	<b>Windows Server 2003 Standard Edition</b> <i>Server License Only - No CALs</i> <i>Discount Schedule: Open Program - No Level</i> <i>Unit Price reflects a 28% discount from the</i> <i>retail unit price of \$999.</i>	\$719	1	\$719
659-00390	<b>Visual Studio .Net 2003 Professional</b> <i>No Discount Applied</i>	\$799	1	\$799
N/A	<b>Microsoft Problem Resolution Services</b> <i>Professional Support</i> <i>(1 Incident)</i>	\$245	1	\$245

Some products may not be currently orderable but will be available through Microsoft's normal distribution channels by November 7, 2005.

Defect support is included in the purchase price. Additional support is available from Microsoft PSS on an incident by incident basis at \$245 per call.

This quote is valid for the next 90 days.

If we can be of any further assistance, please contact Jamie Reding at (425) 703-0510 or [jamiere@microsoft.com](mailto:jamiere@microsoft.com).

Reference ID: PHkyam0511108200.

Please include this Reference ID in any correspondence regarding this price quote.



## Shopping Cart

	Quantity	Item Name	Price	Extension
<a href="#">Remove</a>	<input type="text" value="50"/>	<a href="#">NIC/QLA2340-CK-BK</a> Qlogic PCI-X TO 2GB FIBRE CHANNEL ADAPTER 2GB 133MHZ SNGL p/n QLA2340-CK	\$824.00	\$41,200.00
<a href="#">Remove</a>	<input type="text" value="1"/>	<a href="#">17543-11256</a> CTX CRT VL510 15 1024 x 768 0.28mm	\$108.90	\$108.90
<input type="button" value="Recalculate"/>			SubTotal	\$41,308.90
Shipping Method: <input type="text" value="Other"/> <input type="button" value="Calculate Shipping"/>				\$0.00

(Order multiple items may have shipping discount please call in for information. Select "Other" in the shipping method to use your carrier account, \$5 handling fee may be applied.)

Coupon Code:

**Please note that 8.25% sales Tax will be added for Texas residents. [Download Tax Exemption Form \(PDF\)](#)**

If the package is going to the Islands (PR Puerto Rico, Hawaii, Alaska, Virgin Islands) of United States, Please choose 2 days or 1 day Air shipping. Otherwise, your order may be delayed in processing. Shipping cost will be slightly higher than the price listed. All orders placed after 2:00PM CST are not guaranteed being shipped the same day. Please call in to confirm.