TPC Benchmark™ H
Full Disclosure Report

Sun Microsystems Sun Fire™ E25K
Using Oracle Database 10g Enterprise Edition with Partitioning and Automatic Storage Manager

Submitted for Review
Report Date: January 27, 2005 Revised: April 25, 2005

TPC Benchmark H Full Disclosure Report

First Printing

901 San Antonio Road, Palo Alto, California 94303 U.S.A.

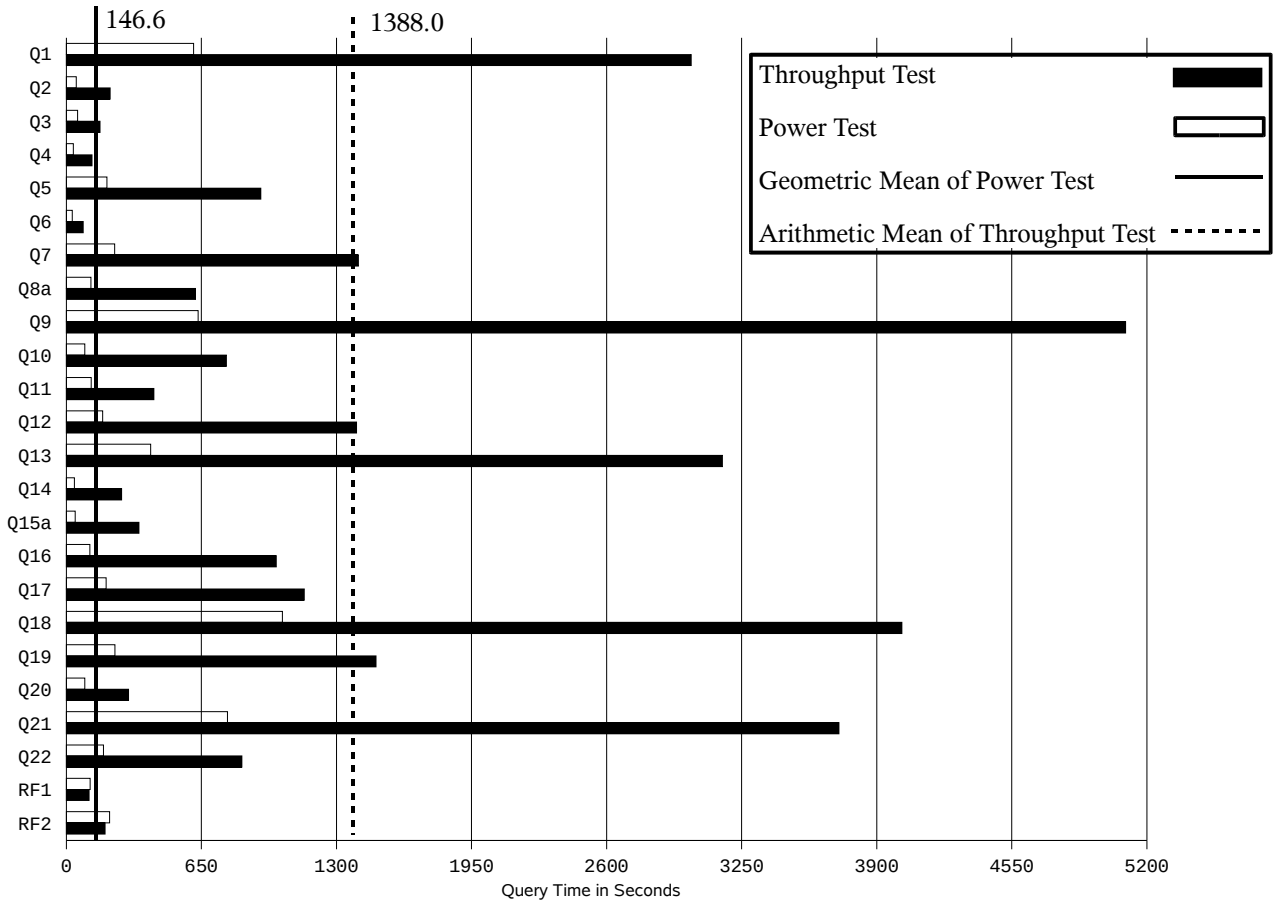
Sun Fire™ E25K Server with Oracle Database 10g

TPC-H Rev. 2.1

Reported January 27, 2005
Revised April 25, 2005

Total System Cost	Composite Query per Hour Metric	Price/Performance
$5,982,737	**59,435.7** QphH@3000GB	**$101** $/QphH@3000GB

Database Size	Database Manager	Operating System	Other Software	Availability Date
3000GB	Oracle Database 10g Enterprise Edition with Partitioning And Automatic Storage Manager	Solaris 10		July 27, 2005



Database Load Time = 4:01	Load Includes Backup: N	Total Data Storage/Database Size=28.8
RAID (Base tables): N	RAID (Base tables and auxiliary data structures): N	RAID (All): Y

System Configuration: Sun Fire™ E25K Server
Processors: 72 UltraSPARC™ IV 1200 MHz processors
Memory: 288GB memory
Disks: 96 StorEdge 3510 FC Arrays (12x73.4GB), 1 SE6120 (14x73.4GB),4 S1 (3x73.4GB)
Total Storage: 86,465.2 (in this calculation one GB is defined as 1024*1024*1024 bytes)

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Description	Part Number	Source	Unit Price	Qty	Ext. Price	3 Yr. Maint.	Unit 3 Yr Maint.
Server Hardware							
Sun Fire E25K base	E25K-BASE	1	315,000	1	315,000	197,244	197,244
UNIBRD 4 USIV @1.2GHz w/16GB	US4BRD-482-1200	1	153,000	18	2,754,000	277,344	15,408
Opt QFE PCI card w/SW	RFBX1034A	1	915	1	915		
PCI Dual GigE + Dual SCSI	X4422A	1	995	1	995		
Cable,SCSI,SCSI-3/SCSI-3, 2.0m	X1139A	1	95	1	95		
hsPCI+ IO Assembly	X4576A	1	15,000	17	255,000		
Opt Pwr Cord For Enterpr.(US)	X3800A	1	0	12	0		
2GB PCI Dual FC Network Adapter	RFBX6768A	1	3,875	48	186,000		
15M Fibre Channel Cable	X9724A	1	190	96	18,240		
Server Hardware Subtotal					3,530,245	474,588	
Storage							
876 GB StorEdge 3510 2 RAID Controllers	TA3510M01A2R876	1	41,995	96	4,031,520	708,480	7,380
StorEdge S1 3x73GB	NS-XDSKS1-373GAC	1	4,695	4	18,780	7,632	1,908
1022 GB StoreEdge 6120	XTA6120R11A1T1022	1	36,995	1	36,995	6,732	6,732
72" StorEdge Expansion Rack	RSG-SG-XARY030A	1	6,500	7	45,500		
Exp Cab 2U Universal Rack Mount Kit	TA-3000-2URK-19U	1	350	96	33,600		
Power Cord for StorEdge	X3858A	1	0	14	0		
Storage Subtotal					4,166,395	722,844	
Server Software							
Solaris 10		3	0	1	0		
Sun One Studio 7	FDEIS-T999-3ST	1	2,376	1	2,376	612	612
Sun StorEdge Comp Mgr	SCMMS-210-R99R	1	0	1	0		
Oracle Database 10g Enterprise Edition, Named User Plus for 3 years		2	10,000	144	1,440,000		
Partitioning, Named User Plus for 3 years		2	2,500	144	360,000		
Oracle Server Support Package for 3 years		2	6,000	1		6,000	
Server Software Subtotal					1,802,376	6,612	
Sun Volume Discounts (50%) and Support Prepayment (35%)		1			-3,849,508	-419,315	
Oracle Mandatory E-Business Discount (25%)		2			-451,500		
			Total		5,198,008	784,729	
Service for all Sun products is from Sun Microsystems, Inc. and is based on SunSpectrum Instant Upgrade Gold 7x24			**3 Yr. Cost**		5,982,737		
Service for Oracle products is from Oracle Corp.			**QphH@3000GB**		59,435.70		
			$/QphH@3000GB		$100.66		

Notes (Source):

1. Sun Microsystems, Inc. (see Appendix G)
2. Oracle Corp. (see Appendix G)
3. Download from SunSolve

Audited by: François Raab, 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 standard components. Individually negotiated discounts are not permitted. Special prices based on assumptions about past or future purchase are not permitted. All discounts reflect 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.

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Numerical Quantities

Measurement Results:

Database Scale Factor	= 3000GB
Total Data Storage / Database Size	= 28.8
Start of database load time	= 01-06-2005 21:26:30
End of database load time	= 01-07-2005 01:27:29
Database Load Time	= 4:01
Query Streams for Throughput Test	= 8
TPC-H Power	= 73,686.8
TPC-H Throughput	= 47,940.7
TPC-H Composite Query-per-Hour Rating (QphH@3000GB)	= 59,435.7
Total System Price Over 3 Years	= $5,982,737
TPC-H Price/Performance Metric ($/QphH@3000GB)	= $101

Measurement Intervals:

Measurement Interval in Throughput Test (Ts)	= 39,649 seconds

Duration of Stream Execution:

Stream ID	Seed	Start Date	Start Time	End Date	End Time	Duration
Stream 00	107012729	1/7/05	01:35:39	1/7/05	03:11:49	01:36:10
Stream 01	10701230	1/7/05	03:12:12	1/7/05	11:06:09	07:53:57
Stream 02	107012731	1/7/05	03:12:12	1/7/05	13:02:06	09:49:54
Stream 03	107012732	1/7/05	03:12:12	1/7/05	10:03:17	06:51:05
Stream 04	107012733	1/7/05	03:12:12	1/7/05	13:33:33	10:21:21
Stream 05	107012734	1/7/05	03:12:12	1/7/05	09:42:19	06:30:07
Stream 06	107012735	1/7/05	03:12:13	1/7/05	11:11:35	07:59:22
Stream 07	107012736	1/7/05	03:12:13	1/7/05	12:00:46	08:48:33
Stream 08	107012737	1/7/05	03:12:13	1/7/05	12:49:28	09:37:15
Refresh		1/7/05	13:33:33	1/7/05	14:13:01	00:39:28

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Sun Fire™ 15K Server with Oracle Database 10g

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TPC-H Timing Intervals (in seconds)

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8a	Q9	Q10	Q11	Q12
Stream 00	613.1	47.3	53.6	33.5	195.8	28.8	232.1	117.8	633.8	89.1	119.3	174.6
Stream 01	2228.7	244.5	208.4	114.4	607.1	55.3	701.2	913.2	1850.1	1141.7	582.1	1650.0
Stream 02	1326.7	280.1	77.6	53.1	2667.1	57.9	2693.6	1016.6	7929.1	1146.5	213.6	1531.7
Stream 03	2083.4	100.4	250.5	173.8	267.9	110.6	786.9	238.5	1954.9	396.5	350.3	2222.2
Stream 04	618.6	302.0	58.6	317.7	1859.0	178.9	237.9	958.3	8380.4	1221.5	886.3	2010.8
Stream 05	1807.4	101.4	189.9	98.6	555.3	64.4	3032.5	259.0	1931.4	348.6	466.0	455.3
Stream 06	1627.1	223.2	97.0	96.9	569.7	60.2	679.8	331.4	7955.6	160.3	351.5	454.3
Stream 07	6408.2	324.8	230.4	78.1	460.6	54.0	617.8	972.7	2276.8	252.3	324.3	639.7
Stream 08	7962.4	111.5	180.2	58.3	502.8	66.4	2490.6	279.0	8499.4	1499.8	200.4	2210.4
Minimum	618.6	100.4	58.6	53.1	267.9	54.0	237.9	238.5	1850.1	160.3	200.4	454.3
Average	3007.8	211.0	161.6	123.9	936.2	81.0	1405.0	621.1	5097.2	770.9	421.8	1396.8
Maximum	7962.4	324.8	250.5	317.7	2667.1	178.9	3032.5	1016.6	8499.4	1499.8	886.3	2222.2

	Q13	Q14	Q15a	Q16	Q17	Q18	Q19	Q20	Q21	Q22	RF1	RF2
Stream 00	405.4	38.9	42.1	112.7	191.1	1040.3	233.9	88.9	775.9	178.1	115.0	208.5
Stream 01	4631.3	395.0	625.2	1125.2	1274.3	3715.6	1813.5	247.0	3784.6	528.3	110.4	181.6
Stream 02	4150.1	668.9	611.1	1801.1	1055.4	3467.4	2028.1	143.3	806.8	1668.1	101.2	180.0
Stream 03	4702.6	97.5	144.4	1097.7	3337.5	3474.7	591.2	213.7	1593.5	476.4	105.4	188.8
Stream 04	401.8	309.0	636.9	1148.5	1080.1	6135.7	1740.9	98.4	8525.3	173.8	102.7	179.6
Stream 05	1337.4	94.8	182.7	1210.0	325.6	3436.5	2699.1	232.8	3847.4	730.9	104.7	182.0
Stream 06	7727.1	92.3	269.7	993.6	379.4	3434.6	451.2	219.6	1953.3	635.1	115.5	195.7
Stream 07	1138.0	129.6	189.2	347.4	1357.6	6124.5	673.8	910.2	7451.6	752.1	121.6	196.4
Stream 08	1171.2	343.4	135.1	355.7	352.7	2383.8	1922.7	329.1	1786.9	1793.4	118.9	181.6
Minimum	401.8	92.3	135.1	347.4	325.6	2383.8	451.2	98.4	806.8	173.8	101.2	179.6
Average	3157.4	266.3	349.3	1009.9	1145.3	4021.6	1490.1	299.3	3718.7	844.8	110.1	185.7
Maximum	7727.1	668.9	636.9	1801.1	3337.5	6135.7	2699.1	910.2	8525.3	1793.4	121.6	196.4

INFO SIZING

TPC TRANSACTION PROCESSING PERFORMANCE COUNCIL
CERTIFIED AUDITOR

Test Sponsors:

Ray Glasstone
Manger, DSS Performance.
Oracle Corporation
100 Oracle Parkway
Redwood Shores, CA 94065

Brad Carlile
Director, Enterprise Benchmarking
Sun Microsystems, Inc.
3295 N.W. 211th Terrace
Hillsboro OR, 97124

January 14, 2005

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

Platform:	**Sun Fire E25K Server**
Database Manager:	**Oracle 10g Enterprise Edition**
Operating System:	**Solaris 10**

The results were:

CPU (Speed)	Memory	Disks	**QphH@3000GB**
Sun Fire E25K Server			
72 x UltraSPARC IV (1200 MHz)	16 MB E-Cache/cpu 288 GB Main	1178 x 73.4 GB	**59,435.7**

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:

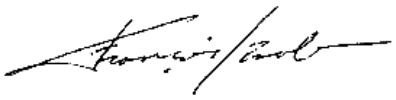
- The database records were defined with the proper layout and size
- The database population was generated using DBGEN
- The database was properly scaled to 3 TB and populated accordingly
- The compliance of the database auxiliary data structures was verified
- The database load time was correctly measured 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 the approved variants 8a and 15a
- 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 8 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. A failure during the second run of the benchmark required the execution of a third run, from which the reported results were collected.
- At least 8 hours 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,



François Raab
President

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Table of Contents

TPC Benchmark H Overview

The TPC BenchmarkTM H (TPC-H) is a Decision Support benchmark. It is a suite of business-oriented ad-hoc queries and concurrent modifications. 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
- 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

1. General Items

1.1 Benchmark Sponsor

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

Sun Microsystems, Inc. and Oracle Corp. are the sponsors of this TPC-H benchmark.

1.2 Parameter Settings

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

- *Database 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*

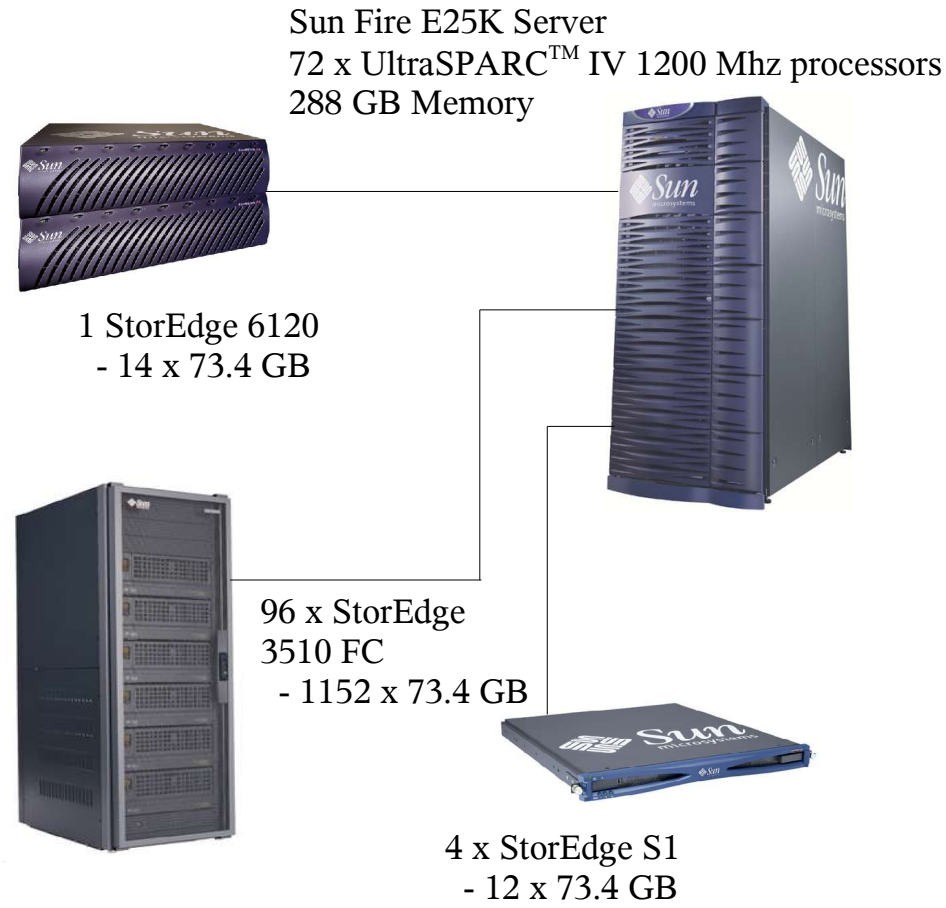
Appendix A contains the Solaris and Oracle parameters used in this benchmark.

1.3 Configuration Diagram

Provide diagrams of both the measured and priced configurations, accompanied by a description of the differences.

Sun Fire™ E25K Server, configured with:

- 72 UltraSPARC IV 1200 MHz processors
- 288 GB memory
- 1 Ethernet controller
- 96 StorEdge 3510 FC disk arrays, each containing 12 x 73.4GB disk drives
- 4 StorEdge S1 disk arrays, containing 3 x 73.4GB disk drives
- 1 StorEdge 6120 disk array, containing 14 x 73.4GB disk drives


Sun Fire E25K Server
72 x UltraSPARC™ IV 1200 Mhz processors
288 GB Memory
1 StorEdge 6120
- 14 x 73.4 GB
96 x StorEdge
3510 FC
- 1152 x 73.4 GB
4 x StorEdge S1
- 12 x 73.4 GB

2. Clause 1 Logical Database Design

2.1 Database Definition Statements

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

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

2.2 Physical 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.

No record clustering or index clustering was used. Column ordering was changed for some tables. Refer to the table create statements in Appendix B for further details.

2.3 Horizontal Partitioning

Horizontal partitioning of tables and rows in the test and qualification databases (see Clause 1.5.4) must be disclosed.

Horizontal partitioning was used for all tables except NATION and REGION. Refer to the table/index create statements in Appendix B for more details.

2.4 Replication

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

No replication was used.

3. Clause 2 Queries and Refresh 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 Verifying Method for Random Number Generation

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

TPC supplied versions 1.3.0 of DBGEN and QGEN were used for this TPC-H benchmark.

3.3 Generating Values for 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 to generate the substitution parameters.

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 qualification query text and query output.

3.5 Query Substitution Parameters and Seeds Used

The query substitution parameters used for all performance tests 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 the levels defined in Clause 3.4, additional descriptive detail must be provided.

The queries and transactions were run with isolation level 3 (repeatable read).

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 driver code included in Appendix E.

4. Clause 3 Database System Properties

4.1 ACID Properties

The ACID (Atomicity, Consistency, Isolation and Durability) properties of transaction processing systems must be supported by the system under test during the timed portion of this benchmark. Since TPC-H is not a transaction processing benchmark, the ACID properties must be evaluated outside the timed portion of the test.

Source code for the ACID test is included in Appendix B.

4.2 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.

4.2.1 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 ORDERS, LINEITEM, and HISTORY tables

1. The total price from the ORDERS 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 committed.
4. The total price from the ORDERS table and the extended price from the LINEITEM table were retrieved for the same order key. It was verified that the appropriate rows had been changed.

4.2.2 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 ORDERS, LINEITEM, and HISTORY tables.

1. The total price from the ORDERS 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 ORDERS table and the extended price from the LINEITEM table were retrieved for the same order key. It was verified that the appropriate rows had not been changed.

4.3 Consistency

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

4.3.1 Consistency Test

Verify that ORDERS and LINEITEM tables are initially consistent, submit the prescribed number of ACID Transactions with randomly selected input parameters, and re-verify the consistency of the ORDERS and LINEITEM.

1. The consistency of the ORDERS and LINEITEM tables was verified based on a sample of order keys.
2. 100 ACID Transactions were submitted by each of eight execution streams.
3. The consistency of the ORDERS and LINEITEM tables was re-verified.

4.4 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 the proper order.

4.4.1 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 blocked and did not see the uncommitted changes made by the ACID Transaction.
3. The ACID Transaction was resumed and COMMITTED.
4. The ACID Query completed. It returned the data as committed by the ACID Transaction.

4.4.2 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.

4.4.3 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. T1 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 + (DELTA1* (T1.L_EXTENDEDPRICE/T1.L_QUANTITY))

4.4.4 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. T1 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 ROLLBACK and T2 completed.
5. It was verified that T2.L_EXTENDEDPRICE = T1.L_EXTENDEDPRICE.

4.4.5 Concurrent Progress of Read and Write Transactions

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 ROLLBACK.
2. Another Transaction, T2, was started which did the following:

   For random values of PS_PARTKEY and PS_SUPPKEY, all columns of the PARTSUPP table for which PS_PARTKEY and PS_SUPPKEY are equal, are returned.
3. T2 completed.
4. T1 was allowed to COMMIT.
5. It was verified that appropriate rows in ORDERS, LINEITEM and HISTORY tables were changed.

4.4.6 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. A Transaction, T1, executing Q1 against the qualification database, was started using a randomly selected DELTA.
2. An ACID Transaction T2, was started for a randomly selected O_KEY, L_KEY and DELTA.
3. T2 completed and appropriate rows in the ORDERS, LINEITEM and HISTORY tables had been changed.
4. Transaction T1 completed executing Q1.

4.5 Durability

The SUT 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 3.5.3.

4.5.1 Failure of a Durable Medium

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 disks containing TPC-H tables and, log files were mirrored. During the durability test the disk containing one side of a data file mirror was removed from its cabinet. Similarly the disk containing one side of a log file mirror was removed from its cabinet. The test continued uninterrupted, using the remaining side of the mirror.

4.5.2 System Crash

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

The system crash and memory failure tests were combined. Power to the server was turned off by flipping breakers at the main electrical panel during the durability test. When power was restored, the system rebooted and the database was restarted. The durability success file and the HISTORY table were compared successfully.

4.5.3 Memory Failure

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

See section 4.5.2.

5. Clause 4 Scaling and Database Population

5.1 Ending Cardinality of Tables

The cardinality (i.e., 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	Rows
Orders	4,500,000,000
Lineitem	18,000,048,306
Customer	450,000,000
Part	600,000,000
Supplier	30,000,000
Partsupp	2,400,000,000
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.

- All tables, indexes, control files, redo logs and temporary tablespace were mirrored and striped across all 1152 disks in the StorEdge 3510 FC disk arrays.
- For more details refer to disk configuration section in Appendix B.

5.3 Database partition/replication mapping

The mapping of database partitions/replications must be explicitly described.

The database was not replicated.

Horizontal partitioning was used for base tables LINEITEM, ORDERS, PARTSUPP, PART, SUPPLIER and CUSTOMER. The details for this partitioning can be understood by examining the syntax of the table and index definition statments in Appendix B.

5.4 RAID Feature

Implementations may use some form of RAID to ensure high availability. If used for data, auxiliary storage (e.g. indexes) or temporary space, the level of RAID must be disclosed for each device.

Table/Index	RAID type
tables	RAID 1+0
indexes	RAID 1+0
temp tablespace	RAID 1+ 0
log	RAID 1+0
System tablespace	RAID 1+0

5.5 Modifications to the DBGEN

Any modifications to the DBGEN (see Clause 4.2.1) 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 version 1.3.0 was used to generate the database population for this benchmark.

5.6 Database Load Time

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

The database load time was 4 hours 1 minute.

5.7 Data Storage Ratio

The data storage ratio must be disclosed. It is computed as the ratio between the total amount of priced disk space, and the chosen test database size as defined in Clause 4.1.3.

The data storage ratio is computed from the following information:

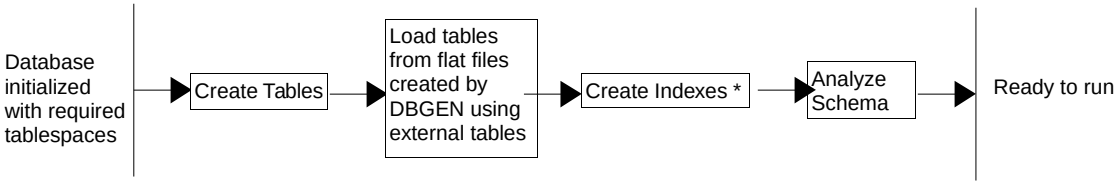
** Disk manufacturer definition of one GB is 10^9 bytes*
***In this calculation one GB is defined as 2^30 bytes*

Disk Type	# Of Disks	Space Per Disk*	Sub-Total Disk Space**
3510 FC	1152	73.4GB	84556.8 GB
6120	14	73.4GB	1027.6 GB
S1	12	73.4GB	880.8 GB
		Total Space	**86,465.2**
		Data Storage Ratio	**28.8**

5.8 Database Load Mechanism Details and Illustration

The details of the database load must be described, including a block diagram illustrating the overall process.

The database was loaded using data generation stored on flat files all on the tested and priced configurations. Oracle created external tables using the files that were created by the DBGEN program.



* Analyze index performed during index creation

5.9 Qualification Database Configuration

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

The qualification database used identical scripts to create and load the data with adjustments for the size difference.

6. Clause 5 Performance Metrics and Execution Rules

6.1 System Activity Between Load and Performance Tests

Any system activity on the SUT that takes place between the conclusion of the load test and the beginning of the performance test must be fully disclosed.

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

All scripts and queries used are included in Appendix F

6.2 Steps in the Power Test

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 used to implement the power test:

1. RF1 Refresh Transaction
2. Stream 00 Execution
3. RF2 Refresh Transaction

6.3 Timing Intervals for Each Query and Refresh Functions

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

The power test timing intervals are:

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8a	Q9	Q10	Q11	Q12
Stream 00	613.1	47.3	53.6	33.5	195.8	28.8	232.1	117.8	633.8	89.1	119.3	174.6
	Q13	**Q14**	**Q15**	**Q16**	**Q17**	**Q18**	**Q19**	**Q20**	**Q21**	**Q22**	**RF1**	**RF2**
Stream 00	405.4	38.9	42.1	112.7	191.1	1040.3	233.9	88.9	775.9	178.1	115.0	208.5

6.4 Number of Streams for the Throughput Test

The number of execution streams used for the throughput test must be disclosed.

Eight streams were used for the throughput test.

6.5 Start and End Date/Times for Each Query Stream

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

The throughput test start time and finish time for each stream are contained in the Numerical Quantity Summary earlier in this document.

6.6 Total Elapsed Time of the Measurement Interval

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

The total elapsed time of the throughput test is contained in the Numerical Quantity Summary earlier in this document.

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

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

The start and finish times for each refresh function in the refresh stream are contained in the Numerical Quantity Summary earlier in this document.

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

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

The timing intervals for each query and each refresh function for the throughput test are contained in the Numerical Quantity Summary earlier in this document.

6.9 Performance Metrics

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

The performance metrics, and the numbers on which they are based, are contained in the Numerical Quantity Summary earlier in this document.

6.10 The Performance Metric and Numerical Quantities from Both Runs

The performance metric and numerical quantities from both runs must be disclosed.

Performance results from the first two executions of the TPC-H benchmark indicated the following percent difference for the metric points:

Run ID	QppH@3000GB	QthH@3000GB	QphH@3000GB
Run 1	73,686.8	47,940.7	59,435.7
Run 2	74,542.7	47,840.5	59,717.3
Difference	1.15%	0.21%	0.47%

6.11 System Activity Between Performance Tests

Any activity on the SUT that takes place between the conclusion of Run1 and the beginning of Run2 must be disclosed.

There was no activity on the SUT between run1 and run2. run2 failed due to an IO error which resulted in the Temporary tablespace becoming unavailable. The IO failure was resolved, the system was rebooted , the database brought up and run3 was started. Run3 ran successfully to completion.

7. Clause 6 SUT and Driver Implementation

7.1 Driver

A detailed description of how the driver performs its functions must be supplied, including any related source code or scripts. This description should allow an independent reconstruction of the driver.

The Power Test and Throughput Test are performed by a shell script called runTPCpt. QGEN is first called with a stream id of 0 to generate the QET for the Power Test. UF1 is then started by executing the runuf1.sh script. Query submission follows, with the qexecpl.c ISL program. The execution of the UF2 script runuf2.sh rounds out the Power Test execution. Both wall-clock and high-resolution times are collected for all measurement intervals.

Following the Power Test, QGEN is again called with the subsequent 7 stream ids to generate new QET for each Throughput Test. qexecpl.c is called simultaneously for all 7 streams to execute the queries as above.Then the update_stream.sh script is called to run all 7 update pairs to finish the throughput run.

7.2 Implementation-Specific Layer

If an implementation-specific layer is used, then a detailed description of how it performs its functions must be supplied, including any related source code or scripts. This description should allow an independent reconstruction of the implementation-specific layer.

Query execution text generated by QGEN is picked up by the ISL program which submits the query to the SUT.

The ISL program (qexecpl.c) utilizes the Oracle Call Interface (OCI) to communicate with the Oracle database on the SUT. EQTs directly generated by QGEN are read and submitted to the SUT via the ISL program (qexecpl.c) as dynamic SQL statements. The ISL program then fetches the query execution output and reports it to the user. Timings are taken at intervals specified in Section 5.3.7 of the TPC-H benchmark specification.

The Update Functions use external tables to load data from flat files. Oracle9i's parallel insert and delete functionality was used to perform the Update Functions, selecting data from the temporary tables.

7.3 Profile-Directed Optimization

If profile-directed optimization as described in Clause 5.2.9 is used, such use must be disclosed.

Profile-directed optimization was not used.

8. Clause 7 Pricing

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 vendor part number, description, and release/revision level, and either 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.

Refer to the Executive Summary.

8.2 Total Three Year Price

The total 3-year price of the entire configuration must be reported, including hardware, software, and maintenance charges. Separate component pricing is recommended. The basis of all discounts used must be disclosed.

The total 3-year price of the configuration is $5,982,737. For details of pricing, see the second page of the Executive Summary.

The following generally available discounts to any buyer with like conditions were applied to the priced configuration:

- a 35% Sun support volume and yearly pre-payment discount
- a 50% discount from list for Sun supplied system components
- a 25% discount for Oracle software

8.3 Availability Date

The committed delivery date for general availability of products used in the price calculations must be reported. When the priced system includes products with different availability dates, the reported availability date for the priced system must be the date at which all components are committed to be available.

All Hardware components are available immediately. All Software components will be available by July 27, 2005.

9. Auditor's Information and Attestation Letter

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.

The auditor's attestation letter is included at the front of this report.

Appendix A. Solaris 10 and Oracle10g Parameters

This Appendix contains Solaris kernel parameters and environment variables and Oracle initialization parameters.

```
================================================
```

Oracle 10g Parameters

(altered from default)

```
================================================
```

inittpch.ora

```
aq_tm_processes                         = 0
audit_trail                     = FALSE
compatible                      = 10.0.0.0
db_block_checksum               = FALSE
db_block_size                   = 16384
db_cache_size                   = 8g
db_create_file_dest             = +dg_tpch
db_file_multiblock_read_count  = 64
db_files                        = 1023
db_name                         = tpch
db_writer_processes             = 10
dml_locks                       = 80000
enqueue_resources               = 50000
global_names                    = FALSE
java_pool_size                  = 0
large_pool_size                         = 10g
log_checkpoints_to_alert        = TRUE
max_dump_file_size              = unlimited
nls_date_format                         = YYYY-MM-DD
open_cursors                    = 1024
optimizer_dynamic_sampling      = 3
optimizer_features_enable       = 10.1.0.1
optimizer_mode                  = CHOOSE
parallel_execution_message_size = 32768
parallel_max_servers            = 2000
parallel_min_servers            = 1500
pga_aggregate_target            = 100g
processes                       = 4000
recovery_parallelism            = 64
replication_dependency_tracking = FALSE
sessions                        = 2048
shared_pool_size                = 10g
statistics_level                = basic
undo_management                         = AUTO
undo_tablespace                         = ts_undo

================================================
```

Solaris Parameters

(altered from default)

```
================================================
```

/etc/system

```
================================================
set shmsys:shminfo_shmmax=0xffffffffffffffff
set shmsys:shminfo_shmseg=200
set msgsys:msginfo_msgmax=1048576
set msgsys:msginfo_msgmnb=4194304
set msgsys:msginfo_msgmni=4400
set msgsys:msginfo_msgtql=32768
set msgsys:msginfo_msgseg=32767
set msgsys:msginfo_msgssz=128
set msgsys:msginfo_msgmap=3002
set semsys:seminfo_semmap=100
set semsys:seminfo_semmni=8000
set semsys:seminfo_semmns=8000
set semsys:seminfo_semmnu=8000
set semsys:seminfo_semmsl=512
set semsys:seminfo_semume=100
set maxpgio=131072
set maxphys=4194304
set autoup=900
set bufhwm=8000
set segspt_minfree=16000
exclude: drv/ohci
set kernel_cage_enable=0
set segmap_percent=1
```

Appendix B. Programs and Scripts

==========

Database Load Scripts

==========
==========

3tb_asm_dbcre.sh

==========

```
#!/bin/ksh
############################
# create tpcd database
############################
sqlplus / as sysdba<<EOF
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
startup pfile=?/dbs/inittpch.ora nomount;
create database
  controlfile reuse
  logfile '+dg_tpch' size 2047m reuse,
          '+dg_tpch' size 2047m reuse
  datafile '+dg_tpch'
           size 2047m reuse
  sysaux datafile '+dg_tpch'
           size 2047m reuse
  undo tablespace ts_undo
       datafile  '+dg_tpch'
         size 5000m reuse
  default temporary tablespace ts_temp
       tempfile '+dg_tpch'
         size 5000m reuse
       extent management local uniform size 10m
  maxdatafiles 2000
  maxinstances 1
;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
EOF

# building data dictionary
sqlplus / as sysdba<<EOF
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
set termout off;
set echo on;
spool /tmp/cat
@?/rdbms/admin/catalog.sql;
@?/rdbms/admin/catparr.sql;
@?/rdbms/admin/catproc.sql;
@?/rdbms/admin/utlxplan.sql;
connect system/manager
@?/sqlplus/admin/pupbld.sql;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
EOF
```

==========

3tb_asm_sctso.sh

==========

```
#!/bin/ksh
#########################################################
######################
# Schema Creation Phase - datafiles only (no tables or
users)
# creating data tablespaces, datafiles
# creating tpcd's ts_default tablespace
#########################################################
######################

# create ts_default tablespace
sqlplus / as sysdba<<! &
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
create tablespace ts_default
datafile '+dg_tpch' size 9900m reuse
extent management local autoallocate ;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!

# create ts_s tablespace
sqlplus / as sysdba<<! &
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
create tablespace ts_s
datafile '+dg_tpch' size 852m reuse
extent management local autoallocate nologging ;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!

# create ts_c tablespace
sqlplus / as sysdba<<! &
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
create tablespace ts_c
datafile '+dg_tpch' size 14303m reuse
extent management local autoallocate nologging ;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!

# create ts_ps tablespace
sqlplus / as sysdba<<! &
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
create tablespace ts_ps
datafile '+dg_tpch' size 19931m reuse
extent management local autoallocate nologging ;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!

# create ts_p tablespace
sqlplus / as sysdba<<! &
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
create tablespace ts_p
datafile '+dg_tpch' size 13511m reuse
extent management local autoallocate nologging ;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!

# create ts_o tablespaces
let i=1
while ((i<=84))
do
sqlplus / as sysdba<<! &
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
create tablespace ts_o${i}
datafile '+dg_tpch' size 8368m reuse
extent management local autoallocate nologging  ;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!
let i+=1
done

# wait for previous create tablespace statements to
complete
# before proceeding
wait

# create ts_l tablespaces
let i=1
```

```
while ((i<=84))
do
sqlplus / as sysdba<<! &
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
create tablespace ts_l${i}
datafile '+dg_tpch' size 40000m reuse
extent management local autoallocate nologging  ;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!
let i+=1
done

# create tpcd's ts_i_lorderkey tablespace
sqlplus / as sysdba<<! &
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
create tablespace ts_i_lorderkey
datafile '+dg_tpch' size 42671m reuse
extent management local autoallocate nologging ;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!

# create tpcd's ts_i_oorderkey tablespace
sqlplus / as sysdba<<! &
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
create tablespace ts_i_oorderkey
datafile '+dg_tpch' size 25399m reuse
extent management local autoallocate nologging ;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!

# creating tpcd's ts_i_ccustkey tablespace
sqlplus / as sysdba<<! &
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
create tablespace ts_i_ccustkey
datafile '+dg_tpch' size 10360m reuse
extent management local autoallocate nologging ;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!

wait

# adding tpcd's ts_undo datafiles
let i=1
while ((i<12))
do
sqlplus / as sysdba<<! &
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
alter tablespace ts_undo
  add datafile '+dg_tpch' size 19997m reuse;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!
let i+=1
done

# adding tpcd's ts_s datafiles
let i=1
while ((i<6))
do
sqlplus / as sysdba<<! &
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
alter tablespace ts_s
  add datafile '+dg_tpch' size 852m reuse;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!
let i+=1
done

# adding tpcd's ts_c datafiles
let i=1
while ((i<6))
do
sqlplus / as sysdba<<! &
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
alter tablespace ts_c
  add datafile '+dg_tpch' size 14303m reuse;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!
let i+=1
done

# adding tpcd's ts_ps datafiles
let i=1
while ((i<24))
do
sqlplus / as sysdba<<! &
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
alter tablespace ts_ps
  add datafile '+dg_tpch' size 19931m reuse;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!
let i+=1
done

# adding tpcd's ts_p datafiles
let i=1
while ((i<6))
do
sqlplus / as sysdba<<! &
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
alter tablespace ts_p
  add datafile '+dg_tpch' size 13511m reuse;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!
let i+=1
done

# adding tpcd's ts_i_lorderkey datafiles
let i=1
while ((i<12))
do
sqlplus / as sysdba<<! &
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
alter tablespace ts_i_lorderkey
  add datafile '+dg_tpch' size 42671m reuse;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!
let i+=1
done

# adding tpcd's ts_i_oorderkey datafiles
let i=1
while ((i<6))
```

```
do
sqlplus / as sysdba<<! &
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
alter tablespace ts_i_oorderkey
  add datafile '+dg_tpch' size 25399m reuse;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!
let i+=1
done

# adding tpcd's ts_i_ccustkey datafiles
let i=1
while ((i<6))
do
sqlplus / as sysdba<<! &
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
alter tablespace ts_i_ccustkey
  add datafile '+dg_tpch' size 10360m reuse;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!
let i+=1
done

wait

# adding tpcd's ts_temp datafiles
let i=1
while ((i<71))
do
sqlplus / as sysdba<<! &
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
alter tablespace ts_temp
  add tempfile '+dg_tpch' size 28445m reuse;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!
let i+=1
done

wait

=====================================================
```

3tb_asm_dapop.sh

```
=====================================================
#########################################################
######################
# Schema Creation Phase - User and Tables
#  AND  Database Population Phase
#
# creating tpcd user
sqlplus / as sysdba <<!
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
drop user tpcd cascade;
grant DBA
to tpcd identified by tpcd;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!

sqlplus / as sysdba <<!
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
connect tpcd/tpcd;
drop directory data_dir1;
drop directory data_dir2;
drop directory data_dir3;
drop directory data_dir4;
drop directory data_dir5;
drop directory data_dir6;
create directory data_dir1 as '/ff1';
create directory data_dir2 as '/ff2';
create directory data_dir3 as '/ff3';
create directory data_dir4 as '/ff4';
create directory data_dir5 as '/ff5';
create directory data_dir6 as '/ff6';
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!

sqlplus / as sysdba <<!
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
connect tpcd/tpcd;
drop table l_et;
create table l_et(
    l_orderkey           number ,
    l_partkey            number ,
    l_suppkey            number ,
    l_linenumber         number ,
    l_quantity           number ,
    l_extendedprice      number ,
    l_discount           number ,
    l_tax                number ,
    l_returnflag         char(1) ,
    l_linestatus         char(1) ,
    l_shipdate           date ,
    l_commitdate         date ,
    l_receiptdate        date ,
    l_shipinstruct       char(25) ,
    l_shipmode           char(10) ,
    l_comment            varchar(44)
)
organization external (
type ORACLE_LOADER
default directory data_dir1
access parameters
(
                records delimited by newline
                badfile 'l_et.bad'
                logfile 'l_et.log'
                fields terminated by '|'
                missing field values are null
        )
        location (
        data_dir1:'lineitem.tbl.1',
        data_dir1:'lineitem.tbl.2',
        data_dir1:'lineitem.tbl.3',
        data_dir1:'lineitem.tbl.4',
        data_dir1:'lineitem.tbl.5',
        data_dir1:'lineitem.tbl.6',
        data_dir1:'lineitem.tbl.7',
        data_dir1:'lineitem.tbl.8',
        data_dir1:'lineitem.tbl.9',
        data_dir1:'lineitem.tbl.10',
        data_dir1:'lineitem.tbl.11',
        data_dir1:'lineitem.tbl.12',
        data_dir1:'lineitem.tbl.13',
        data_dir1:'lineitem.tbl.14',
        data_dir2:'lineitem.tbl.15',
        data_dir2:'lineitem.tbl.16',
        data_dir2:'lineitem.tbl.17',
        data_dir2:'lineitem.tbl.18',
        data_dir2:'lineitem.tbl.19',
        data_dir2:'lineitem.tbl.20',
        data_dir2:'lineitem.tbl.21',
        data_dir2:'lineitem.tbl.22',
        data_dir2:'lineitem.tbl.23',
        data_dir2:'lineitem.tbl.24',
        data_dir2:'lineitem.tbl.25',
        data_dir2:'lineitem.tbl.26',
        data_dir2:'lineitem.tbl.27',
        data_dir2:'lineitem.tbl.28',
        data_dir3:'lineitem.tbl.29',
        data_dir3:'lineitem.tbl.30',
        data_dir3:'lineitem.tbl.31',
        data_dir3:'lineitem.tbl.32',
        data_dir3:'lineitem.tbl.33',
        data_dir3:'lineitem.tbl.34',
```

```
        data_dir3:'lineitem.tbl.35',
        data_dir3:'lineitem.tbl.36',
        data_dir3:'lineitem.tbl.37',
        data_dir3:'lineitem.tbl.38',
        data_dir3:'lineitem.tbl.39',
        data_dir3:'lineitem.tbl.40',
        data_dir3:'lineitem.tbl.41',
        data_dir3:'lineitem.tbl.42',
        data_dir4:'lineitem.tbl.43',
        data_dir4:'lineitem.tbl.44',
        data_dir4:'lineitem.tbl.45',
        data_dir4:'lineitem.tbl.46',
        data_dir4:'lineitem.tbl.47',
        data_dir4:'lineitem.tbl.48',
        data_dir4:'lineitem.tbl.49',
        data_dir4:'lineitem.tbl.50',
        data_dir4:'lineitem.tbl.51',
        data_dir4:'lineitem.tbl.52',
        data_dir4:'lineitem.tbl.53',
        data_dir4:'lineitem.tbl.54',
        data_dir4:'lineitem.tbl.55',
        data_dir4:'lineitem.tbl.56',
        data_dir5:'lineitem.tbl.57',
        data_dir5:'lineitem.tbl.58',
        data_dir5:'lineitem.tbl.59',
        data_dir5:'lineitem.tbl.60',
        data_dir5:'lineitem.tbl.61',
        data_dir5:'lineitem.tbl.62',
        data_dir5:'lineitem.tbl.63',
        data_dir5:'lineitem.tbl.64',
        data_dir5:'lineitem.tbl.65',
        data_dir5:'lineitem.tbl.66',
        data_dir5:'lineitem.tbl.67',
        data_dir5:'lineitem.tbl.68',
        data_dir5:'lineitem.tbl.69',
        data_dir5:'lineitem.tbl.70',
        data_dir6:'lineitem.tbl.71',
        data_dir6:'lineitem.tbl.72',
        data_dir6:'lineitem.tbl.73',
        data_dir6:'lineitem.tbl.74',
        data_dir6:'lineitem.tbl.75',
        data_dir6:'lineitem.tbl.76',
        data_dir6:'lineitem.tbl.77',
        data_dir6:'lineitem.tbl.78',
        data_dir6:'lineitem.tbl.79',
        data_dir6:'lineitem.tbl.80',
        data_dir6:'lineitem.tbl.81',
        data_dir6:'lineitem.tbl.82',
        data_dir6:'lineitem.tbl.83',
        data_dir6:'lineitem.tbl.84'
        ))
reject limit unlimited;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!

sqlplus / as sysdba <<!
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
connect tpcd/tpcd;
drop table o_et;
create table o_et(
    o_orderkey          number ,
    o_custkey           number ,
    o_orderstatus       char(1) ,
    o_totalprice        number ,
    o_orderdate         date ,
    o_orderpriority     char(15) ,
    o_clerk             char(15) ,
    o_shippriority      number ,
    o_comment           varchar(79)
)
organization external (
type ORACLE_LOADER
default directory data_dir1
access parameters
(
                records delimited by newline
                badfile 'o_et.bad'
                logfile 'o_et.log'
                fields terminated by '|'
                missing field values are null
        )
        location (
data_dir1:'orders.tbl.1',
data_dir1:'orders.tbl.2',
data_dir1:'orders.tbl.3',
data_dir1:'orders.tbl.4',
data_dir1:'orders.tbl.5',
data_dir1:'orders.tbl.6',
data_dir1:'orders.tbl.7',
data_dir1:'orders.tbl.8',
data_dir1:'orders.tbl.9',
data_dir1:'orders.tbl.10',
data_dir1:'orders.tbl.11',
data_dir1:'orders.tbl.12',
data_dir1:'orders.tbl.13',
data_dir1:'orders.tbl.14',
data_dir2:'orders.tbl.15',
data_dir2:'orders.tbl.16',
data_dir2:'orders.tbl.17',
data_dir2:'orders.tbl.18',
data_dir2:'orders.tbl.19',
data_dir2:'orders.tbl.20',
data_dir2:'orders.tbl.21',
data_dir2:'orders.tbl.22',
data_dir2:'orders.tbl.23',
data_dir2:'orders.tbl.24',
data_dir2:'orders.tbl.25',
data_dir2:'orders.tbl.26',
data_dir2:'orders.tbl.27',
data_dir2:'orders.tbl.28',
data_dir3:'orders.tbl.29',
data_dir3:'orders.tbl.30',
data_dir3:'orders.tbl.31',
data_dir3:'orders.tbl.32',
data_dir3:'orders.tbl.33',
data_dir3:'orders.tbl.34',
data_dir3:'orders.tbl.35',
data_dir3:'orders.tbl.36',
data_dir3:'orders.tbl.37',
data_dir3:'orders.tbl.38',
data_dir3:'orders.tbl.39',
data_dir3:'orders.tbl.40',
data_dir3:'orders.tbl.41',
data_dir3:'orders.tbl.42',
data_dir4:'orders.tbl.43',
data_dir4:'orders.tbl.44',
data_dir4:'orders.tbl.45',
data_dir4:'orders.tbl.46',
data_dir4:'orders.tbl.47',
data_dir4:'orders.tbl.48',
data_dir4:'orders.tbl.49',
data_dir4:'orders.tbl.50',
data_dir4:'orders.tbl.51',
data_dir4:'orders.tbl.52',
data_dir4:'orders.tbl.53',
data_dir4:'orders.tbl.54',
data_dir4:'orders.tbl.55',
data_dir4:'orders.tbl.56',
data_dir5:'orders.tbl.57',
data_dir5:'orders.tbl.58',
data_dir5:'orders.tbl.59',
data_dir5:'orders.tbl.60',
data_dir5:'orders.tbl.61',
data_dir5:'orders.tbl.62',
data_dir5:'orders.tbl.63',
data_dir5:'orders.tbl.64',
data_dir5:'orders.tbl.65',
data_dir5:'orders.tbl.66',
data_dir5:'orders.tbl.67',
data_dir5:'orders.tbl.68',
data_dir5:'orders.tbl.69',
data_dir5:'orders.tbl.70',
data_dir6:'orders.tbl.71',
data_dir6:'orders.tbl.72',
data_dir6:'orders.tbl.73',
data_dir6:'orders.tbl.74',
data_dir6:'orders.tbl.75',
data_dir6:'orders.tbl.76',
data_dir6:'orders.tbl.77',
data_dir6:'orders.tbl.78',
data_dir6:'orders.tbl.79',
data_dir6:'orders.tbl.80',
data_dir6:'orders.tbl.81',
data_dir6:'orders.tbl.82',
data_dir6:'orders.tbl.83',
data_dir6:'orders.tbl.84'
        ))
```

```
reject limit unlimited;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!

sqlplus / as sysdba <<!
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
connect tpcd/tpcd;
drop table ps_et;
create table ps_et(
    ps_partkey          number ,
    ps_suppkey          number ,
    ps_availqty         number ,
    ps_supplycost       number ,
    ps_comment          varchar(199)
)
organization external (
type ORACLE_LOADER
default directory data_dir1
access parameters
(
                records delimited by newline
                badfile 'ps_et.bad'
                logfile 'ps_et.log'
                fields terminated by '|'
                missing field values are null
        )
        location (
        data_dir1:'partsupp.tbl.1',
        data_dir1:'partsupp.tbl.2',
        data_dir1:'partsupp.tbl.3',
        data_dir1:'partsupp.tbl.4',
        data_dir1:'partsupp.tbl.5',
        data_dir1:'partsupp.tbl.6',
        data_dir2:'partsupp.tbl.7',
        data_dir2:'partsupp.tbl.8',
        data_dir2:'partsupp.tbl.9',
        data_dir2:'partsupp.tbl.10',
        data_dir2:'partsupp.tbl.11',
        data_dir2:'partsupp.tbl.12',
        data_dir3:'partsupp.tbl.13',
        data_dir3:'partsupp.tbl.14',
        data_dir3:'partsupp.tbl.15',
        data_dir3:'partsupp.tbl.16',
        data_dir3:'partsupp.tbl.17',
        data_dir3:'partsupp.tbl.18',
        data_dir4:'partsupp.tbl.19',
        data_dir4:'partsupp.tbl.20',
        data_dir4:'partsupp.tbl.21',
        data_dir4:'partsupp.tbl.22',
        data_dir4:'partsupp.tbl.23',
        data_dir4:'partsupp.tbl.24',
        data_dir5:'partsupp.tbl.25',
        data_dir5:'partsupp.tbl.26',
        data_dir5:'partsupp.tbl.27',
        data_dir5:'partsupp.tbl.28',
        data_dir5:'partsupp.tbl.29',
        data_dir5:'partsupp.tbl.30',
        data_dir6:'partsupp.tbl.31',
        data_dir6:'partsupp.tbl.32',
        data_dir6:'partsupp.tbl.33',
        data_dir6:'partsupp.tbl.34',
        data_dir6:'partsupp.tbl.35',
        data_dir6:'partsupp.tbl.36'
        ))
reject limit unlimited;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!

sqlplus / as sysdba <<!
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
connect tpcd/tpcd;
drop table p_et;
create table p_et(
    p_partkey           number ,
    p_name              varchar(55) ,
    p_mfgr              char(25) ,
    p_brand             char(10) ,
    p_type              varchar(25) ,
    p_size              number ,
    p_container         char(10) ,
    p_retailprice       number ,
    p_comment           varchar(23)
)
organization external (
type ORACLE_LOADER
default directory data_dir1
access parameters
(
                records delimited by newline
                badfile 'p_et.bad'
                logfile 'p_et.log'
                fields terminated by '|'
                missing field values are null
        )
        location (
        data_dir1:'part.tbl.1',
        data_dir1:'part.tbl.2',
        data_dir1:'part.tbl.3',
        data_dir1:'part.tbl.4',
        data_dir1:'part.tbl.5',
        data_dir1:'part.tbl.6',
        data_dir2:'part.tbl.7',
        data_dir2:'part.tbl.8',
        data_dir2:'part.tbl.9',
        data_dir2:'part.tbl.10',
        data_dir2:'part.tbl.11',
        data_dir2:'part.tbl.12',
        data_dir3:'part.tbl.13',
        data_dir3:'part.tbl.14',
        data_dir3:'part.tbl.15',
        data_dir3:'part.tbl.16',
        data_dir3:'part.tbl.17',
        data_dir3:'part.tbl.18',
        data_dir4:'part.tbl.19',
        data_dir4:'part.tbl.20',
        data_dir4:'part.tbl.21',
        data_dir4:'part.tbl.22',
        data_dir4:'part.tbl.23',
        data_dir4:'part.tbl.24',
        data_dir5:'part.tbl.25',
        data_dir5:'part.tbl.26',
        data_dir5:'part.tbl.27',
        data_dir5:'part.tbl.28',
        data_dir5:'part.tbl.29',
        data_dir5:'part.tbl.30',
        data_dir6:'part.tbl.31',
        data_dir6:'part.tbl.32',
        data_dir6:'part.tbl.33',
        data_dir6:'part.tbl.34',
        data_dir6:'part.tbl.35',
        data_dir6:'part.tbl.36'
))
reject limit unlimited;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!

sqlplus / as sysdba <<!
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
connect tpcd/tpcd;
drop table c_et;
create table c_et(
    c_custkey           number ,
    c_name              varchar(25) ,
    c_address           varchar(40) ,
    c_nationkey         number ,
    c_phone             char(15) ,
    c_acctbal           number ,
    c_mktsegment        char(10) ,
    c_comment           varchar(117)
)
organization external (
type ORACLE_LOADER
default directory data_dir1
access parameters
(
                records delimited by newline
                badfile 'c_et.bad'
```

```
                logfile 'c_et.log'
                fields terminated by '|'
                missing field values are null
        )
        location (
        data_dir1:'customer.tbl.1',
        data_dir2:'customer.tbl.2',
        data_dir3:'customer.tbl.3',
        data_dir4:'customer.tbl.4',
        data_dir5:'customer.tbl.5',
        data_dir6:'customer.tbl.6'
))
reject limit unlimited;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!

sqlplus / as sysdba <<!
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
connect tpcd/tpcd;
drop table s_et;
create table s_et(
    s_suppkey            number ,
    s_name               char(25) ,
    s_address            varchar(40) ,
    s_nationkey          number ,
    s_phone              char(15) ,
    s_acctbal            number,
    s_comment            varchar(101)
)
organization external (
type ORACLE_LOADER
default directory data_dir1
access parameters
(
                records delimited by newline
                badfile 's_et.bad'
                logfile 's_et.log'
                fields terminated by '|'
                missing field values are null
        )
        location (
        data_dir1:'supplier.tbl.1',
        data_dir2:'supplier.tbl.2',
        data_dir3:'supplier.tbl.3',
        data_dir4:'supplier.tbl.4',
        data_dir5:'supplier.tbl.5',
        data_dir6:'supplier.tbl.6'
        ))
reject limit unlimited;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!

sqlplus / as sysdba <<!
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
connect tpcd/tpcd;
drop table n_et;
create table n_et(
    n_nationkey          number ,
    n_name               char(25) ,
    n_regionkey          number ,
    n_comment            varchar(152)
)
organization external (
type ORACLE_LOADER
default directory data_dir1
access parameters
(
                records delimited by newline
                badfile 'n_et.bad'
                logfile 'n_et.log'
                fields terminated by '|'
                missing field values are null
        )
        location (
        data_dir1:'nation.tbl'))
reject limit unlimited;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!

sqlplus / as sysdba <<!
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
connect tpcd/tpcd;
drop table r_et;
create table r_et(
    r_regionkey          number ,
    r_name               char(25) ,
    r_comment            varchar(152)
)
organization external (
type ORACLE_LOADER
default directory data_dir1
access parameters
(
                records delimited by newline
                badfile 'r_et.bad'
                logfile 'r_et.log'
                fields terminated by '|'
                missing field values are null
        )
        location (
        data_dir1:'region.tbl'))
reject limit unlimited;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!

sqlplus / as sysdba <<!
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
connect tpcd/tpcd;
alter table l_et parallel 144;
alter table o_et parallel 144;
alter table ps_et parallel 144;
alter table p_et parallel 144;
alter table c_et parallel 144;
alter table s_et parallel 144;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!

# altering tpcd's default and temporary tablespace
sqlplus / as sysdba <<!
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
alter user tpcd default tablespace ts_default;
alter user tpcd temporary tablespace ts_temp;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!

sqlplus / as sysdba <<!
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
!date
connect tpcd/tpcd;
set timing on
set echo on

rem drop table lineitem;
create table lineitem(
    l_shipdate           ,
    l_orderkey           NOT NULL,
    l_discount           NOT NULL,
    l_extendedprice      NOT NULL,
    l_suppkey            NOT NULL,
    l_quantity           NOT NULL,
    l_returnflag         ,
    l_partkey            NOT NULL,
```

```
    l_linestatus        ,
    l_tax               NOT NULL,
    l_commitdate        ,
    l_receiptdate       ,
    l_shipmode          ,
    l_linenumber        NOT NULL,
    l_shipinstruct      ,
    l_comment
)
pctfree 1
pctused 99
initrans 10
storage (initial 1500m freelist groups 4 freelists 84)
parallel 144
nologging
partition by range (l_shipdate)
subpartition by hash(l_partkey)
subpartitions 16
(
partition item1 values less than (to_date('1992-01-
01','YYYY-MM-DD'))
tablespace ts_l1
,
partition item2 values less than (to_date('1992-02-
01','YYYY-MM-DD'))
tablespace ts_l2
,
partition item3 values less than (to_date('1992-03-
01','YYYY-MM-DD'))
tablespace ts_l3
,
partition item4 values less than (to_date('1992-04-
01','YYYY-MM-DD'))
tablespace ts_l4
,
partition item5 values less than (to_date('1992-05-
01','YYYY-MM-DD'))
tablespace ts_l5
,
partition item6 values less than (to_date('1992-06-
01','YYYY-MM-DD'))
tablespace ts_l6
,
partition item7 values less than (to_date('1992-07-
01','YYYY-MM-DD'))
tablespace ts_l7
,
partition item8 values less than (to_date('1992-08-
01','YYYY-MM-DD'))
tablespace ts_l8
,
partition item9 values less than (to_date('1992-09-
01','YYYY-MM-DD'))
tablespace ts_l9
,
partition item10 values less than (to_date('1992-10-
01','YYYY-MM-DD'))
tablespace ts_l10
,
partition item11 values less than (to_date('1992-11-
01','YYYY-MM-DD'))
tablespace ts_l11
,
partition item12 values less than (to_date('1992-12-
01','YYYY-MM-DD'))
tablespace ts_l12
,
partition item13 values less than (to_date('1993-01-
01','YYYY-MM-DD'))
tablespace ts_l13
,
partition item14 values less than (to_date('1993-02-
01','YYYY-MM-DD'))
tablespace ts_l14
,
partition item15 values less than (to_date('1993-03-
01','YYYY-MM-DD'))
tablespace ts_l15
,
partition item16 values less than (to_date('1993-04-
01','YYYY-MM-DD'))
tablespace ts_l16
,
partition item17 values less than (to_date('1993-05-
01','YYYY-MM-DD'))
tablespace ts_l17
,
partition item18 values less than (to_date('1993-06-
01','YYYY-MM-DD'))
tablespace ts_l18
,
partition item19 values less than (to_date('1993-07-
01','YYYY-MM-DD'))
tablespace ts_l19
,
partition item20 values less than (to_date('1993-08-
01','YYYY-MM-DD'))
tablespace ts_l20
,
partition item21 values less than (to_date('1993-09-
01','YYYY-MM-DD'))
tablespace ts_l21
,
partition item22 values less than (to_date('1993-10-
01','YYYY-MM-DD'))
tablespace ts_l22
,
partition item23 values less than (to_date('1993-11-
01','YYYY-MM-DD'))
tablespace ts_l23
,
partition item24 values less than (to_date('1993-12-
01','YYYY-MM-DD'))
tablespace ts_l24
,
partition item25 values less than (to_date('1994-01-
01','YYYY-MM-DD'))
tablespace ts_l25
,
partition item26 values less than (to_date('1994-02-
01','YYYY-MM-DD'))
tablespace ts_l26
,
partition item27 values less than (to_date('1994-03-
01','YYYY-MM-DD'))
tablespace ts_l27
,
partition item28 values less than (to_date('1994-04-
01','YYYY-MM-DD'))
tablespace ts_l28
,
partition item29 values less than (to_date('1994-05-
01','YYYY-MM-DD'))
tablespace ts_l29
,
partition item30 values less than (to_date('1994-06-
01','YYYY-MM-DD'))
tablespace ts_l30
,
partition item31 values less than (to_date('1994-07-
01','YYYY-MM-DD'))
tablespace ts_l31
,
partition item32 values less than (to_date('1994-08-
01','YYYY-MM-DD'))
tablespace ts_l32
,
partition item33 values less than (to_date('1994-09-
01','YYYY-MM-DD'))
tablespace ts_l33
,
partition item34 values less than (to_date('1994-10-
01','YYYY-MM-DD'))
tablespace ts_l34
,
partition item35 values less than (to_date('1994-11-
01','YYYY-MM-DD'))
tablespace ts_l35
,
partition item36 values less than (to_date('1994-12-
01','YYYY-MM-DD'))
tablespace ts_l36
,
partition item37 values less than (to_date('1995-01-
01','YYYY-MM-DD'))
tablespace ts_l37
,
partition item38 values less than (to_date('1995-02-
01','YYYY-MM-DD'))
tablespace ts_l38
,
partition item39 values less than (to_date('1995-03-
```

```
01','YYYY-MM-DD'))
tablespace ts_l39
,
partition item40 values less than (to_date('1995-04-
01','YYYY-MM-DD'))
tablespace ts_l40
,
partition item41 values less than (to_date('1995-05-
01','YYYY-MM-DD'))
tablespace ts_l41
,
partition item42 values less than (to_date('1995-06-
01','YYYY-MM-DD'))
tablespace ts_l42
,
partition item43 values less than (to_date('1995-07-
01','YYYY-MM-DD'))
tablespace ts_l43
,
partition item44 values less than (to_date('1995-08-
01','YYYY-MM-DD'))
tablespace ts_l44
,
partition item45 values less than (to_date('1995-09-
01','YYYY-MM-DD'))
tablespace ts_l45
,
partition item46 values less than (to_date('1995-10-
01','YYYY-MM-DD'))
tablespace ts_l46
,
partition item47 values less than (to_date('1995-11-
01','YYYY-MM-DD'))
tablespace ts_l47
,
partition item48 values less than (to_date('1995-12-
01','YYYY-MM-DD'))
tablespace ts_l48
,
partition item49 values less than (to_date('1996-01-
01','YYYY-MM-DD'))
tablespace ts_l49
,
partition item50 values less than (to_date('1996-02-
01','YYYY-MM-DD'))
tablespace ts_l50
,
partition item51 values less than (to_date('1996-03-
01','YYYY-MM-DD'))
tablespace ts_l51
,
partition item52 values less than (to_date('1996-04-
01','YYYY-MM-DD'))
tablespace ts_l52
,
partition item53 values less than (to_date('1996-05-
01','YYYY-MM-DD'))
tablespace ts_l53
,
partition item54 values less than (to_date('1996-06-
01','YYYY-MM-DD'))
tablespace ts_l54
,
partition item55 values less than (to_date('1996-07-
01','YYYY-MM-DD'))
tablespace ts_l55
,
partition item56 values less than (to_date('1996-08-
01','YYYY-MM-DD'))
tablespace ts_l56
,
partition item57 values less than (to_date('1996-09-
01','YYYY-MM-DD'))
tablespace ts_l57
,
partition item58 values less than (to_date('1996-10-
01','YYYY-MM-DD'))
tablespace ts_l58
,
partition item59 values less than (to_date('1996-11-
01','YYYY-MM-DD'))
tablespace ts_l59
,
partition item60 values less than (to_date('1996-12-
01','YYYY-MM-DD'))
tablespace ts_l60
,
partition item61 values less than (to_date('1997-01-
01','YYYY-MM-DD'))
tablespace ts_l61
,
partition item62 values less than (to_date('1997-02-
01','YYYY-MM-DD'))
tablespace ts_l62
,
partition item63 values less than (to_date('1997-03-
01','YYYY-MM-DD'))
tablespace ts_l63
,
partition item64 values less than (to_date('1997-04-
01','YYYY-MM-DD'))
tablespace ts_l64
,
partition item65 values less than (to_date('1997-05-
01','YYYY-MM-DD'))
tablespace ts_l65
,
partition item66 values less than (to_date('1997-06-
01','YYYY-MM-DD'))
tablespace ts_l66
,
partition item67 values less than (to_date('1997-07-
01','YYYY-MM-DD'))
tablespace ts_l67
,
partition item68 values less than (to_date('1997-08-
01','YYYY-MM-DD'))
tablespace ts_l68
,
partition item69 values less than (to_date('1997-09-
01','YYYY-MM-DD'))
tablespace ts_l69
,
partition item70 values less than (to_date('1997-10-
01','YYYY-MM-DD'))
tablespace ts_l70
,
partition item71 values less than (to_date('1997-11-
01','YYYY-MM-DD'))
tablespace ts_l71
,
partition item72 values less than (to_date('1997-12-
01','YYYY-MM-DD'))
tablespace ts_l72
,
partition item73 values less than (to_date('1998-01-
01','YYYY-MM-DD'))
tablespace ts_l73
,
partition item74 values less than (to_date('1998-02-
01','YYYY-MM-DD'))
tablespace ts_l74
,
partition item75 values less than (to_date('1998-03-
01','YYYY-MM-DD'))
tablespace ts_l75
,
partition item76 values less than (to_date('1998-04-
01','YYYY-MM-DD'))
tablespace ts_l76
,
partition item77 values less than (to_date('1998-05-
01','YYYY-MM-DD'))
tablespace ts_l77
,
partition item78 values less than (to_date('1998-06-
01','YYYY-MM-DD'))
tablespace ts_l78
,
partition item79 values less than (to_date('1998-07-
01','YYYY-MM-DD'))
tablespace ts_l79
,
partition item80 values less than (to_date('1998-08-
01','YYYY-MM-DD'))
tablespace ts_l80
,
partition item81 values less than (to_date('1998-09-
01','YYYY-MM-DD'))
tablespace ts_l81
,
partition item82 values less than (to_date('1998-10-
```

```
01','YYYY-MM-DD'))
tablespace ts_l82
,
partition item83 values less than (to_date('1998-11-
01','YYYY-MM-DD'))
tablespace ts_l83
,
partition item84 values less than (MAXVALUE)
tablespace ts_l84
)
as select
l_shipdate,l_orderkey,l_discount,l_extendedprice,l_sup
pkey,l_quantity,l_returnflag,l_partkey,l_linestatus,l_
tax,l_commitdate,l_receiptdate,l_shipmode,l_linenumber
,l_shipinstruct,l_comment from l_et;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!

sqlplus / as sysdba <<!
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
connect tpcd/tpcd;
set timing on
set echo on

!date
rem drop table orders;
create table orders(
    o_orderdate          ,
    o_orderkey           NOT NULL,
    o_custkey            NOT NULL,
    o_orderpriority      ,
    o_shippriority       ,
    o_clerk              ,
    o_orderstatus        ,
    o_totalprice         ,
    o_comment            )
pctfree 1
pctused 99
initrans 10
storage (initial 400m freelist groups 4 freelists 84)
parallel 144
nologging
partition by range (o_orderdate)
subpartition by hash(o_custkey)
subpartitions 16
(
partition ord1 values less than (to_date('1992-01-
01','YYYY-MM-DD'))
tablespace ts_o1
,
partition ord2 values less than (to_date('1992-02-
01','YYYY-MM-DD'))
tablespace ts_o2
,
partition ord3 values less than (to_date('1992-03-
01','YYYY-MM-DD'))
tablespace ts_o3
,
partition ord4 values less than (to_date('1992-04-
01','YYYY-MM-DD'))
tablespace ts_o4
,
partition ord5 values less than (to_date('1992-05-
01','YYYY-MM-DD'))
tablespace ts_o5
,
partition ord6 values less than (to_date('1992-06-
01','YYYY-MM-DD'))
tablespace ts_o6
,
partition ord7 values less than (to_date('1992-07-
01','YYYY-MM-DD'))
tablespace ts_o7
,
partition ord8 values less than (to_date('1992-08-
01','YYYY-MM-DD'))
tablespace ts_o8
,
partition ord9 values less than (to_date('1992-09-
01','YYYY-MM-DD'))
tablespace ts_o9
,
partition ord10 values less than (to_date('1992-10-
01','YYYY-MM-DD'))
tablespace ts_o10
,
partition ord11 values less than (to_date('1992-11-
01','YYYY-MM-DD'))
tablespace ts_o11
,
partition ord12 values less than (to_date('1992-12-
01','YYYY-MM-DD'))
tablespace ts_o12
,
partition ord13 values less than (to_date('1993-01-
01','YYYY-MM-DD'))
tablespace ts_o13
,
partition ord14 values less than (to_date('1993-02-
01','YYYY-MM-DD'))
tablespace ts_o14
,
partition ord15 values less than (to_date('1993-03-
01','YYYY-MM-DD'))
tablespace ts_o15
,
partition ord16 values less than (to_date('1993-04-
01','YYYY-MM-DD'))
tablespace ts_o16
,
partition ord17 values less than (to_date('1993-05-
01','YYYY-MM-DD'))
tablespace ts_o17
,
partition ord18 values less than (to_date('1993-06-
01','YYYY-MM-DD'))
tablespace ts_o18
,
partition ord19 values less than (to_date('1993-07-
01','YYYY-MM-DD'))
tablespace ts_o19
,
partition ord20 values less than (to_date('1993-08-
01','YYYY-MM-DD'))
tablespace ts_o20
,
partition ord21 values less than (to_date('1993-09-
01','YYYY-MM-DD'))
tablespace ts_o21
,
partition ord22 values less than (to_date('1993-10-
01','YYYY-MM-DD'))
tablespace ts_o22
,
partition ord23 values less than (to_date('1993-11-
01','YYYY-MM-DD'))
tablespace ts_o23
,
partition ord24 values less than (to_date('1993-12-
01','YYYY-MM-DD'))
tablespace ts_o24
,
partition ord25 values less than (to_date('1994-01-
01','YYYY-MM-DD'))
tablespace ts_o25
,
partition ord26 values less than (to_date('1994-02-
01','YYYY-MM-DD'))
tablespace ts_o26
,
partition ord27 values less than (to_date('1994-03-
01','YYYY-MM-DD'))
tablespace ts_o27
,
partition ord28 values less than (to_date('1994-04-
01','YYYY-MM-DD'))
tablespace ts_o28
,
partition ord29 values less than (to_date('1994-05-
01','YYYY-MM-DD'))
tablespace ts_o29
,
partition ord30 values less than (to_date('1994-06-
01','YYYY-MM-DD'))
tablespace ts_o30
,
partition ord31 values less than (to_date('1994-07-
```

```
01','YYYY-MM-DD'))
tablespace ts_o31
,
partition ord32 values less than (to_date('1994-08-
01','YYYY-MM-DD'))
tablespace ts_o32
,
partition ord33 values less than (to_date('1994-09-
01','YYYY-MM-DD'))
tablespace ts_o33
,
partition ord34 values less than (to_date('1994-10-
01','YYYY-MM-DD'))
tablespace ts_o34
,
partition ord35 values less than (to_date('1994-11-
01','YYYY-MM-DD'))
tablespace ts_o35
,
partition ord36 values less than (to_date('1994-12-
01','YYYY-MM-DD'))
tablespace ts_o36
,
partition ord37 values less than (to_date('1995-01-
01','YYYY-MM-DD'))
tablespace ts_o37
,
partition ord38 values less than (to_date('1995-02-
01','YYYY-MM-DD'))
tablespace ts_o38
,
partition ord39 values less than (to_date('1995-03-
01','YYYY-MM-DD'))
tablespace ts_o39
,
partition ord40 values less than (to_date('1995-04-
01','YYYY-MM-DD'))
tablespace ts_o40
,
partition ord41 values less than (to_date('1995-05-
01','YYYY-MM-DD'))
tablespace ts_o41
,
partition ord42 values less than (to_date('1995-06-
01','YYYY-MM-DD'))
tablespace ts_o42
,
partition ord43 values less than (to_date('1995-07-
01','YYYY-MM-DD'))
tablespace ts_o43
,
partition ord44 values less than (to_date('1995-08-
01','YYYY-MM-DD'))
tablespace ts_o44
,
partition ord45 values less than (to_date('1995-09-
01','YYYY-MM-DD'))
tablespace ts_o45
,
partition ord46 values less than (to_date('1995-10-
01','YYYY-MM-DD'))
tablespace ts_o46
,
partition ord47 values less than (to_date('1995-11-
01','YYYY-MM-DD'))
tablespace ts_o47
,
partition ord48 values less than (to_date('1995-12-
01','YYYY-MM-DD'))
tablespace ts_o48
,
partition ord49 values less than (to_date('1996-01-
01','YYYY-MM-DD'))
tablespace ts_o49
,
partition ord50 values less than (to_date('1996-02-
01','YYYY-MM-DD'))
tablespace ts_o50
,
partition ord51 values less than (to_date('1996-03-
01','YYYY-MM-DD'))
tablespace ts_o51
,
partition ord52 values less than (to_date('1996-04-
01','YYYY-MM-DD'))
tablespace ts_o52
,
partition ord53 values less than (to_date('1996-05-
01','YYYY-MM-DD'))
tablespace ts_o53
,
partition ord54 values less than (to_date('1996-06-
01','YYYY-MM-DD'))
tablespace ts_o54
,
partition ord55 values less than (to_date('1996-07-
01','YYYY-MM-DD'))
tablespace ts_o55
,
partition ord56 values less than (to_date('1996-08-
01','YYYY-MM-DD'))
tablespace ts_o56
,
partition ord57 values less than (to_date('1996-09-
01','YYYY-MM-DD'))
tablespace ts_o57
,
partition ord58 values less than (to_date('1996-10-
01','YYYY-MM-DD'))
tablespace ts_o58
,
partition ord59 values less than (to_date('1996-11-
01','YYYY-MM-DD'))
tablespace ts_o59
,
partition ord60 values less than (to_date('1996-12-
01','YYYY-MM-DD'))
tablespace ts_o60
,
partition ord61 values less than (to_date('1997-01-
01','YYYY-MM-DD'))
tablespace ts_o61
,
partition ord62 values less than (to_date('1997-02-
01','YYYY-MM-DD'))
tablespace ts_o62
,
partition ord63 values less than (to_date('1997-03-
01','YYYY-MM-DD'))
tablespace ts_o63
,
partition ord64 values less than (to_date('1997-04-
01','YYYY-MM-DD'))
tablespace ts_o64
,
partition ord65 values less than (to_date('1997-05-
01','YYYY-MM-DD'))
tablespace ts_o65
,
partition ord66 values less than (to_date('1997-06-
01','YYYY-MM-DD'))
tablespace ts_o66
,
partition ord67 values less than (to_date('1997-07-
01','YYYY-MM-DD'))
tablespace ts_o67
,
partition ord68 values less than (to_date('1997-08-
01','YYYY-MM-DD'))
tablespace ts_o68
,
partition ord69 values less than (to_date('1997-09-
01','YYYY-MM-DD'))
tablespace ts_o69
,
partition ord70 values less than (to_date('1997-10-
01','YYYY-MM-DD'))
tablespace ts_o70
,
partition ord71 values less than (to_date('1997-11-
01','YYYY-MM-DD'))
tablespace ts_o71
,
partition ord72 values less than (to_date('1997-12-
01','YYYY-MM-DD'))
tablespace ts_o72
,
partition ord73 values less than (to_date('1998-01-
01','YYYY-MM-DD'))
tablespace ts_o73
,
partition ord74 values less than (to_date('1998-02-
```

```
01','YYYY-MM-DD'))
tablespace ts_o74
,
partition ord75 values less than (to_date('1998-03-
01','YYYY-MM-DD'))
tablespace ts_o75
,
partition ord76 values less than (to_date('1998-04-
01','YYYY-MM-DD'))
tablespace ts_o76
,
partition ord77 values less than (to_date('1998-05-
01','YYYY-MM-DD'))
tablespace ts_o77
,
partition ord78 values less than (to_date('1998-06-
01','YYYY-MM-DD'))
tablespace ts_o78
,
partition ord79 values less than (to_date('1998-07-
01','YYYY-MM-DD'))
tablespace ts_o79
,
partition ord80 values less than (to_date('1998-08-
01','YYYY-MM-DD'))
tablespace ts_o80
,
partition ord81 values less than (to_date('1998-09-
01','YYYY-MM-DD'))
tablespace ts_o81
,
partition ord82 values less than (to_date('1998-10-
01','YYYY-MM-DD'))
tablespace ts_o82
,
partition ord83 values less than (to_date('1998-11-
01','YYYY-MM-DD'))
tablespace ts_o83
,
partition ord84 values less than (MAXVALUE)
tablespace ts_o84
)
as select o_orderdate, o_orderkey, o_custkey,
o_orderpriority, o_shippriority,
o_clerk,o_orderstatus, o_totalprice, o_comment from
o_et;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!

sqlplus / as sysdba <<!
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
connect tpcd/tpcd
set timing on
set echo on

!date
rem drop table partsupp;
create table partsupp(
    ps_partkey          NOT NULL,
    ps_suppkey          NOT NULL,
    ps_supplycost       ,
    ps_availqty         ,
    ps_comment          ,
constraint pk_partkey_suppkey_1 primary key
(ps_partkey, ps_suppkey)
)
organization index tablespace ts_ps
partition by hash (ps_partkey)
partitions 144
compress
pctthreshold 50
storage (initial 1500m)
parallel 144
nologging
as select ps_partkey, ps_suppkey, ps_supplycost,
ps_availqty, ps_comment from ps_et;
!date
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!

sqlplus / as sysdba <<!
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
connect tpcd/tpcd
set timing on
set echo on

!date
rem drop table part;
create table part(
    p_partkey           NOT NULL,
    p_type              ,
    p_size              ,
    p_brand             ,
    p_name              ,
    p_container         ,
    p_mfgr              ,
    p_retailprice       ,
    p_comment           )
pctfree 0
pctused 99
tablespace ts_p
storage (freelists 99)
parallel 144
nologging
partition by hash (p_partkey)
partitions 144
as select p_partkey, p_type, p_size, p_brand, p_name,
p_container, p_mfgr, p_retailprice, p_comment  from
p_et;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!

sqlplus / as sysdba <<!
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
connect tpcd/tpcd;
set timing on
set echo on

!date
rem drop table customer;
create table customer(
    c_custkey           NOT NULL,
    c_mktsegment        ,
    c_nationkey         ,
    c_name              ,
    c_address           ,
    c_phone             ,
    c_acctbal           ,
    c_comment           )
pctfree 0
pctused 99
tablespace ts_c
storage (freelists 99)
parallel 144
nologging
partition by hash (c_custkey)
partitions 144
as select c_custkey, c_mktsegment, c_nationkey,
c_name, c_address, c_phone, c_acctbal, c_comment from
c_et;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!

sqlplus / as sysdba <<!
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
connect tpcd/tpcd;
set timing on
set echo on
rem drop table supplier;
create table supplier(
    s_suppkey           NOT NULL,
    s_nationkey         ,
```

```
    s_comment           ,
    s_name              ,
    s_address           ,
    s_phone             ,
    s_acctbal           )
pctfree 0
pctused 99
tablespace ts_s
storage (freelists 99)
parallel 144
nologging
partition by hash (s_suppkey)
partitions 144
as select s_suppkey, s_nationkey, s_comment, s_name,
s_address, s_phone, s_acctbal from s_et;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!

sqlplus / as sysdba <<!
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
connect tpcd/tpcd;
set echo on
set timing on

rem drop table nation;
create table nation(
    n_nationkey         NOT NULL,
    n_name              ,
    n_regionkey         ,
    n_comment           )
tablespace ts_default
as select * from n_et;

rem drop table region;
create table region(
    r_regionkey         ,
    r_name              ,
    r_comment           )
tablespace ts_default
as select * from r_et;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!

sqlplus / as sysdba <<!
set echo on;
set termout on;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
connect tpcd/tpcd
set timing on
set echo on

!date
drop table l_et;
drop table o_et;
drop table ps_et;
drop table p_et;
drop table c_et;
drop table s_et;
drop table n_et;
drop table r_et;
select to_char(sysdate, 'MM-DD-YYYY HH24:MI:SS') now
from dual;
exit;
!
```

==========

3tb_asm_ixcre.sh

```
#!/bin/ksh
##########################################################
######################
# Index Creation Phase
##########################################################
######################
sqlplus / as sysdba<<EOF
connect tpcd/tpcd;
!date
set echo on
set timing on
rem drop index i_l_orderkey;
create index i_l_orderkey
on lineitem (l_orderkey)
pctfree 5
initrans 10
tablespace ts_i_lorderkey
storage (freelist groups 4 freelists 84)
parallel 144
compute statistics
nologging ;

!date
rem drop index i_o_orderkey;
create unique index i_o_orderkey
on orders (o_orderkey)
pctfree 5
initrans 10
tablespace ts_i_oorderkey
storage (freelist groups 4 freelists 84 )
parallel 144
compute statistics
nologging ;

!date
rem drop index i_c_custkey;
create unique index i_c_custkey
on customer (c_custkey)
pctfree 0
initrans 10
tablespace ts_i_ccustkey
storage (freelists 84)
parallel 144
compute statistics
nologging ;

alter index i_o_orderkey allocate extent (size 10000m
instance 1);

alter index i_l_orderkey allocate extent (size 20000m
instance 1);
EOF
```

==========

3tb_asm_anlyz.sh

```
#!/bin/ksh
##########################################################
######################
# Analyze Phase
###################3
sqlplus / as sysdba<<EOF
connect tpcd/tpcd;
!date
set echo on
set timing on
execute dbms_stats.gather_schema_stats('TPCD' ,
estimate_percent => 1, degree => 18 , granularity =>
'GLOBAL' );
!date
connect / as sysdba
execute dbms_stats.gather_system_stats;
EOF
```

==========

ACID Test Source Code

==========

==========

atranspl.c

```
#include <stdio.h>
#include <stdlib.h>
#include <sys/types.h>
#include <sys/stat.h>
#include <fcntl.h>

#include "atranspl.h"

/* Declare error handling functions */

double gettime();
```

```
void sql_error();
void usage();
void ACIDinit();
void ACIDexit();
int atoi();
void srand48();
long lrand48();

/* declarations for ORDERS */

int o_key = 0;
double o_tprice = 0.0;
double o_newtprice = 0.0;

/* declarations for LINEITEM */

int l_key = 0;
int l_pkey = 0;
int l_skey = 0;

int l_quan = 0;
int l_newquan = 0;
double l_eprice = 0.0;
double l_neweprice = 0.0;
double l_disc = 0.0;
double l_tax = 0.0;

sb2 l_npricei;

/* other declarations */

int delta = 0;
double rprice;
double cost;

int proc_no = 1;          /* process number, global
*/
int num_streams = 1;      /* number of transaction
streams       */
int trig = 0;             /* Trigger Time
*/
int slp = 0;              /* Sleep Time
*/

int logfile;              /* fdes for logfile for
durability (optional)   */
int outfile = 1;          /* output file (optional)
*/
#ifdef LINUX
  FILE *infile;     /* input file (optional)
*/
#else
  FILE *infile = stdin;     /* input file (optional)
*/
                          /* in the format of
<o_key> <delta>    */
#endif
char lname[UNAME_LEN];    /* username/passwd combo
*/
char *passwd;             /* pointer to password
*/

char buf[WRITE_BUF_LEN];  /* buffer to write
*/

unsigned flag = (unsigned) 0;       /* flag to store
all sorts of options  */

#define INFILE  0x01u
#define OUTFILE 0x02u
#define LOGFILE 0x04u
#define COMMIT  0x08u
#define DELTA   0x10u

double tr_end = 0.0;      /* transaction end time
*/
double tr_start = 0.0;    /* transaction start time
*/

int num_iter = 0;         /* number of iterations
*/

time_t curr_time;         /* Current Time
*/

/* OCI handles */

OCIEnv *tpcenv = NULL;
OCIServer *tpcsrv = NULL;
OCIError *errhp = NULL;
OCISvcCtx *tpcsvc = NULL;
OCISession *tpcusr = NULL;
OCIStmt *curi = NULL;
OCIStmt *curr = NULL;
OCIStmt *cure1 = NULL;
OCIStmt *cure2 = NULL;

/* OCI bind handles */

#ifdef NOLKEY
OCIBind *l_keyi_bp = NULL;
OCIBind *o_keyi_bp = NULL;
#endif /* NOLKEY */

OCIBind *l_key_bp = NULL;
OCIBind *o_key_bp = NULL;
OCIBind *delta_bp = NULL;
OCIBind *l_pkey_bp = NULL;
OCIBind *l_skey_bp = NULL;
OCIBind *l_quan_bp = NULL;
OCIBind *l_newquan_bp = NULL;
OCIBind *l_tax_bp = NULL;
OCIBind *l_disc_bp = NULL;
OCIBind *l_eprice_bp = NULL;
OCIBind *l_neweprice_bp = NULL;
OCIBind *o_tprice_bp = NULL;
OCIBind *o_newtprice_bp = NULL;
OCIBind *rprice_bp = NULL;
OCIBind *cost_bp = NULL;

OCIBind *l_neweprice1_bp = NULL;
OCIBind *l_newquan1_bp = NULL;
OCIBind *o_key1_bp = NULL;
OCIBind *l_key1_bp = NULL;

OCIBind *o_newtprice2_bp = NULL;
OCIBind *o_key2_bp = NULL;

sword status = OCI_SUCCESS;  /* OCI return value */

char sqlstmt[1024];

/* usage: prints the usage of the program */

void usage()
{

  fprintf (stderr,"\nUsage: atrans.o[st]t <proc_no>
<num_streams> <commit> <delta>\n[i<pathname for
input>] [o<pathname for output>] [d<pathname for
durability file>] [u<uid/passwd>] \n\n");

  fprintf(stderr,"    proc_no      :the process number
within this ACID\n");
  fprintf(stderr,"    num_streams  :the total number
of ACID transaction streams\n");
  fprintf(stderr,"    commit       :1 to commit
transaction, abort otherwise\n\n");
  fprintf(stderr,"    delta        :1 to generate new
random delta, otherwise obtain delta from input\n\n");
  fprintf(stderr,"    OPTIONAL PARAMETERS:\n");
  fprintf(stderr,"    i<pathname for input>      :full
path name for input file - default is stdin\n");
  fprintf(stderr,"    o<pathname for output>     :full
path name for output file - default is stdout\n");
  fprintf(stderr,"    d<pathname for durability> :full
path name for durability success file - must specify
for durability test\n");
  fprintf(stderr,"    u<uid/passwd>             :
Username/Password string - default is tcpd/tpcd\n");
  fprintf(stderr,"    t<trigger>                :
Trigger Time - sleep <trigger> seconds before
start\n\n");
  fprintf(stderr,"    s<sleep>                  :
Sleep Time - sleep <sleep> seconds before commit or
rollback\n\n");
  exit(-1);

}


void ACIDexit() {
```

```
  OCILogoff(tpcsvc,errhp);
  OCIhfree(tpcenv,OCI_HTYPE_STMT);
  OCIhfree(tpcsvc,OCI_HTYPE_SVCCTX);
  OCIhfree(tpcsrv,OCI_HTYPE_SERVER);
  OCIhfree(tpcusr,OCI_HTYPE_SESSION);

}



/* type: 0 if environment handle is passed, 1 if error
handle is passwd */

void sql_error(errhp,status,type)
     OCIError *errhp;
     sword status;
     sword type;
{
  char msg[2048];
  ub4 errcode;
  ub4 msglen;
  int i,j;

  switch(status) {
  case OCI_SUCCESS_WITH_INFO:
    fprintf(stderr, "Error: Statement returned with
info.\n");
    if (type)
      (void) OCIErrorGet(errhp,1,NULL,(sb4*) &errcode,
(text*) msg,
                         2048, OCI_HTYPE_ERROR);
    else
      (void) OCIErrorGet(errhp,1,NULL,(sb4*) &errcode,
(text*) msg,
                         2048, OCI_HTYPE_ENV);
    fprintf(stderr,"%s\n",msg);
    break;
  case OCI_ERROR:
    fprintf(stderr, "Error: OCI call error.\n");
    if (type)
      (void) OCIErrorGet(errhp,1,NULL, (sb4 *)
&errcode, (text*) msg,
                         2048,OCI_HTYPE_ERROR);
    else
      (void) OCIErrorGet(errhp,1,NULL, (sb4 *)
&errcode, (text*) msg,
                         2048,OCI_HTYPE_ENV);
    fprintf(stderr,"%s\n",msg);
    break;
  case OCI_INVALID_HANDLE:
    fprintf(stderr, "Error: Invalid Handle.\n");
    if (type)
      (void) OCIErrorGet(errhp,1,NULL, (sb4 *)
&errcode, (text*) msg,
                         2048,OCI_HTYPE_ERROR);
    else
      (void) OCIErrorGet(errhp,1,NULL, (sb4 *)
&errcode, (text*) msg,
                         2048,OCI_HTYPE_ENV);
    fprintf(stderr,"%s\n",msg);
    break;
  }
  /* Rollback just in case */

  (void) OCITransRollback(tpcsvc,errhp,OCI_DEFAULT);

  fprintf(stderr, "Exiting Oracle...\n");
  fflush(stderr);

  ACIDexit();

  exit(1);
}

#ifdef LINUX
int main(argc,argv)
#else
void main(argc,argv)
#endif
     int argc;
     char *argv[];
{

  int i;
  char line[64];
  ub4 errcode;
  char msg[2048];
  int need_commit = 0;

  /* Initialize some variables */
#ifdef LINUX
  infile=fopen("/dev/stdin","r");
#endif
  strcpy((char *) lname, "tpcd/tpcd");

  if ((argc > 10) || (argc < 5)) {
    usage();
  }

  /* argv[1] -- Process Number */

  proc_no = atoi(argv[1]);

  /* argv[2] -- Number of Streams */

  num_streams = atoi(argv[2]);

  /* argv[3] -- Commit? */

  if (atoi(argv[3]) == 1)
    BIS(flag, COMMIT);

  /* argv[4] -- Delta? */

  if (atoi(argv[4]) == 1)
    BIS(flag, DELTA);

  /* Process  optional parameters */

  argc -= 4;
  argv += 4;

  while(--argc) {
    ++argv;
    switch(argv[0][0]) {
    case 'u':
      strncpy((char *) lname, ++(argv[0]), UNAME_LEN);
      if (strchr((char *) lname, '/') == NULL) {
        fprintf(stderr, "Login name must be in the
format of userid/passwd\n");
        usage();
        exit(-1);
      }
      break;
    case 'i':
      if ((infile = fopen(++(argv[0]), "r")) == NULL)
{
        fprintf(stderr,"Cannot open input file %s\n",
argv[0]);
        fprintf(stderr,"%s\n",strerror(errno));
        exit(-1);
      }
      BIS(flag, INFILE);
      break;
    case 'o':
      if ((outfile = open(++(argv[0]), (O_RDWR |
O_SYNC | O_CREAT), S_IRWXU)) == -1) {
        fprintf(stderr,"Cannot open output file %s\n",
argv[0]);
        fprintf(stderr,"%s\n",strerror(errno));
        exit(-1);
      }
      BIS(flag, OUTFILE);
      break;
    case 'd':
      if ((logfile = open(++(argv[0]), (O_RDWR |
O_SYNC | O_CREAT), S_IRWXU)) == -1) {
        fprintf(stderr,"Cannot open durability success
file %s\n", argv[0]);
        fprintf(stderr,"%s\n",strerror(errno));
        exit(-1);
      }
      BIS(flag, LOGFILE);
      break;
    case 'b':
      num_iter = atoi(++(argv[0]));
      break;
    case 't':
      trig = atoi(++(argv[0]));
      break;
    case 's':
```

```
      slp = atoi(++(argv[0]));
      break;
    default:
      fprintf(stderr, "Unknown argument %s\n", argv
[0]);
      usage();
      break;
    }
  }

  FPRTF
(outfile,"----------------------------------------
---\n");

  /* Initialize the cursors etc. */

  (void) ACIDinit();

  /* sleep for some time (triggering) */

  sleep(trig);

  /* start doing the ACID transactions */

  tr_start = gettime();

  /* The number of iteration we will run depends on
the number of */
  /* input lines
*/

  while (fgets(line, 64, infile) != NULL) {

#ifdef NOLKEY
    sscanf(line, "%d %d\n", &o_key, &delta);

    /* Obtain l_key from l_key query */

    OCIsexec(tpcsvc,curi,errhp,1);

    /* l_key is the highest l_linenumber available.
We need to pick */
    /* at random a number between 1..l_key.
*/

    l_key = (int) ((lrand48() % l_key) + 1);
#else
    sscanf(line, "%d %d %d\n", &o_key, &l_key,
&delta);
#endif /* NOLKEY */

    /* Generate delta if necessary */

    if (BIT(flag, DELTA))
      delta = (int) (floor((drand48() * 100)) + 1);

    /* Now, we are ready to run the ACID transaction.
*/

    curr_time = time(NULL);

    FPRTF2(outfile, "Starting ACID transaction %d at %
s...\n", (++num_iter),
            ctime(&curr_time));

    FPRTF1(outfile, "o_key: %d\n", (int) o_key);
    FPRTF1(outfile, "l_key: %d\n", (int) l_key);
    FPRTF1(outfile, "delta: %d\n", (int) delta);

    OCIsexec(tpcsvc,curr,errhp,1);

    curr_time = time(NULL);

    if (!BIT(flag, LOGFILE)) {
    FPRTF1(outfile, "BEFORE COMMIT/ROLLBACK
TRANSACTION at %s\n", ctime(&curr_time));
    FPRTF1(outfile, "l_extendedprice: %.2f\n",
l_eprice);
    FPRTF1(outfile, "l_quantity:      %d\n", (int)
l_quan);
    FPRTF1(outfile, "o_totalprice:    %.2f\n\n",
o_tprice);
    }

    FPRTF1(outfile, "Sleep %d seconds before
COMMIT/ROLLBACK...\n\n", slp);

    sleep(slp);

    /* Shall we commit? */

    if (BIT(flag, COMMIT)) {
      need_commit = 1;
      while (need_commit) {
        if((status=OCITransCommit
(tpcsvc,errhp,OCI_DEFAULT)) != OCI_SUCCESS) {
              OCIrol(tpcsvc,errhp);
              OCIsexec(tpcsvc,curr,errhp,1);
        } else {
            need_commit = 0;
            curr_time = time(NULL);
            FPRTF2(outfile, "ACID Transaction
iteration %d COMMITED at %s\n",
              num_iter, ctime(&curr_time));
        }
      }
    } else {
      OCIrol(tpcsvc,errhp);
      curr_time = time(NULL);
      FPRTF2(outfile, "ACID Transaction iteration %d
ROLLBACK at %s\n",
             num_iter, ctime(&curr_time));
    }

    /* Report all results to outfile and if necessary,
to success file. */

    /* Report initial and new values for o_totalprice,
l_extendedprice, */
    /* l_quantity.
*/

    /*
    curr_time = time(NULL);
    FPRTF1(outfile, "Transaction Completed at %s\n",
ctime(&curr_time));
    */

    /* Get the values in LINEITEM and ORDERS after the
transaction */

    if (BIT(flag, LOGFILE)) {
      FPRTF1(logfile, "p_key:      %d\n", (int)
l_pkey);
      FPRTF1(logfile, "s_key:      %d\n", (int)
l_skey);
      FPRTF1(logfile, "o_key:      %d\n", (int)
o_key);
      FPRTF1(logfile, "l_key:      %d\n", (int)
l_key);
      FPRTF1(logfile, "delta:      %d\n", (int)
delta);
      FPRTF1(logfile, "Transaction Completed at %s\n",
ctime(&curr_time));
      FPRTF(logfile,
"----------------------------------------------
\n");
    } else {

      OCIsexec(tpcsvc,cure1,errhp,1);
      OCIsexec(tpcsvc,cure2,errhp,1);

      FPRTF(outfile, "AFTER TRANSACTION:\n");
      FPRTF1(outfile, "l_extendedprice: %.2lf\n",
l_neweprice);
      FPRTF1(outfile, "l_quantity:      %d\n", (int)
l_newquan);
      FPRTF1(outfile, "o_totalprice:    %.2lf\n\n",
o_newtprice);
      FPRTF1(outfile, "l_tax:           %.2lf\n",
l_tax);
      FPRTF1(outfile, "l_discount:      %.2lf\n",
l_disc);
      FPRTF1(outfile, "rprice:          %.2lf\n",
rprice);
      FPRTF1(outfile, "cost:            %.2lf\n",
cost);
      FPRTF(outfile,
"-----------------------------------------------
\n");
    }
  }
```

```
  tr_end = gettime();

  if (!BIT(flag,LOGFILE)) {
    FPRTF1(outfile, "Start Time: %.2f\n", tr_start);
    FPRTF1(outfile, "End Time: %.2f\n", tr_end);
    FPRTF1(outfile, "Elapsed Time: %.2f\n", (tr_end -
tr_start));
    FPRTF1(outfile, "Transaction Count: %d\n",
num_iter);
    FPRTF1(outfile, "Transaction Rate: %.2f\n",
num_iter/(tr_end - tr_start));
  } else {
    FPRTF1(logfile, "Start Time: %.2f\n", tr_start);
    FPRTF1(logfile, "End Time: %.2f\n", tr_end);
    FPRTF1(logfile, "Elapsed Time: %.2f\n", (tr_end -
tr_start));
    FPRTF1(logfile, "Transaction Count: %d\n",
num_iter);
  }

  /*  Disconnect from ORACLE. */

  if (BIT(flag, INFILE))
    fclose(infile);
  if (BIT(flag, OUTFILE))
    close(outfile);
  if (BIT(flag, LOGFILE))
    close(logfile);

  ACIDexit();

  exit(0);
}


void ACIDinit()
{

  /* run random seed */

  srand48(getpid());

  /* Connect to ORACLE.  Program will call sql_error()
     if an error occurs in connecting to the default
database. */

  (void) OCIInitialize(OCI_DEFAULT,(dvoid *)0,0,0,0);
  if((status=OCIEnvInit((OCIEnv **)
&tpcenv,OCI_DEFAULT,0,(dvoid **)0)) !=
     OCI_SUCCESS)
    sql_error(tpcenv, status, 0);

  OCIhalloc(tpcenv,&errhp,OCI_HTYPE_ERROR);
  OCIhalloc(tpcenv,&curi,OCI_HTYPE_STMT);
  OCIhalloc(tpcenv,&curr,OCI_HTYPE_STMT);
  OCIhalloc(tpcenv,&cure1,OCI_HTYPE_STMT);
  OCIhalloc(tpcenv,&cure2,OCI_HTYPE_STMT);
  OCIhalloc(tpcenv,&tpcsvc,OCI_HTYPE_SVCCTX);
  OCIhalloc(tpcenv,&tpcsrv,OCI_HTYPE_SERVER);
  OCIhalloc(tpcenv,&tpcusr,OCI_HTYPE_SESSION);

  /* Disables auto commit */
/*
  if (ocof(&tpclda)) {
    sql_error(&tpclda, &tpclda);
    ologof(&tpclda);
    exit(-1);
  }
*/

  /* get username and password */

  passwd = strchr(lname, '/');
  *passwd = '\0';
  passwd++;

  if ((status = OCIServerAttach(tpcsrv,errhp,(text *)
0,0,OCI_DEFAULT)) != OCI_SUCCESS)
    sql_error(errhp,status,1);

  OCIaset
(tpcsvc,OCI_HTYPE_SVCCTX,tpcsrv,0,OCI_ATTR_SERVER,errh
p);
  OCIaset(tpcusr,OCI_HTYPE_SESSION,lname,strlen
(lname),OCI_ATTR_USERNAME,
          errhp);

  OCIaset(tpcusr,OCI_HTYPE_SESSION,passwd,strlen
(passwd),OCI_ATTR_PASSWORD,
          errhp);

  if ((status = OCISessionBegin(tpcsvc, errhp, tpcusr,
OCI_CRED_RDBMS,
                                OCI_DEFAULT)) !=
OCI_SUCCESS)
    sql_error(errhp,status,1);

  OCIaset
(tpcsvc,OCI_HTYPE_SVCCTX,tpcusr,0,OCI_ATTR_SESSION,err
hp);

  /* Enable session parallel dml */

  sprintf((char *) sqlstmt, PDMLTXT);
  OCIStmtPrepare(curi,errhp,(text *)sqlstmt,strlen
((char *)sqlstmt),
                 OCI_NTV_SYNTAX,OCI_DEFAULT);
  OCIsexec(tpcsvc,curi,errhp,1);

  /* Enable session parallel ddl */

  /*sprintf((char *) sqlstmt, PDDLTXT);
  OCIStmtPrepare(curi,errhp,(text *)sqlstmt,strlen
((char *)sqlstmt),
                 OCI_NTV_SYNTAX,OCI_DEFAULT);
  OCIsexec(tpcsvc,curi,errhp,1);*/


  /* Make session serializable */

  sprintf ((char *) sqlstmt, ISOTXT);
  OCIStmtPrepare(curi,errhp,(text *)sqlstmt,strlen
((char *)sqlstmt),
                 OCI_NTV_SYNTAX,OCI_DEFAULT);
  OCIsexec(tpcsvc,curi,errhp,1);

  /* Set optimizer_index_cost_adj = 25 */

  sprintf ((char *) sqlstmt, OICATXT);
  OCIStmtPrepare(curi,errhp,(text *)sqlstmt,strlen
((char *)sqlstmt),
                 OCI_NTV_SYNTAX,OCI_DEFAULT);
  OCIsexec(tpcsvc,curi,errhp,1);

  curr_time = time(NULL);
  printf("\nConnected to ORACLE as user: %s at %
s\n\n", lname, ctime(&curr_time));


#ifdef NOLKEY
  /* Open and Parse cursor for query to choose
determine l_key. */
  /* Binds l_key to :l_key.
*/

  sprintf((char *) sqlstmt,SQLTXT1);
  OCIStmtPrepare(curi,errhp,sqlstmt,strlen((char *)
sqlstmt),OCI_NTV_SYNTAX,OCI_DEFAULT);


  OCIbbname(curi,&l_keyi_bp,errhp,":l_key",ADR(l_key),
SIZ(l_key),SQLT_INT);
  OCIbbname(curi,&o_keyi_bp,errhp,":o_key",ADR(o_key),
SIZ(o_key),SQLT_INT);

#endif /* NOLKEY */

  /* Open and Parse cursor for the ACID transaction.
*/

  sprintf((char *) sqlstmt,SQLTXT2);
  OCIStmtPrepare(curr,errhp,(text *)sqlstmt,strlen
((char *)sqlstmt),
                 OCI_NTV_SYNTAX,OCI_DEFAULT);

  /* bind variables */

  OCIbbname(curr,l_key_bp,errhp,":l_key",ADR(l_key),
SIZ(l_key),SQLT_INT);
  OCIbbname(curr,o_key_bp,errhp,":o_key",ADR(o_key),
SIZ(o_key),SQLT_INT);
  OCIbbname(curr,delta_bp,errhp,":delta",ADR(delta),
SIZ(delta),SQLT_INT);
```

```
  OCIbbname(curr,l_pkey_bp,errhp,":l_pkey",ADR
(l_pkey),SIZ(l_pkey),SQLT_INT);
  OCIbbname(curr,l_skey_bp,errhp,":l_skey",ADR
(l_skey),SIZ(l_skey),SQLT_INT);
  OCIbbname(curr,l_quan_bp,errhp,":l_quan",ADR
(l_quan),SIZ(l_quan),SQLT_INT);
  OCIbbname(curr,l_newquan_bp,errhp,":l_newquan",ADR
(l_newquan),
            SIZ(l_newquan),SQLT_INT);
  OCIbbname(curr,l_tax_bp,errhp,":l_tax",ADR(l_tax),
SIZ(l_tax),SQLT_FLT);
  OCIbbname(curr,l_disc_bp,errhp,":l_disc",ADR
(l_disc),SIZ(l_disc),SQLT_FLT);
  OCIbbname(curr,l_eprice_bp,errhp,":l_eprice",ADR
(l_eprice),SIZ(l_eprice),
            SQLT_FLT);
  OCIbbname
(curr,l_neweprice_bp,errhp,":l_neweprice",ADR
(l_neweprice),
            SIZ(l_neweprice),SQLT_FLT);

  OCIbbname(curr,o_tprice_bp,errhp,":o_tprice",ADR
(o_tprice),SIZ(o_tprice),
            SQLT_FLT);
  OCIbbname
(curr,o_newtprice_bp,errhp,":o_newtprice",ADR
(o_newtprice),
            SIZ(o_newtprice), SQLT_FLT);
  OCIbbname(curr,rprice_bp,errhp,":rprice",ADR
(rprice),SIZ(rprice), SQLT_FLT);
  OCIbbname(curr,cost_bp,errhp,":cost",ADR(cost),SIZ
(cost), SQLT_FLT);

  /* Open & Parse cursor for end values query */

  sprintf((char *) sqlstmt,SQLTXT3);
  OCIStmtPrepare(cure1,errhp,(text *)sqlstmt,strlen
((char *)sqlstmt),
                 OCI_NTV_SYNTAX,OCI_DEFAULT);

  sprintf((char *) sqlstmt,SQLTXT4);
  OCIStmtPrepare(cure2,errhp,(text *)sqlstmt,strlen
((char *)sqlstmt),
                 OCI_NTV_SYNTAX,OCI_DEFAULT);

  /* bind variables */

  OCIbbname
(cure1,l_neweprice1_bp,errhp,":l_neweprice",ADR
(l_neweprice),
            SIZ(l_neweprice),SQLT_FLT);
  OCIbbname(cure1,l_newquan1_bp,errhp,":l_newquan",ADR
(l_newquan),
            SIZ(l_newquan),SQLT_INT);
  OCIbbname(cure1,o_key1_bp,errhp,":o_key",ADR(o_key),
SIZ(o_key),SQLT_INT);
  OCIbbname(cure1,l_key1_bp,errhp,":l_key",ADR(l_key),
SIZ(l_key),SQLT_INT);

  OCIbbname
(cure2,o_newtprice2_bp,errhp,":o_newtprice",ADR
(o_newtprice),
            SIZ(o_newtprice),SQLT_FLT);
  OCIbbname(cure2,o_key2_bp,errhp,":o_key",ADR(o_key),
SIZ(o_key),SQLT_INT);

}
```

==========

atranspl.h

```
#ifndef ATRANSPL_H

#define ATRANSPL_H

#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <sys/param.h>
#include <sys/types.h>
#include <time.h>
#include <errno.h>
#include <math.h>

#include <oratypes.h>

#ifndef OCIDFN
#include <ocidfn.h>
#endif /* OCIDFN */

#ifndef OCI_ORACLE
#include <oci.h>
#endif /* OCI_ORACLE */

/*
#ifdef __STDC__
#include <ociapr.h>
#else
#include <ocikpr.h>
#endif */ /* __STDC__ */

extern int errno;

#ifndef NULL
#define NULL 0
#endif

#ifndef NULLP
# define NULLP (void *)NULL
#endif /* NULLP */

#ifndef DISCARD
# define DISCARD (void)
#endif

#ifndef sword
# define sword int
#endif

#ifndef ub1
#define ub1 unsigned char
#endif

#define UNAME_LEN 64
#define WRITE_BUF_LEN 1024

#define NA              -1      /* ANSI SQL NULL */
#define VER7            2
#define NOT_SERIALIZABLE  8177  /* ORA-08177:
transaction not serializable */
#define WRITE_BUF_LEN 1024

#define ADR(object) ((ub1 *)&(object))
#define SIZ(object) ((sword)sizeof(object))
#define BIS(flg,mask) (unsigned) (flg |= (unsigned)
mask)
#define BIT(flg,mask) (unsigned) ((unsigned) flg &
(unsigned) mask)

#define FPRTF(fd,s) \
{sprintf(buf,s); write(fd, buf, strlen(s));}
#define FPRTF1(fd,s,p) \
{sprintf(buf,s,p); write(fd, buf, strlen(buf));}
#define FPRTF2(fd,s,p1,p2) \
{sprintf(buf,s,p1,p2); write(fd, buf, strlen(buf));}

#define OCIhalloc(envh,hndl,htyp) \
    if((status=OCIHandleAlloc((dvoid *)envh,(dvoid **)
hndl,htyp,0,(dvoid **)0))!=OCI_SUCCESS) \
       sql_error(envh,status,0); \
    else \
       DISCARD 0

#define OCIhfree(hndl,htyp) \
    if((status=OCIHandleFree((dvoid *)hndl,htyp)) ==
OCI_SUCCESS) \
       fprintf(stderr, "Error freeing handle of type %
d\n", htyp)

#define OCIaget(hndl,htyp,attp,size,atyp,errh) \
    if((status=OCIAttrGet((dvoid *)hndl,htyp,(dvoid *)
attp,(dvoid *)size,atyp,errh)) != OCI_SUCCESS) \
       sql_error(errh,status,1); \
    else \
       DISCARD 0

#define OCIaset(hndl,htyp,attp,size,atyp,errh) \
    if((status=OCIAttrSet((dvoid *)hndl,htyp,(dvoid *)
attp,size,atyp,errh)) != OCI_SUCCESS) \
       sql_error(errh,status,1); \
    else \
       DISCARD 0
```

```
#define OCIsexec(svch,stmh,errh,iter) \
    if((status=OCIStmtExecute
(svch,stmh,errh,iter,0,NULL,NULL,OCI_DEFAULT)) !=
OCI_SUCCESS) \
       sql_error(errh,status,1); \
    else \
       DISCARD 0

#define OCIbbname
(stmh,bindp,errh,sqlvar,progv,progvl,ftype) \
    if((status=OCIBindByName(stmh,&bindp,errh,(text *)
sqlvar,strlen(sqlvar), \
                progv,progvl,ftype,0,0,0,0,0,OCI_DEFAUL
T)) != OCI_SUCCESS) \
       sql_error(errh,status,1); \
    else \
       DISCARD 0

#define OCIbbnamei
(stmh,bindp,errh,sqlvar,progv,progvl,ftype,indp) \
    if((status=OCIHandleAlloc((dvoid *)stmh,(dvoid **)
&bindp,OCI_HTYPE_BIND, \
                              0,(dvoid **)0))!
=OCI_SUCCESS) \
       sql_error(stmh,status,0); \
    if((status=OCIBindByName(stmh,&bindp,errh,(text *)
sqlvar,strlen(sqlvar), \
                progv,progvl,ftype,indp,0,0,0,0,OCI_DEF
AULT)) != OCI_SUCCESS) \
       sql_error(errh,status,1); \
    else \
       DISCARD 0

#define OCIcom(svcp,errh) \
     if((status=OCITransCommit(svcp,errh,OCI_DEFAULT))
!= OCI_SUCCESS) \
        sql_error(errh,status,1); \
     else \
        DISCARD 0

#define OCIrol(svcp,errh) \
     if((status=OCITransRollback
(svcp,errh,OCI_DEFAULT)) != OCI_SUCCESS) \
        sql_error(errh,status,1); \
     else \
        DISCARD 0

#define ISOTXT "alter session set isolation_level =
serializable"
#define PDMLTXT "alter session force parallel dml
parallel (degree 84)"
#define PDDLTXT "alter session force parallel ddl
parallel (degree 84)"
#define OICATXT "alter session set
optimizer_index_cost_adj=25"

#define SQLTXT1 "BEGIN SELECT /*+ index
(lineitem,i_l_orderkey) */ MAX(l_linenumber) INTO :
l_key FROM lineitem \
WHERE l_orderkey = :o_key; END;"

#define SQLTXT2 "BEGIN d_atrans.doatrans(:l_key, :
o_key, :delta, :l_pkey, \
:l_skey, :l_quan, :l_newquan, :l_tax, :l_disc, :
l_eprice, :l_neweprice, \
:o_tprice, :o_newtprice, :rprice, :cost); END;"

#define SQLTXT3 "BEGIN SELECT l_extendedprice,
l_quantity \
INTO :l_neweprice, :l_newquan \
FROM lineitem \
WHERE l_orderkey = :o_key \
AND l_linenumber = :l_key; END;"

#define SQLTXT4 "BEGIN SELECT o_totalprice INTO :
o_newtprice \
FROM orders \
WHERE o_orderkey = :o_key; END;"

#define SQLTXT5 "BEGIN SELECT l_extendedprice,
l_quantity \
INTO :l_eprice, :l_quan \
FROM lineitem \
WHERE l_orderkey = :o_key \
AND l_linenumber = :l_key; END;"

#define SQLTXT6 "BEGIN SELECT o_totalprice INTO :
o_tprice \
FROM orders \
WHERE o_orderkey = :o_key; END;"

#endif /* ATRANSPL_H */
```

==========

randpsup.c

```
#include <stdio.h>
#include <stdlib.h>
#include <math.h>

#define PS_PER_SF 200000.0
#define S_PER_SF 10000.0
#define SUPP_PER_PART 4

/* borrowed from build.c in the dbgen distribution */

#define PART_SUPP_BRIDGE(tgt, p, s) \
    { \
    long tot_scnt = (long) (S_PER_SF * sf); \
    tgt = (p + s *  (tot_scnt / SUPP_PER_PART +  \
        (long) ((p - 1) / tot_scnt))) % tot_scnt + 1;
\
    }

void usage();
double atof();
void srand48();
long lrand48();


main(argc, argv)
     int argc;
     char **argv;
{

  double sf = 0.1;            /* scale factor      */
  long supp;                  /* the i-th supplier */
  long pkey;                  /* partkey           */
  long maxpkey;               /* highest partkey   */
  long ps_skey;               /* ps_suppkey        */

  if (argc < 2) {
    usage();
    exit(-1);
  }

  /* seed the random number generator */

  srand48(getpid());

  sf = atof(argv[1]);
  maxpkey = (long) (sf * PS_PER_SF);
  supp = lrand48() % 4;
  pkey = lrand48() % maxpkey + 1;

  PART_SUPP_BRIDGE(ps_skey, pkey, supp);

  fprintf(stdout, "%ld %ld", pkey, ps_skey);

  exit(0);
}


void usage()
{
  fprintf(stderr, "Usage: randpsup <SF>\n\n");
}
```

==========

randkey.c

```
#include <stdio.h>
#include <stdlib.h>
#include <math.h>
#include "atranspl.h"

#define ORDERCNT 150000.0
```

```
/* MK_SPARSE adopted from dss.h */

#define  MK_SPARSE(key, seq) \
         (((((key>>3)<<2)|(seq & 0x0003))<<3)|(key &
0x0007))

void sql_error();
void usage();
void ACIDinit();
long atol();
void srand48();
long lrand48();

/* Not really used here, but retained it for future
purposes. */

typedef struct aciddef {
  long okey;
  long lkey;
  int delta;
} adef;

long l_key = 0;
long o_key = 0;
char lname[UNAME_LEN];
char *passwd;

/* OCI handles */

OCIEnv *tpcenv;
OCIServer *tpcsrv;
OCIError *errhp;
OCISvcCtx *tpcsvc;
OCISession *tpcusr;
OCIStmt *curi;

OCIBind *l_key_bp;
OCIBind *o_key_bp;

sword status = OCI_SUCCESS;  /* OCI return value */

char sqlstmt[1024];


void ACIDexit() {
  OCILogoff(tpcsvc,errhp);
  OCIhfree(tpcenv,OCI_HTYPE_STMT);
  OCIhfree(tpcsvc,OCI_HTYPE_SVCCTX);
  OCIhfree(tpcsrv,OCI_HTYPE_SERVER);
  OCIhfree(tpcusr,OCI_HTYPE_SESSION);
}


/* type: 0 if environment handle is passed, 1 if error
handle is passwd */

void sql_error(errhp,status,type)
     OCIError *errhp;
     sword status;
     sword type;
{
  char msg[2048];
  sb4 errcode;
  ub4 msglen;
  int i,j;

  switch(status) {
  case OCI_SUCCESS_WITH_INFO:
    fprintf(stderr, "Error: Statement returned with
info.\n");
    if (type)
      (void) OCIErrorGet(errhp,1,NULL,(sb4 *)
&errcode,(text *)msg,
                         2048,OCI_HTYPE_ERROR);
    else
      (void) OCIErrorGet(errhp,1,NULL,(sb4 *)
&errcode,(text *)msg,
                         2048,OCI_HTYPE_ENV);
    fprintf(stderr,"%s\n",msg);
    break;
  case OCI_ERROR:
    fprintf(stderr, "Error: OCI call error.\n");
    if (type)
      (void) OCIErrorGet(errhp,1,NULL,(sb4 *)
&errcode,(text *)msg,
                         2048,OCI_HTYPE_ERROR);
    else
      (void) OCIErrorGet(errhp,1,NULL,(sb4 *)
&errcode,(text *)msg,
                         2048,OCI_HTYPE_ENV);
    fprintf(stderr,"%s\n",msg);
    break;
  case OCI_INVALID_HANDLE:
    fprintf(stderr, "Error: Invalid Handle.\n");
    if (type)
      (void) OCIErrorGet(errhp,1,NULL,(sb4 *)
&errcode,(text *)msg,
                         2048,OCI_HTYPE_ERROR);
    else
      (void) OCIErrorGet(errhp,1,NULL,(sb4 *)
&errcode,(text *)msg,
                         2048,OCI_HTYPE_ENV);
    fprintf(stderr,"%s\n",msg);
    break;
  }
  /* Rollback just in case */

  (void) OCITransRollback(tpcsvc,errhp,OCI_DEFAULT);

  fprintf(stderr, "Exiting Oracle...\n");
  fflush(stderr);

  ACIDexit();

  exit(1);
}


main(argc, argv)
     int argc;
     char **argv;
{

  long count;
  long i;
  double sf;         /* need to accomodate sf 0.1 */
  double random;
  double ordcnt;
  adef *res;

  if ((argc < 3) || (argc > 4)) {
    usage();
    exit(-1);
  }

  strcpy((char *) lname, "tpcd/tpcd");

  count = atol(argv[1]);
  sf = atof(argv[2]);

  argc -= 2;
  argv += 2;

  while (--argc) {
    ++argv;
    switch(argv[0][0]) {
    case 'u':
      strncpy((char *) lname, ++(argv[0]), UNAME_LEN);
      if (strchr((char *) lname, '/') == NULL) {
        usage();
        exit(-1);
      }
      break;
    default:
      fprintf(stderr, "Unknown argument %s\n", argv
[0]);
      usage();
      break;
    }
  }

  ACIDinit();

  /* initialize array for random numbers */

  res = (adef *) malloc(count*sizeof(adef));
  ordcnt = (double) ORDERCNT * (double) sf;

  for (i=0; i<count; i++) {

    /* The algorithm:
*/
```

```
    /* Assumes drand's output is 'unique', first get a
number within */
    /* the range of [0..sf*ORDERCNT) and then maps the
different     */
    /* ranges to generate the real output.
*/

    random = floor(drand48() * (double) ordcnt) + 1;
    res[i].okey = o_key = (long) MK_SPARSE((long)
random, 0);
    res[i].delta = (long) floor(drand48() * 100) + 1;

    /* Obtain l_key from l_key query */

    OCIsexec(tpcsvc,curi,errhp,1);

    /* l_key is the highest l_linenumber available.
We need to pick */
    /* at random a number between 1..l_key.
*/

    res[i].lkey = (lrand48() % l_key) + 1;

    printf("%ld %ld %d\n", res[i].okey, res[i].lkey,
res[i].delta);
  }

  ACIDexit();
  free(res);

}


void usage() {

  fprintf(stderr, "Usage: randkey <number of random
keys to generate> <SF> u<user/password>\n");
  fprintf(stderr, "\n");
}

void ACIDinit()
{

  /* run random seed */

  srand48(getpid());

  /* Connect to ORACLE.  Program will call sql_error()
     if an error occurs in connecting to the default
database. */

  (void) OCIInitialize(OCI_DEFAULT,(dvoid *)0,0,0,0);
  if((status=OCIEnvInit((OCIEnv **)
&tpcenv,OCI_DEFAULT,0,(dvoid **)0)) !=
     OCI_SUCCESS)
    sql_error(tpcenv, status, 0);

  OCIhalloc(tpcenv,&errhp,OCI_HTYPE_ERROR);
  OCIhalloc(tpcenv,&curi,OCI_HTYPE_STMT);
  OCIhalloc(tpcenv,&tpcsvc,OCI_HTYPE_SVCCTX);
  OCIhalloc(tpcenv,&tpcsrv,OCI_HTYPE_SERVER);
  OCIhalloc(tpcenv,&tpcusr,OCI_HTYPE_SESSION);

  /* get username and password */

  passwd = strchr(lname, '/');
  *passwd = '\0';
  passwd++;

  if ((status=OCIServerAttach(tpcsrv,errhp,(text *)
0,0,OCI_DEFAULT))!=OCI_SUCCESS)
    sql_error(errhp,status,1);

  OCIaset
(tpcsvc,OCI_HTYPE_SVCCTX,tpcsrv,0,OCI_ATTR_SERVER,errh
p);
  OCIaset(tpcusr,OCI_HTYPE_SESSION,lname,strlen
(lname),OCI_ATTR_USERNAME,
          errhp);
  OCIaset(tpcusr,OCI_HTYPE_SESSION,passwd,strlen
(passwd),OCI_ATTR_PASSWORD,
          errhp);

  if ((status = OCISessionBegin(tpcsvc, errhp, tpcusr,
OCI_CRED_RDBMS,
                                OCI_DEFAULT)) !=
OCI_SUCCESS)
    sql_error(errhp,status,1);

  OCIaset
(tpcsvc,OCI_HTYPE_SVCCTX,tpcusr,0,OCI_ATTR_SESSION,err
hp);

  /* Open and Parse cursor for query to choose
determine l_key. */
  /* Binds l_key to :l_key.
*/

  sprintf((char *) sqlstmt,SQLTXT1);
  OCIStmtPrepare(curi,errhp,(text *)sqlstmt,strlen
((char *)sqlstmt),
                 OCI_NTV_SYNTAX,OCI_DEFAULT);

  OCIbbname(curi,l_key_bp,errhp,":l_key",ADR(l_key),
SIZ(l_key),SQLT_INT);
  OCIbbname(curi,o_key_bp,errhp,":o_key",ADR(o_key),
SIZ(o_key),SQLT_INT);
}
```

==========

gettime.c

```
#define SUN_OS5

#if defined(SUN_OS5)
#define TIME_W_GETTIME
#define CPU_W_TIMES
#undef GETRU_STATS
#undef CPU_W_GETRU
#endif /* SUN_OS5 */

#if defined(sequent) || defined(SEQ_PSX)
# define GET_P_STATS
#endif /* sequent */

#if defined(aix) || defined(AIXRIOS)
# define TIME_W_GETTIME
# define CPU_W_TIMES
# define GETRU_STATS
#endif /* AIXRIOS */

#if defined(a_osf) || defined(A_OSF)
# define TIME_W_GETTIME
# define CPU_W_GETRU
# define GETRU_STATS
#endif /* AIXRIOS */

#if defined(HPUX) || defined(XENIX_386) || defined
(SYSV_386) || defined(ATT_3B)
# define TIME_W_TIMES
# define CPU_W_TIMES
#endif /* HPUX || XENIX_386 || SYSV_386 */

#if !defined(TIME_W_GETTIME) && !defined(TIME_W_TIMES)
# define TIME_W_TIMES
#endif

#if !defined(CPU_W_GETRU) && !defined(CPU_W_TIMES)
# define CPU_W_TIMES
#endif

#ifdef GET_P_STATS
# ifdef GETRU_STATS
#  undef GETRU_STATS
# endif
#endif

#if defined(TIME_W_GETTIME) || defined(CPU_W_GETRU) ||
defined(GETRU_STATS)
# include <sys/time.h>
#endif /* TIME_W_GETTIME || CPU_W_GETRU || GETRU_STATS
*/

#if defined(CPU_W_GETRU) || defined(GETRU_STATS)
# include <sys/resource.h>
#endif /* CPU_W_GETRU || GETRU_STATS */

#if defined(TIME_W_TIMES) || defined (CPU_W_TIMES)
# include <sys/types.h>
# include <sys/times.h>
```

```
# include <sys/param.h>  /* most systems define HZ
here */
#endif /* TIME_W_TIMES or CPU_W_TIMES */

#ifdef GET_P_STATS
# include <sys/types.h>
# include <sys/procstats.h>
#endif /* GET_P_STATS */

# include <stdio.h>

#ifdef GETRU_STATS
struct rusage selfru;
struct rusage kidsru;
#endif /* GETRU_STATS */

#ifdef GET_P_STATS
struct process_stats selfru;
struct process_stats kidsru;
#endif /* GET_P_STATS */



double gettime ()

{

#ifdef TIME_W_GETTIME
   struct timeval tv;

   (void) gettimeofday (&tv, (struct timezone *) 0);
   return ((double) tv.tv_sec + (1.0e-6 * (double)
tv.tv_usec));
#endif /* TIME_W_GETTIME */

#ifdef TIME_W_TIMES
   struct tms buf;

   return ((double) times (&buf) / HZ);
#endif /* TIME_W_TIMES */

}



double getcpu ()

{

#ifdef CPU_W_TIMES
   struct tms buf;

   (void) times (&buf);
   return (((double) buf.tms_utime + (double)
buf.tms_stime) / HZ);
#endif /* CPU_W_TIMES */

#ifdef CPU_W_GETRU
   struct rusage ru;
   double usecs;

   (void) getrusage (0, &ru);
   usecs = 1.0e-6 * (double) (ru.ru_utime.tv_usec +
ru.ru_stime.tv_usec);
   return ((double) (ru.ru_utime.tv_sec +
ru.ru_stime.tv_sec) + usecs);
#endif /* CPU_W_GETRU */

}



getru (fp, kids, config, runname, proc_no)

FILE *fp;
int kids;
char *config;
char *runname;
int proc_no;

{

#ifdef GETRU_STATS
   struct rusage ru;

   fprintf (fp, "%-10.10s %-10.10s %10d %10d ",
config,runname, proc_no, kids);
   getrusage (kids ? RUSAGE_CHILDREN : RUSAGE_SELF,
&ru);
   print_ru (fp, &ru);
   fprintf (fp, "\n");
#endif /* GETRU_STATS */

#ifdef GET_P_STATS
   timeval_t tv;
   struct process_stats ru;

   fprintf (fp, "%-10.10s %-10.10s %10d %10d ",
config,runname, proc_no, kids);
   if (kids)
      get_process_stats (&tv, PS_SELF, (struct
process_stats *) 0, &ru);
   else
      get_process_stats (&tv, PS_SELF, &ru, (struct
process_stats *) 0);
   print_ru (fp, &ru);
   fprintf (fp, "\n");
#endif /* GET_P_STATS */

}



getru1 (kids)

int kids;

{

#ifdef GETRU_STATS
   if (kids) {
      memset (&kidsru, 0, sizeof (kidsru));
      getrusage (RUSAGE_CHILDREN, &kidsru);
   }
   else {
      memset (&selfru, 0, sizeof (selfru));
      getrusage (RUSAGE_SELF, &selfru);
   }
#endif /* GETRU_STATS */

#ifdef GET_P_STATS
   timeval_t tv;

   if (kids) {
      memset (&kidsru, 0, sizeof (kidsru));
      get_process_stats (&tv, PS_SELF, (struct
process_stats *) 0, &kidsru);
   }
   else {
      memset (&selfru, 0, sizeof (selfru));
      get_process_stats (&tv, PS_SELF, &selfru,
(struct process_stats *) 0);
   }
#endif /* GET_P_STATS */

}



getru2 (fp, kids, config, runname, proc_no)

FILE *fp;
int kids;
char *config;
char *runname;
int proc_no;

{

#ifdef GETRU_STATS
   struct rusage ru;

   fprintf (fp, "%-10.10s %-10.10s %10d %10d ",
config, runname, proc_no, kids);
   getrusage (kids ? RUSAGE_CHILDREN : RUSAGE_SELF,
&ru);
   if (kids)
      diffru (&ru, &kidsru);
   else
      diffru (&ru, &selfru);
   print_ru (fp, &ru);
   fprintf (fp, "\n");
```

```
#endif /* GETRU_STATS */

#ifdef GET_P_STATS
   timeval_t tv;
   struct process_stats ru;

   fprintf (fp, "%-10.10s %-10.10s %10d %10d ",
config, runname, proc_no, kids);
   if (kids)
      get_process_stats (&tv, PS_SELF, (struct
process_stats *) 0, &ru);
   else
      get_process_stats (&tv, PS_SELF, &ru, (struct
process_stats *) 0);
   if (kids)
      diffru (&ru, &kidsru);
   else
      diffru (&ru, &selfru);
   print_ru (fp, &ru);
   fprintf (fp, "\n");
#endif /* GET_P_STATS */

}



#ifdef GETRU_STATS

print_ru (fp, ru)

FILE *fp;
struct rusage *ru;

{

   fprintf (fp, "%10ld ", ru->ru_utime.tv_sec * 1000 +
                          (ru->ru_utime.tv_usec/1000));
   fprintf (fp, "%10ld ", ru->ru_stime.tv_sec * 1000 +
                          (ru->ru_stime.tv_usec/1000));
   fprintf (fp, "%10ld ", ru->ru_maxrss);
   fprintf (fp, "%10ld ", ru->ru_majflt);
   fprintf (fp, "%10ld ", ru->ru_minflt);
   fprintf (fp, "%10ld ", 0);
   fprintf (fp, "%10ld ", 0);
   fprintf (fp, "%10ld ", 0);
   fprintf (fp, "%10ld ", ru->ru_nswap);
   fprintf (fp, "%10ld ", 0);
   fprintf (fp, "%10ld ", ru->ru_nvcsw);
   fprintf (fp, "%10ld ", ru->ru_nivcsw);
   fprintf (fp, "%10ld ", ru->ru_nsignals);
   fprintf (fp, "%10ld ", 0);
   fprintf (fp, "%10ld ", 0);
   fprintf (fp, "%10ld ", ru->ru_inblock);
   fprintf (fp, "%10ld ", ru->ru_oublock);
   fprintf (fp, "%10ld ", 0);
   fprintf (fp, "%10ld",  0);

}



diffru (ru2, ru)

struct rusage *ru2;
struct rusage *ru;

{

   ru2->ru_utime.tv_sec -= ru->ru_utime.tv_sec;
   ru2->ru_utime.tv_usec -= ru->ru_utime.tv_usec;
   ru2->ru_stime.tv_sec -= ru->ru_stime.tv_sec;
   ru2->ru_stime.tv_usec -= ru->ru_stime.tv_usec;
   ru2->ru_maxrss -= ru->ru_maxrss;
   ru2->ru_ixrss -= ru->ru_ixrss;
   ru2->ru_idrss -= ru->ru_idrss;
   ru2->ru_minflt -= ru->ru_minflt;
   ru2->ru_majflt -= ru->ru_majflt;
   ru2->ru_nswap -= ru->ru_nswap;
   ru2->ru_inblock -= ru->ru_inblock;
   ru2->ru_oublock -= ru->ru_oublock;
   ru2->ru_msgsnd -= ru->ru_msgsnd;
   ru2->ru_msgrcv -= ru->ru_msgrcv;
   ru2->ru_nsignals -= ru->ru_nsignals;
   ru2->ru_nvcsw -= ru->ru_nvcsw;
   ru2->ru_nivcsw -= ru->ru_nivcsw;
}

#endif /* GETRU_STATS */



#ifdef GET_P_STATS

print_ru (fp, ps)

FILE *fp;
struct process_stats *ps;

{

   fprintf (fp, "%lu ", ps->ps_utime.tv_sec * 1000 +
                        (ps->ps_utime.tv_usec/1000));
   fprintf (fp, "%lu ", ps->ps_stime.tv_sec * 1000 +
                         (ps->ps_stime.tv_usec/1000));
   fprintf (fp, "%lu ", ps->ps_maxrss);
   fprintf (fp, "%lu ", ps->ps_pagein);
   fprintf (fp, "%lu ", ps->ps_reclaim);
   fprintf (fp, "%lu ", ps->ps_zerofill);
   fprintf (fp, "%lu ", ps->ps_pffincr);
   fprintf (fp, "%lu ", ps->ps_pffdecr);
   fprintf (fp, "%lu ", ps->ps_swap);
   fprintf (fp, "%lu ", ps->ps_syscall);
   fprintf (fp, "%lu ", ps->ps_volcsw);
   fprintf (fp, "%lu ", ps->ps_involcsw);
   fprintf (fp, "%lu ", ps->ps_signal);
   fprintf (fp, "%lu ", ps->ps_lread);
   fprintf (fp, "%lu ", ps->ps_lwrite);
   fprintf (fp, "%lu ", ps->ps_bread);
   fprintf (fp, "%lu ", ps->ps_bwrite);
   fprintf (fp, "%lu ", ps->ps_phread);
   fprintf (fp, "%lu",  ps->ps_phwrite);

}



diffru (ru2, ru)

struct process_stats *ru2;
struct process_stats *ru;

{

   ru2->ps_utime.tv_sec -= ru->ps_utime.tv_sec;
   ru2->ps_utime.tv_usec -= ru->ps_utime.tv_usec;
   ru2->ps_stime.tv_sec -= ru->ps_stime.tv_sec;
   ru2->ps_stime.tv_usec -= ru->ps_stime.tv_usec;
   ru2->ps_maxrss -= ru->ps_maxrss;
   ru2->ps_pagein -= ru->ps_pagein;
   ru2->ps_reclaim -= ru->ps_reclaim;
   ru2->ps_zerofill -= ru->ps_zerofill;
   ru2->ps_pffincr -= ru->ps_pffincr;
   ru2->ps_pffdecr -= ru->ps_pffdecr;
   ru2->ps_swap -= ru->ps_swap;
   ru2->ps_syscall -= ru->ps_syscall;
   ru2->ps_volcsw -= ru->ps_volcsw;
   ru2->ps_involcsw -= ru->ps_involcsw;
   ru2->ps_signal -= ru->ps_signal;
   ru2->ps_lread -= ru->ps_lread;
   ru2->ps_lwrite -= ru->ps_lwrite;
   ru2->ps_bread -= ru->ps_bread;
   ru2->ps_bwrite -= ru->ps_bwrite;
   ru2->ps_phread -= ru->ps_phread;
   ru2->ps_phwrite -= ru->ps_phwrite;

}

#endif /* GET_P_STATS */
```

==========

a_query.sql

==========

```
set serverout on;

select
'BEFORE ACID QUERY' as STAGE,
substr(TO_CHAR(sysdate,'YYYY-MM-DD HH:MI:SS'),1,20) as
CURRENT_TIME
```

```
from dual;

select SUM(trunc(trunc(l_extendedprice * (1-
l_discount),2) * (1+l_tax),2)) AS RESULT
from lineitem
where l_orderkey = &&1;

select
'AFTER ACID QUERY' as STAGE,
substr(TO_CHAR(sysdate,'YYYY-MM-DD HH:MI:SS'),1,20) as
CURRENT_TIME
from dual;

exit;
```

a_query2.sql

```
set serverout on;

select
'BEFORE PARTSUPP QUERY' as STAGE,
substr(TO_CHAR(sysdate,'YYYY-MM-DD HH:MI:SS'),1,20) as
CURRENT_TIME
from dual;

select *
from partsupp
where ps_partkey = &&1
and ps_suppkey = &&2;

select
'AFTER PARTSUPP QUERY' as STAGE,
substr(TO_CHAR(sysdate,'YYYY-MM-DD HH:MI:SS'),1,20) as
CURRENT_TIME
from dual;

exit;
```

atom.sh

```
#!/bin/ksh

. $KIT_DIR/env

OH=$ORACLE_HOME
# ACID_DIR=$TPCD_KIT_DIR/audit set in env
OUT_DIR=$ACID_OUT
DURA_DIR=$ACID_DIR/dura
SF=1

usage() {

   echo ""
   echo "Usage: $0 [-n iter] [-p prog] [-u usr/pswd]
-h"
   echo ""
   echo "-n iter     : number of iterations, default
is 100"
   echo "-p prog     : program to run, default is
atranspl.ott"
   echo "-u usr/pswd : user/password combo for
database access, default is tpcd/tpcd"
   echo "-h          : print this usage summary"
   exit 1;
}

ITER=3
SF=1
PROG=atranspl
OUT=${OUT_DIR}/atom
USER=tpcd/tpcd

set -- `getopt "n:p:u:h" "$@"` || usage

while :
do
   case "$1" in
   -n) shift; ITER=$1;;
   -p) shift; PROG=$1;;
   -u) shift; USER=$1;;
   -h) usage; exit 0;;
   --) break;;
   esac
   shift
done

echo "Starting Atomicity Test at `date`..."
echo ""
echo "Performing $ITER ACID transactions with COMMIT"
echo ""

randkey $ITER $SF u$USER | $PROG 1 1 1 0 u$USER >
${OUT}c 2>&1

echo "ACID transactions with COMMIT ended. Output in
${OUT}c"
echo ""
echo "Performing $ITER ACID transactions with
ROLLBACK"
echo ""

randkey $ITER $SF u$USER | $PROG 1 1 0 0 u$USER >
${OUT}r 2>&1

echo "ACID transactions with ROLLBACK ended. Output in
${OUT}r"
echo ""
echo "Ending Atomicity Test at `date`..."
```

atranspl.sh

```
#!/bin/ksh
ade useview acid2 << END
echo I am in atranspl.sh
echo my arguments are $1 $2 $3 $4 $5 $6 $7
/private/tpcd/acid/kit/utils/atranspl $1 $2 $3 $4 $5
$6 $7
exit
END
```

ckpt.sh

```
#!/bin/ksh

. $KIT_DIR/env

svrmgrl << !

       connect internal;
       alter system switch logfile;
       alter system switch logfile;
       exit;
!
```

cnt_hist.sql

```
select count(*) from history;
exit;
```

consist.sh

```
#!/bin/ksh

. $KIT_DIR/env

OH=$ORACLE_HOME
# ACID_DIR=$TPCD_KIT_DIR/audit set in env
OUT_DIR=$ACID_OUT

KEY=$OUT_DIR/key$$_
OUTFILE=${OUT_DIR}/consrte
CON1=${OUT_DIR}/conb
CON2=${OUT_DIR}/cona
CHK=${OUT_DIR}/consckpt

/bin/rm -rf ${KEY}* $CON1 $CON2 $OUTFILE $CHK

trap "/bin/rm -rf ${KEY}*; exit 1" 1 2 3 15
```

```
STREAM=9
ITER=100
PROG=atranspl
USER="tpcd/tpcd"
CK=10

usage() {

   echo ""
   echo "Usage: $0 [-n iter] [-s number of stream] [-p
prog] [-u usr/pswd] -h"
   echo ""
   echo "-n iter             : number of iterations,
default is 100"
   echo "-s number of stream : number of streams,
default is 2"
   echo "-p prog             : program to run, default
is atranspl.ott"
   echo "-u usr/pswd         : user/password for
database access, default is tpcd/tpcd"
   echo "-t chkpt            : time after the start of
ACID transaction to perform the checkpoint"
   echo "                      default is 10 seconds"
   echo "-h                  : print this usage
summary"
   exit 1;
}

set -- `getopt "n:p:u:s:h" "$@"` || usage

while :
do
   case "$1" in
   -s) shift; STREAM=$1;;
   -n) shift; ITER=$1;;
   -p) shift; PROG=$1;;
   -u) shift; USER=$1;;
   -t) shift; CK=$1;;
   -h) usage; exit 0;;
   --) break;;
   esac
   shift
done


if [ $ITER -lt 100 ]
then
echo "Error: Must at least run 100 iterations!"
echo "Exiting..."
exit 1
fi

if [ $STREAM -lt 2 ]
then
echo "Error: Must at least run 2 streams!"
echo "Exiting..."
exit 1
fi

echo "Starting Consistency Test at `date`..."
echo ""
echo "Generate some keys first"
echo ""

i=0

while [ $i -lt $STREAM ]
do
   echo randkey $ITER 1 u$USER
   randkey $ITER 1 u$USER > ${KEY}$i
   i=`expr $i + 1`
done

echo "Check consistency before Submitting Transactions
`date`"
echo "Check consistency before Submitting Transactions
`date`" >> $CON1
echo "Obtain 10 keys from the each key file to check
consistency"

i=0
while [ $i -lt $STREAM ]
do
KEYS=`head -10 ${KEY}${i} | awk '{printf "%d ", $1}'`
echo "The 10 Keys for file $i are: $KEYS"
#for j in `head -10 ${KEY}${i} | awk '{printf "%d ",
$1}'`
for j in $KEYS
do
    sqlplus $USER @consist $j >> $CON1
    echo "------------------------------" >> $CON1
done
    i=`expr $i + 1`
done

echo ""
echo "Starting ACID transactions at `date`"
echo ""

i=0

while [ $i -lt $STREAM ]
do
    $PROG $i $STREAM 1 0 u${USER} i${KEY}${i} o$
{OUTFILE}${i} s1 &
    i=`expr $i + 1`
done

echo "Schedule a Checkpoint"
echo "Checkpoint scheduled at $CK seconds after
`date`"

(sleep $CK; $ACID_DIR/consistency/ckpt.sh) &

wait

echo ""
echo "Ending ACID transactions at `date`"
echo ""

echo "Completed $STREAM transaction streams with $ITER
iterations each"
echo ""

echo "Check consistency after Submitting Transactions
`date`"
echo "Check consistency after Submitting Transactions
`date`" >> $CON2

cat ${ORACLE_HOME}/rdbms/log/alert_${ORACLE_SID}.log
>> $CHK

i=0
while [ $i -lt $STREAM ]
do
KEYS=`head -10 ${KEY}$i | awk '{printf "%d ", $1}'`
#for j in `head -10 ${KEY}$i | awk '{printf "%d ",
$1}'`
echo "The keys to check for consistency after the test
from file $i are:"
echo "$KEYS"
for j in $KEYS
do
    sqlplus $USER @consist $j >> $CON2
    echo "------------------------------" >> $CON2
done
    i=`expr $i + 1`
done
```

consist.sql

```
set verify off

select
substr(TO_CHAR(sysdate,'YYYY-MM-DD HH:MI:SS'),1,20) as
CURRENT_TIME
from dual;
set serverout on;

DECLARE
       o_okey          number;
       o_tprice        number;
       l_tprice        number;
       diff            number;
BEGIN
    select o_totalprice
       into o_tprice
       from orders
       where o_orderkey = &&1;
```

```
    select /*+ index(lineitem,i_l_orderkey) */ sum
(trunc((trunc((l_extendedprice * (1-l_discount)), 2)
          * (1+l_tax)), 2))
        into l_tprice
        from lineitem
        where l_orderkey = &&1;

    diff := l_tprice - o_tprice;

    dbms_output.put_line('O_TOTALPRICE: ' || TO_CHAR
(trunc(o_tprice,2)));
    dbms_output.put_line('L_TOTALPRICE: ' || TO_CHAR
(trunc(l_tprice,2)));
    dbms_output.put_line('Difference:   ' || TO_CHAR
(trunc(diff,2)));

END;
.
/


spool off
exit
```

==========

end_acid.sh

==========

```
#!/bin/ksh

. $KIT_DIR/env

OH=$ORACLE_HOME
# ACID_DIR=$OH/tpcd/audit set in env
OUT_DIR=$ACID_OUT/
DURA_DIR=$ACID_OUT/dura
RUN_ID_FILE=$ACID_DIR/run_id

ITER=1000
STEM=9
PROG=${ACID_DIR}/atranspl.ott
IN=${ACID_DIR}/acid_in
DURA=${DURA_DIR}/dura
DURA=${DURA_DIR}/drate
OUT=${DURA_DIR}/drate
DSMPL=${DURA_DIR}/durasmpl
KEY=${DURA_DIR}/key${1}_
USER=tpcd/tpcd
TRIG=1
HCNT=duracnta

sqlplus $USER @cnt_hist > $DURA_DIR/$HCNT

i=0
while [ $i -lt $STEM ]
do
   for j in `head -10 ${KEY}${i} | awk '{printf "%d
",$1}'`
   do
      sqlplus tpcd/tpcd @consist $j >>
$DURA_DIR/duraconsa
   done
   i=`expr $i + 1`
done

i=0
while [ $i -lt $STEM ]
do
sample.sh $DURA${i} > ${DSMPL}${i} 2>&1
i=`expr $i + 1`
done
```

==========

iso1.sh

==========

```
#!/bin/ksh

. $KIT_DIR/env

RSH=rsh

OH=$ORACLE_HOME
OUT_DIR=$ACID_OUT
TXN1FILE=$OUT_DIR/txn1$$.out
TXN2FILE=$OUT_DIR/txn2$$.out
KEYFILE=$OUT_DIR/key$$.out
ISOFILE=$OUT_DIR/iso1

USER="tpcd/tpcd"
PROG=atranspl


/bin/rm -rf $TXN1FILE $TXN2FILE $KEYFILE

trap "/bin/rm -rf $TXN1FILE $TXN2FILE $KEYFILE; exit
1" 1 2 3 15

usage() {

   echo ""
   echo "Usage: $0 [-u user/passwd] [-n remote_node]
-h"
   echo ""
   exit 1;
}

set -- `getopt "u:n:h" "$@"` || usage

while :
do
   case "$1" in
   -u) shift; USER=$1;;
   -n) shift; HOST="$1";;
   -h) usage; exit 0;;
   --) break;;
   esac
   shift;
done


de=`direxists.sh $ACID_OUT c` # I am not using $de
afterward, but I want to avoid the output of direxists

randkey 1 1 u"$USER" > $KEYFILE
echo -----
ls -l $KEYFILE
cat $KEYFILE
echo ++++++
OKEY=`cat $KEYFILE | awk '{print $1}'`
echo "o_key is "$OKEY

echo "Running ACID query BEFORE the start of Isolation
Test 1" >> $TXN2FILE
echo "`date`" >> $TXN2FILE
echo "" >> $TXN2FILE
sqlplus $USER @$ACID_DIR/isolation/a_query $OKEY >>
$TXN2FILE
echo "" >> $TXN2FILE
echo
"-----------------------------------------------" >>
$TXN2FILE
sleep 1
echo before PROG

$PROG 1 1 1 0 i$KEYFILE u$USER s60 >> $TXN1FILE &

echo PROG 1 1 1 0 i$KEYFILE u$USER s60

sleep 10

echo "Running ACID query 10 seconds AFTER the start of
ACID Transaction" \
>> $TXN2FILE
echo "`date`" >> $TXN2FILE
if [ "$HOST" != "" ]
then
echo "Starting ACID query on node $HOST" >> $TXN2FILE
@$ACID_DIR/isolation/a_query $OKEY >> $TXN2FILE
${RSH} -n ${HOST} a_query.sh $OKEY >> $TXN2FILE
else
sqlplus $USER @$ACID_DIR/isolation/a_query $OKEY >>
$TXN2FILE
fi

echo
"-----------------------------------------------" >>
$TXN2FILE
wait
```

```
echo
"-----------------------------------------------" >>
$TXN1FILE

cat $TXN1FILE $TXN2FILE >> $ISOFILE

/bin/rm -rf $TXN1FILE $TXN2FILE $KEYFILE

=====================================================
```

iso2.sh

```
=====================================================
#!/bin/ksh

. $KIT_DIR/env

RSH=rsh

OH=$ORACLE_HOME
OUT_DIR=$ACID_OUT

DURA_DIR=$ACID_DIR/dura

TXN1FILE=$OUT_DIR/txn1$$.out
TXN2FILE=$OUT_DIR/txn2$$.out
KEYFILE=$OUT_DIR/key$$.out
ISOFILE=$OUT_DIR/iso2

USER="tpcd/tpcd"
PROG=atranspl

/bin/rm -rf $TXN1FILE $TXN2FILE $KEYFILE

trap "/bin/rm -rf $TXN1FILE $TXN2FILE $KEYFILE; exit
1" 1 2 3 15

usage() {

   echo ""
   echo "Usage: $0 [-u user/passwd] [-n remote_node]
-h"
   echo ""
   exit 1;
}

set -- `getopt "u:n:h" "$@"` || usage

while :
do
   case "$1" in
   -u) shift; USER=$1;;
   -n) shift; HOST="$1";;
   -h) usage; exit 0;;
   --) break;;
   esac
   shift;
done


randkey 1 1 u"$USER" > $KEYFILE

OKEY=`cat $KEYFILE | awk '{print $1}'`
echo "o_key is "$OKEY

echo "Running ACID query BEFORE the start of Isolation
Test 1" >> $TXN2FILE
echo "`date`" >> $TXN2FILE
echo "" >> $TXN2FILE
sqlplus $USER @$ACID_DIR/isolation/a_query $OKEY >>
$TXN2FILE
echo "" >> $TXN2FILE
echo
"-----------------------------------------------" >>
$TXN2FILE

sleep 1

$PROG 1 1 0 0 i$KEYFILE u$USER s30 >> $TXN1FILE &

sleep 10

echo "Running ACID query 10 seconds AFTER the start of
ACID transaction" \
>> $TXN2FILE
echo "`date`" >> $TXN2FILE
if [ "$HOST" != "" ]
then
echo "Starting ACID query on node $HOST" >> $TXN2FILE
${RSH} -n ${HOST} a_query.sh $OKEY >> $TXN2FILE
else
sqlplus $USER @$ACID_DIR/isolation/a_query $OKEY >>
$TXN2FILE
fi

echo
"-----------------------------------------------" >>
$TXN2FILE
wait
echo
"-----------------------------------------------" >>
$TXN1FILE

cat $TXN1FILE $TXN2FILE >> $ISOFILE

/bin/rm -rf $TXN1FILE $TXN2FILE $KEYFILE

=====================================================
```

iso3.sh

```
=====================================================
#!/bin/ksh
. $KIT_DIR/env

RSH=rsh

OH=$ORACLE_HOME
OUT_DIR=$ACID_OUT

DURA_DIR=$ACID_DIR/dura

TXN1FILE=$OUT_DIR/txn1$$.out
TXN2FILE=$OUT_DIR/txn2$$.out
KEYFILE=$OUT_DIR/key$$.out
ISOFILE=$OUT_DIR/iso3

USER="tpcd/tpcd"
PROG=$KIT_DIR/utils/atranspl

/bin/rm -rf $TXN1FILE $TXN2FILE $KEYFILE

trap "/bin/rm -rf $TXN1FILE $TXN2FILE $KEYFILE; exit
1" 1 2 3 15

usage() {

   echo ""
   echo "Usage: $0 [-u user/passwd] [-n remote_node]
-h"
   echo ""
   exit 1;
}

set -- `getopt "u:n:h" "$@"` || usage

while :
do
   case "$1" in
   -u) shift; USER=$1;;
   -n) shift; HOST="$1";;
   -h) usage; exit 0;;
   --) break;;
   esac
   shift
done

randkey 1 1 u"$USER" > $KEYFILE
k1=`cat $KEYFILE | awk '{print $1}'`
k2=`cat $KEYFILE | awk '{print $2}'`
k3=`cat $KEYFILE | awk '{print $3}'`
sleep 1

$PROG 1 2 1 0 i$KEYFILE u$USER s30 >> $TXN1FILE &

sleep 10

if [ "$HOST" != "" ]
then
echo "Starting TXN2 on node $HOST" >> $TXN2FILE
${RSH} -n ${HOST} atranspl.sh 2 2 1 1 $k1 $k2 $k3
u$USER s1 >> $TXN2FILE &
else
$PROG 2 2 1 1 i$KEYFILE u$USER s1 >> $TXN2FILE &
```

```
fi

wait
echo
"------------------------------------------------" >>
$TXN2FILE
echo
"------------------------------------------------" >>
$TXN1FILE

cat $TXN1FILE $TXN2FILE >> $ISOFILE

/bin/rm -rf $TXN1FILE $TXN2FILE $KEYFILE

==================================================
```

iso4.sh

```
==================================================
#!/bin/ksh
. $KIT_DIR/env

RSH=rsh

OH=$ORACLE_HOME
OUT_DIR=$ACID_OUT

DURA_DIR=$ACID_DIR/dura

TXN1FILE=$OUT_DIR/txn1$$.out
TXN2FILE=$OUT_DIR/txn2$$.out
KEYFILE=/tpch_ff/ff_ps8/key$$.out
ISOFILE=$OUT_DIR/iso4

USER="tpcd/tpcd"
PROG=atranspl

/bin/rm -rf $TXN1FILE $TXN2FILE $KEYFILE

trap "/bin/rm -rf $TXN1FILE $TXN2FILE $KEYFILE; exit
1" 1 2 3 15

usage() {

   echo ""
   echo "Usage: $0 [-u user/passwd] [-n remote_node]
-h"
   echo ""
   exit 1;
}

set -- `getopt "u:n:h" "$@"` || usage

while :
do
   case "$1" in
   -u) shift; USER=$1;;
   -n) shift; HOST="$1";;
   -h) usage; exit 0;;
   --) break;;
   esac
   shift
done

randkey 1 1 u"$USER" > $KEYFILE

k1=`cat $KEYFILE | awk '{print $1}'`
k2=`cat $KEYFILE | awk '{print $2}'`
k3=`cat $KEYFILE | awk '{print $3}'`


sleep 1

$PROG 1 2 0 0 i$KEYFILE u$USER s30 >> $TXN1FILE &

sleep 10

if [ "$HOST" != "" ]
then
echo "Starting TXN2 on node $HOST" >> $TXN2FILE
${RSH} -n ${HOST} atranspl.sh 2 2 1 1 $k1 $k2 $k3
u$USER s1 >> $TXN2FILE &
else
$PROG 2 2 1 1 i$KEYFILE u$USER s1 >> $TXN2FILE &
fi

wait
echo
"------------------------------------------------" >>
$TXN2FILE
echo
"------------------------------------------------" >>
$TXN1FILE

cat $TXN1FILE $TXN2FILE >> $ISOFILE

/bin/rm -rf $TXN1FILE $TXN2FILE $KEYFILE

==================================================
```

iso5.sh

```
==================================================
#!/bin/ksh
. $KIT_DIR/env

RSH=rsh

OH=$ORACLE_HOME
OUT_DIR=$ACID_OUT
DURA_DIR=$ACID_DIR/dura

TXN1FILE=$OUT_DIR/txn1$$.out
TXN2FILE=$OUT_DIR/txn2$$.out
KEYFILE=$OUT_DIR/key$$.out
ISOFILE=$OUT_DIR/iso5

USER="tpcd/tpcd"
PROG=atranspl

/bin/rm -rf $TXN1FILE $TXN2FILE $KEYFILE

trap "/bin/rm -rf $TXN1FILE $TXN2FILE $KEYFILE; exit
1" 1 2 3 15

usage() {

   echo ""
   echo "Usage: $0 [-u user/passwd] [-n remote_node]
-h"
   echo ""
   exit 1;
}

set -- `getopt "u:n:h" "$@"` || usage

while :
do
   case "$1" in
   -u) shift; USER=$1;;
   -n) shift; HOST="$1";;
   -h) usage; exit 0;;
   --) break;;
   esac
   shift;
done

randkey 1 1 u"$USER" > $KEYFILE

OKEY=`cat $KEYFILE | awk '{print $1}'`
echo "o_key is "$OKEY

echo "Running ACID query BEFORE the start of Isolation
Test 5" >> $TXN1FILE
echo "`date`" >> $TXN1FILE
echo "" >> $TXN1FILE
sqlplus $USER @$ACID_DIR/isolation/a_query $OKEY >>
$TXN1FILE
echo "" >> $TXN1FILE
echo
"------------------------------------------------" >>
$TXN1FILE

sleep 1

$PROG 1 1 1 0 i$KEYFILE u$USER s60 >> $TXN1FILE &
sleep 5
PSKEY=`randpsup 1`

echo "Running PARTSUPP query 5 seconds AFTER the start
of ACID Transaction" \
>> $TXN2FILE
echo "`date`" >> $TXN2FILE
echo "PS_PARTKEY and PS_SUPPKEY are: $PSKEY" >>
```

```
$TXN2FILE

if [ "$HOST" != "" ]
then
echo "Starting PARTSUPP query on node $HOST" >>
$TXN2FILE
${RSH} -n ${HOST} a_query2.sh ${PSKEY} >> $TXN2FILE &
else
sqlplus $USER @$ACID_DIR/isolation/a_query2 ${PSKEY}
>> $TXN2FILE &
fi

wait

echo
"-----------------------------------------------" >>
$TXN2FILE
echo
"-----------------------------------------------" >>
$TXN1FILE

cat $TXN1FILE $TXN2FILE >> $ISOFILE

/bin/rm -rf $TXN1FILE $TXN2FILE $KEYFILE


====================================================
```

iso6.sh

```
====================================================
#!/bin/ksh
. $KIT_DIR/env

# May need to change the following:
RSH=rsh

OH=/private/tpcd
# ACID_DIR=$TPCD_KIT_DIR/audit is set in env
OUT_DIR=$ACID_OUT

DURA_DIR=$ACID_DIR/dura

TXN1FILE=$OUT_DIR/txn1$$.out
TXN2FILE=$OUT_DIR/txn2$$.out
TXN3FILE=$OUT_DIR/txn3$$.out
KEYFILE=$OUT_DIR/key$$.out
ISOFILE=$OUT_DIR/iso6

USER=$DATABASE_USER
PROG=atranspl

/bin/rm -rf $TXN1FILE $TXN2FILE $TXN3FILE $KEYFILE

trap "/bin/rm -rf $TXN1FILE $TXN2FILE $TXN3FILE
$KEYFILE; exit 1" 1 2 3 15

usage() {

   echo ""
   echo "Usage: $0 [-u user/passwd] [-n remote_node]
-h"
   echo ""
   exit 1;
}

set -- `getopt "u:n:h" "$@"` || usage

while :
do
   case "$1" in
   -u) shift; USER=$1;;
   -n) shift; HOST="$1";;
   -h) usage; exit 0;;
   --) break;;
   esac
   shift;
done


# generate key files

randkey 1 0.1 u"$USER" > $KEYFILE

OKEY=`cat $KEYFILE | awk '{print $1}'`
echo "o_key is "$OKEY

# before the any transaction, let's run a ACID query
to record the
# initial state of lineitem

echo "Running ACID query BEFORE the start of Isolation
Test 6" >> $TXN2FILE
echo "`date`" >> $TXN2FILE
echo "" >> $TXN2FILE
sqlplus $USER @$ACID_DIR/isolation/a_query $OKEY >>
$TXN2FILE
echo "" >> $TXN2FILE
echo
"-----------------------------------------------" >>
$TXN2FILE

sleep 1

# start Query 1, use 0 as the delta

echo "Running Query 1 at `date`" >> $TXN1FILE
sqlplus $USER @q1 >> $TXN1FILE &

# sleep 2 seconds before starting ACID transaction

sleep 2

# start ACID transaction, COMMIT after one second

echo "Starting AICD transaction at `date`" >>
$TXN2FILE

if [ "$HOST" != "" ]
then
echo "Starting ACID transaction on node $HOST" >>
$TXN2FILE
${RSH} -n ${HOST} $PROG 1 1 1 0 i$KEYFILE u$USER s1 >>
$TXN2FILE &
else
$PROG 1 1 1 0 i$KEYFILE u$USER s1 >> $TXN2FILE &
fi

# start Query 1

sleep 2

echo "Running 2nd Query 1 at `date`" >> $TXN3FILE
sqlplus $USER @q1 >> $TXN3FILE &
# wait for everyone to finish

wait

echo
"-----------------------------------------------" >>
$TXN3FILE
echo
"-----------------------------------------------" >>
$TXN2FILE
echo
"-----------------------------------------------" >>
$TXN1FILE

cat $TXN1FILE $TXN2FILE $TXN3FILE >> $ISOFILE

/bin/rm -rf $TXN1FILE $TXN2FILE $TXN3FILE $KEYFILE

====================================================
```

run_acid.sh

```
====================================================
#!/bin/ksh

. $KIT_DIR/env

OH=$ORACLE_HOME
OUT_DIR=$ACID_OUT

usage() {

   echo ""
   echo "Usage: $0 [-n iter] [-s stream] [-p prog] [-i
infile] [-o outfile]"
   echo "          [-d durafile] [-u usr/pswd] -h"
   echo ""
   echo "-n iter     : number of iterations, default
is 100"
   echo "-s stream   : number of streams, default is
```

```
2"
   echo "-p prog     : program to run, default is
atranspl.ott"
   echo "-i infile   : input file prefix, suffix by
process number within a"
   echo "              stream and run ID, default
is ./acid_in"
   echo "-o outfile  : output file prefix, similar to
input file"
   echo "              default is ./out/acid_out"
   echo "-d durafile : durability file prefix, used
for durability tests"
   echo "              default is ./dura/acid_dura"
   echo "-u usr/pswd : user/password combo for
database access, default is tpcd/tpcd"
echo "-t trigger  : trigger time between process
starts, default is 1 second"
   echo "-h          : print this usage summary"
   exit 1;
}

ITER=1000
STEM=9
SF=1
PROG=atranspl
IN=${ACID_DIR}/acid_in
DURA_DIR=$ACID_OUT/dura
OUT=${DURA_DIR}/drate
DURA=${DURA_DIR}/dura
KEY=${DURA_DIR}/key$$_
USER=tpcd/tpcd
TRIG=1
HCNT=duracntb

set -- `getopt "n:s:p:i:o:d:u:ht:f:" "$@"` || usage
while :
do
   case "$1" in
   -n) shift; ITER=$1;;
   -s) shift; STEM=$1;;
   -p) shift; PROG=$1;;
   -i) shift; IN=$1;;
   -o) shift; OUT=$1;;
   -d) shift; DURA=$1;;
   -u) shift; USER=$1;;
   -h) usage; exit 0;;
   -t) shift; TRIG=$1;;
   -f) shift; SF=$1;;
   --) break;;
   esac
   shift;
done


echo "Starting durability run..."

i=0
T=`expr $STEM \* $TRIG + 6`

sqlplus -s $USER << ! > $DURA_DIR/$HCNT 2>&1
connect tpcd/tpcd
@cnt_hist
!

while [ $i -lt $STEM ]
do
   randkey 1000 ${SF} u${USER} > ${KEY}${i} &
   i=`expr $i + 1`
done

wait
i=0
while [ $i -lt $STEM ]
do
   for j in `head -10 ${KEY}${i} | awk '{printf "%d
",$1}'`
   do
      sqlplus tpcd/tpcd @consist $j >>
$DURA_DIR/duraconsb
   done
   i=`expr $i + 1`
done

i=0
while [ $i -lt $STEM ]
do
   $PROG $i $STEM 1 0 i${KEY}${i} o${OUT}${i} d${DURA}
${i} u$USER s1 &
   T=`expr $T - $TRIG`
   i=`expr $i + 1`

done

wait

echo "Durability run completed"
```

sample.sh

```
#!/bin/ksh
. $KIT_DIR/env

cat $1 | grep o_key | awk '{printf "%d \n", $2}' > /
tmp/okey$$
cat $1 | grep l_key | awk '{printf "%d \n", $2}' > /
tmp/lkey$$

paste /tmp/okey$$ /tmp/lkey$$ > /tmp/keys$$
tail -6 /tmp/keys$$ > /tmp/6keys$$

echo "Keys chosen are:"
cat /tmp/6keys$$

i=1
while [ $i -le 6 ]
do

j=`cat /tmp/6keys$$ | tail -${i} | head -1`
sqlplus tpcd/tpcd @sample $j
i=`expr $i + 1`
done

/bin/rm -f /tmp/*key*
```

sample.sql

```
alter session set nls_date_format = 'YYYY-MM-DD
HH:MI:SS';
select * from history where  h_o_key = &&1 and h_l_key
= &&2;

exit;
```

Disk Configuration Details

Basic Assumptions:

1. Use hardware RAID-1 capabilities of StorEdge 3510 FC Arrays
2. Use Oracle Automatic Storage Manager (ASM) for striping

Disk Config:

1 x StorEdge 6120. Used for oracle software and tpc-h kit
1 x s1 12 x 72GB. Used for boot tray
96 x StorEdge 3510 FC RAID Arrays w/ 12 10Krpm 73.4G drives. Used for all database objects (tables, indexes, controlfiles, redo logs, temporary tablespace, undo tablespace, system tablespace)

Mirroring was implemented by creating 6 x 1+1 RAID-1 logical drives on each StorEdge 3510 FC Array. The logical drives were then partitioned and presented to the SUT as LUNs. Solaris Volume Manager was used to create a metadevice on each LUN.

Striping was implemented using Oracle Automatic Storage Manager (ASM). An ASM diskgroup was created comprised of the SVM metadevices described above. Oracle managed striping the tables, indexes, controlfiles, redo logs, undo tablespace, temporary tablespace and system tablespace across the ASM diskgroup.

```
Solaris Volume Manager information
d100             s   57GB c2t40d0s6
d101             s   57GB c3t40d0s6
d102             s   57GB c4t40d0s6
d103             s   57GB c5t40d0s6
d104             s   57GB c6t40d0s6
d105             s   57GB c7t40d0s6
d106             s   57GB c8t40d0s6
d107             s   57GB c9t40d0s6
d108             s   57GB c10t40d0s6
d109             s   57GB c11t40d0s6
d110             s   57GB c12t40d0s6
d111             s   57GB c13t40d0s6
d112             s   57GB c14t40d0s6
d113             s   57GB c15t40d0s6
d114             s   57GB c16t40d0s6
d115             s   57GB c17t40d0s6
d116             s   57GB c18t40d0s6
d117             s   57GB c19t40d0s6
d118             s   57GB c20t40d0s6
d119             s   57GB c21t40d0s6
d120             s   57GB c22t40d0s6
d121             s   57GB c23t40d0s6
d122             s   57GB c24t40d0s6
d123             s   57GB c25t40d0s6
d124             s   57GB c26t40d0s6
d125             s   57GB c27t40d0s6
--- d126-d195,d200-d295,d300-d395,d400-d495,d500-
d595,d600-d674
d675             s   57GB c77t40d5s6
d676             s   57GB c78t40d5s6
d677             s   57GB c79t40d5s6
d678             s   57GB c80t40d5s6
d679             s   57GB c81t40d5s6
d680             s   57GB c82t40d5s6
d681             s   57GB c83t40d5s6
d682             s   57GB c84t40d5s6
d683             s   57GB c85t40d5s6
d684             s   57GB c86t40d5s6
d685             s   57GB c87t40d5s6
d686             s   57GB c88t40d5s6
d687             s   57GB c89t40d5s6
d688             s   57GB c90t40d5s6
d689             s   57GB c91t40d5s6
d690             s   57GB c109t40d5s6
d691             s   57GB c110t40d5s6
d692             s   57GB c111t40d5s6
d695             s   57GB c114t40d5s6

ASM instance information:

# initasm.ora
instance_type = asm
processes     = 1024
shared_pool_size = 2g
sort_area_size = 10485760
ASM_DISKSTRING = '/links/asm/d*'
ASM_DISKGROUPS = dg_tpch

# create dg_tpch diskgroup
CREATE DISKGROUP dg_tpch EXTERNAL REDUNDANCY
DISK
'/links/asm/d100' size 25G,
'/links/asm/d101' size 25G,
'/links/asm/d102' size 25G,
'/links/asm/d103' size 25G,
'/links/asm/d104' size 25G,
'/links/asm/d105' size 25G,
'/links/asm/d106' size 25G,
'/links/asm/d107' size 25G,
'/links/asm/d108' size 25G,
'/links/asm/d109' size 25G,
'/links/asm/d110' size 25G,
'/links/asm/d111' size 25G,
'/links/asm/d112' size 25G,
'/links/asm/d113' size 25G,
'/links/asm/d114' size 25G,
'/links/asm/d115' size 25G,
'/links/asm/d116' size 25G,
'/links/asm/d117' size 25G,
'/links/asm/d118' size 25G,
'/links/asm/d119' size 25G,
'/links/asm/d120' size 25G,
'/links/asm/d121' size 25G,
'/links/asm/d122' size 25G,
'/links/asm/d123' size 25G,
'/links/asm/d124' size 25G,
'/links/asm/d125' size 25G,
--- d126-d195,d200-d295,d300-d395,d400-d495,d500-
d595,d600-d674
'/links/asm/d675' size 25G,
'/links/asm/d676' size 25G,
'/links/asm/d677' size 25G,
'/links/asm/d678' size 25G,
'/links/asm/d679' size 25G,
'/links/asm/d680' size 25G,
'/links/asm/d681' size 25G,
'/links/asm/d682' size 25G,
'/links/asm/d683' size 25G,
'/links/asm/d684' size 25G,
'/links/asm/d685' size 25G,
'/links/asm/d686' size 25G,
'/links/asm/d687' size 25G,
'/links/asm/d688' size 25G,
'/links/asm/d689' size 25G,
'/links/asm/d690' size 25G,
'/links/asm/d691' size 25G,
'/links/asm/d692' size 25G,
'/links/asm/d693' size 25G,
'/links/asm/d694' size 25G,
'/links/asm/d695' size 25G
;
!
```

Appendix C. Query Text and Query Output

```
==================================================
```

qual01

```
==================================================
-- TPC-H/TPC-R Pricing Summary Report Query (Q1)
-- Functional Query Definition
-- Approved February 1998


select
l_returnflag,
l_linestatus,
sum(l_quantity) as sum_qty,
sum(l_extendedprice) as sum_base_price,
sum(l_extendedprice * (1 - l_discount)) as
sum_disc_price,
sum(l_extendedprice * (1 - l_discount) * (1 + l_tax))
as sum_charge,
avg(l_quantity) as avg_qty,
avg(l_extendedprice) as avg_price,
avg(l_discount) as avg_disc,
count(*) as count_order
from
lineitem
where
l_shipdate <= to_date ('1998-12-01','YYYY-MM-DD')  -
90
group by
l_returnflag,
l_linestatus
order by
l_returnflag,
l_linestatus

L_RETURNFLAG L_LINESTATUS SUM_QTY
SUM_BASE_PRICE
SUM_DISC_PRICE         SUM_CHARGE              AVG_QTY
AVG_PRICE              AVG_DISC
COUNT_ORDER
A            F            37734107.00
56586554400.73
53758257134.87         55909065222.83          25.52
38273.13               0.05
1478493.00
N            F            991417.00
1487504710.38
1413082168.05          1469649223.19           25.52
38284.47               0.05                    38854.00
N            O            74476040.00
111701729697.74
106118230307.61        110367043872.50         25.50
38249.12               0.05
2920374.00
R            F            37719753.00
56568041380.90
53741292684.60         55889619119.83          25.51
38250.85               0.05
1478870.00


4 rows processed.
Query Processed in 16.29 seconds.
==================================================
```

qual02

```
==================================================
-- TPC-H/TPC-R Minimum Cost Supplier Query (Q2)
-- Functional Query Definition
-- Approved February 1998


select * from (
select
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 = 15
and p_type like '%BRASS'
and s_nationkey = n_nationkey
and n_regionkey = r_regionkey
and r_name = 'EUROPE'
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 = 'EUROPE'
)
order by
s_acctbal desc,
n_name,
s_name,
p_partkey
)
where rownum <= 100

S_ACCTBAL              S_NAME
N_NAME
P_PARTKEY              P_MFGR
S_ADDRESS                                      S_PHONE
S_COMMENT
9938.53                Supplier#000005359
UNITED KINGDOM
185358.00              Manufacturer#4
QKuHYh,vZGiwu2FWEJoLDx04                       33-429-790-
6131
blithely silent pinto beans are furiously. slyly final
deposits acros
9937.84                Supplier#000005969
ROMANIA
108438.00              Manufacturer#1
ANDENSOSmk,miq23Xfb5RWt6dvUcvt6Qa              29-520-692-
3537
carefully slow deposits use furiously. slyly ironic
platelets above the ironic
9936.22                Supplier#000005250
UNITED KINGDOM
249.00                 Manufacturer#4
B3rqp0xbSEim4Mpy2RH J                          33-320-228-
2957
blithely special packages are. stealthily express
deposits across the closely final instructi
9923.77                Supplier#000002324
GERMANY
29821.00               Manufacturer#4
y3OD9UywSTOk                                   17-779-299-
1839
quickly express packages breach quiet pinto beans.
requ
9871.22                Supplier#000006373
GERMANY
43868.00               Manufacturer#5
J8fcXWsTqM                                     17-813-485-
8637
never silent deposits integrate furiously blit
9870.78                Supplier#000001286
GERMANY
81285.00               Manufacturer#2
YKA,E2fjiVd7eUrzp2Ef8j1QxGo2DFnosaTEH          17-516-924-
4574
final theodolites cajole slyly special,
9870.78                Supplier#000001286
GERMANY
181285.00              Manufacturer#4
YKA,E2fjiVd7eUrzp2Ef8j1QxGo2DFnosaTEH          17-516-924-
4574
```

```
final theodolites cajole slyly special,
9852.52               Supplier#000008973
RUSSIA
18972.00              Manufacturer#2
t5L67YdBYYH6o,Vz24jpDyQ9                  32-188-594-
7038
quickly regular instructions wake-- carefully unusual
braids into the expres
9847.83               Supplier#000008097
RUSSIA
130557.00             Manufacturer#2
xMe97bpE69NzdwLoX                         32-375-640-
3593
slyly regular dependencies sleep slyly furiously
express dep
9847.57               Supplier#000006345
FRANCE
86344.00              Manufacturer#1
VSt3rzk3qG698u6ld8HhOByvrTcSTSvQlDQDag   16-886-766-
7945
silent pinto beans should have to snooze carefully
along the final reques
9847.57               Supplier#000006345
FRANCE
173827.00             Manufacturer#2
VSt3rzk3qG698u6ld8HhOByvrTcSTSvQlDQDag   16-886-766-
7945
silent pinto beans should have to snooze carefully
along the final reques
9836.93               Supplier#000007342
RUSSIA
4841.00               Manufacturer#4
JOlK7C1,7xrEZSSOw                         32-399-414-
5385
final accounts haggle. bold accounts are furiously
dugouts. furiously silent asymptotes are slyly
9817.10               Supplier#000002352
RUSSIA
124815.00             Manufacturer#2
4LfoHUZjgjEbAKw TgdKcgOc4D4uCYw           32-551-831-
1437
blithely pending packages across the ironic accounts
grow slyly after the furiously
9817.10               Supplier#000002352
RUSSIA
152351.00             Manufacturer#3
4LfoHUZjgjEbAKw TgdKcgOc4D4uCYw           32-551-831-
1437
blithely pending packages across the ironic accounts
grow slyly after the furiously
9739.86               Supplier#000003384
FRANCE
138357.00             Manufacturer#2
o,Z3v4POifevE k9U1b 6J1ucX,I              16-494-913-
5925
slyly ironic theodolites hag
9721.95               Supplier#000008757
UNITED KINGDOM
156241.00             Manufacturer#3
Atg6GnM4dT2                               33-821-407-
2995
ironic, even dolphins above the furiously ironic foxes
sleep slyly around the caref
9681.33               Supplier#000008406
RUSSIA
78405.00              Manufacturer#1
,qUuXcftUl                                32-139-873-
8571
furiously even deposits affix thinly special
theodolites. furiou
9643.55               Supplier#000005148
ROMANIA
107617.00             Manufacturer#1
kT4ciVFslx9z4s79p Js825                   29-252-617-
4850
doggedly even ideas boost furiously against the
furiously express
9624.82               Supplier#000001816
FRANCE
34306.00              Manufacturer#3
e7vab91vLJPWxxZnewmnDBpDmxYHrb            16-392-237-
6726
blithely regular accounts cajole furiously. regular
9624.78               Supplier#000009658
ROMANIA
189657.00             Manufacturer#1
oE9uBgEfSS4opIcepXyAYM,x                  29-748-876-
2014
regular deposits haggle. furiously express asympto
9612.94               Supplier#000003228
ROMANIA
120715.00             Manufacturer#2
KDdpNKN3cWu7ZSrbdqp7AfSLxx,qWB            29-325-784-
8187
carefully pending accounts serve. furiously close
deposits boost slyly. q
9612.94               Supplier#000003228
ROMANIA
198189.00             Manufacturer#4
KDdpNKN3cWu7ZSrbdqp7AfSLxx,qWB            29-325-784-
8187
carefully pending accounts serve. furiously close
deposits boost slyly. q
9571.83               Supplier#000004305
ROMANIA
179270.00             Manufacturer#2
qNHZ7WmCzygwMPRDO9Ps                      29-973-481-
1831
furiously final deposits
9558.10               Supplier#000003532
UNITED KINGDOM
88515.00              Manufacturer#4
..... delete lines ...................
33094.00              Manufacturer#5
kkYvL6IuvojJgTNG IKkaXQDYgx8ILohj         17-627-663-
8014
quickly regular requests are furiously. pending
deposits wake
7937.93               Supplier#000009012
ROMANIA
83995.00              Manufacturer#2
iUiTziH,Ek3i4lwSgunXMgrcTzwdb             29-250-925-
9690
blithely bold ideas haggle quickly final, regular
request
7914.45               Supplier#000001013
RUSSIA
125988.00             Manufacturer#2
riRcntps4KEDtYScjpMIWeYF6mNnR             32-194-698-
3365
final, ironic theodolites alongside of the ironic
7912.91               Supplier#000004211
GERMANY
159180.00             Manufacturer#5
2wQRVovHrm3,v03IKzfTd,1PYsFXQFFOG         17-266-947-
7315
final requests integrate slyly above the silent, even
7912.91               Supplier#000004211
GERMANY
184210.00             Manufacturer#4
2wQRVovHrm3,v03IKzfTd,1PYsFXQFFOG         17-266-947-
7315
final requests integrate slyly above the silent, even
7894.56               Supplier#000007981
GERMANY
85472.00              Manufacturer#4
NSJ96vMROAbeXP                            17-963-404-
3760
regular, even theodolites integrate carefully. bold,
special theodolites are slyly fluffily iron
7887.08               Supplier#000009792
GERMANY
164759.00             Manufacturer#3
Y28ITVeYriT3kIGdV2K8fSZ V2UqT5H1Otz       17-988-938-
4296
pending, ironic packages sleep among the carefully
ironic accounts. quickly final accounts
7871.50               Supplier#000007206
RUSSIA
104695.00             Manufacturer#1
3w fNCnrVmvJjE95sgWZzvW                   32-432-452-
7731
furiously dogged pinto beans cajole. bold, express
notornis until the slyly pending
7852.45               Supplier#000005864
RUSSIA
8363.00               Manufacturer#4
WCNfBPZeSXh3h,c                           32-454-883-
3821
blithely regular deposits
7850.66               Supplier#000001518
UNITED KINGDOM
```

```
86501.00                Manufacturer#1
ONda3YJiHKJOC                              33-730-383-
3892
furiously final accounts wake carefully idle requests.
even dolphins wake acc
7843.52                 Supplier#000006683
FRANCE
11680.00                Manufacturer#4
2Z0JGkiv01Y00oCFwUGfviIbhzCdy              16-464-517-
8943
carefully bold accounts doub


100 rows processed.
Query Processed in 0.28 seconds.
```

==========

qual03

```
==========
-- TPC-H/TPC-R Shipping Priority Query (Q3)
-- Functional Query Definition
-- Approved February 1998


select * from (
select
l_orderkey,
sum(l_extendedprice * (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 < to_date( '1995-03-15', 'YYYY-MM-DD')
and l_shipdate > to_date( '1995-03-15', 'YYYY-MM-DD')
group by
l_orderkey,
o_orderdate,
o_shippriority
order by
revenue desc,
o_orderdate)
where rownum <= 10

L_ORDERKEY              REVENUE
O_ORDERDATE O_SHIPPRIORITY
2456423.00              406181.01              1995-03-
05  0.00
3459808.00              405838.70              1995-03-
04  0.00
492164.00               390324.06              1995-02-
19  0.00
1188320.00              384537.94              1995-03-
09  0.00
2435712.00              378673.06              1995-02-
26  0.00
4878020.00              378376.80              1995-03-
12  0.00
5521732.00              375153.92              1995-03-
13  0.00
2628192.00              373133.31              1995-02-
22  0.00
993600.00               371407.46              1995-03-
05  0.00
2300070.00              367371.15              1995-03-
13  0.00


10 rows processed.
Query Processed in 3.28 seconds.


-- @(#)22.sql   2.1.4.2
-- TPC-D Global Sales Opportunity Query (Q22)
-- Functional Query Definition
-- Approved February 1998


select
cntrycode,
count(*) as numcust,
sum(c_acctbal) as totacctbal
from
(
select
substr(c_phone, 1, 2) as cntrycode,
c_acctbal
from
customer
where
substr(c_phone,1, 2) in
('13', '31', '23', '29', '30', '18', '17')
and c_acctbal > (
select
avg(c_acctbal)
from
customer
where
c_acctbal > 0.00
and substr(c_phone, 1, 2) in
('13', '31', '23', '29', '30', '18', '17')
)
and not exists (
select
*
from
orders
where
o_custkey = c_custkey
)
) custsale
group by
cntrycode
order by
cntrycode

CNTRYCODE NUMCUST                TOTACCTBAL
13        888.00                 6737713.99
17        861.00                 6460573.72
18        964.00                 7236687.40
23        892.00                 6701457.95
29        948.00                 7158866.63
30        909.00                 6808436.13
31        922.00                 6806670.18


7 rows processed.
Query Processed in 2.07 seconds.
```

==========

qual04

```
==========
-- TPC-H/TPC-R Order Priority Checking Query (Q4)
-- Functional Query Definition
-- Approved February 1998


select
o_orderpriority,
count(*) as order_count
from
orders
where
o_orderdate >= to_date( '1993-07-01',  'YYYY-MM-DD')
and o_orderdate < add_months(to_date( '1993-07-01',
'YYYY-MM-DD'),3)
and exists (
select
*
from
lineitem
where
l_orderkey = o_orderkey
and l_commitdate < l_receiptdate
)
group by
o_orderpriority
order by
o_orderpriority

O_ORDERPRIORITY ORDER_COUNT
1-URGENT        10594.00
2-HIGH          10476.00
3-MEDIUM        10410.00
4-NOT SPECIFIED 10556.00
```

```
5-LOW           10487.00

5 rows processed.
Query Processed in 8.27 seconds.
```

qual05

```
-- TPC-H/TPC-R Local Supplier Volume Query (Q5)
-- Functional Query Definition
-- Approved February 1998


select
n_name,
sum(l_extendedprice * (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 = 'ASIA'
and o_orderdate >= to_date( '1994-01-01',  'YYYY-MM-
DD')
and o_orderdate < add_months(to_date( '1994-01-01',
'YYYY-MM-DD'),  12)
group by
n_name
order by
revenue desc

N_NAME                    REVENUE
INDONESIA                 55502041.17
VIETNAM                   55295087.00
CHINA                     53724494.26
INDIA                     52035512.00
JAPAN                     45410175.70


5 rows processed.
Query Processed in 5.04 seconds.
```

qual06

```
-- TPC-H/TPC-R Forecasting Revenue Change Query (Q6)
-- Functional Query Definition
-- Approved February 1998


select
sum(l_extendedprice * l_discount) as revenue
from
lineitem
where
l_shipdate >= to_date( '1994-01-01',  'YYYY-MM-DD')
and l_shipdate < add_months(to_date( '1994-01-01',  'YYYY-MM-DD'),  12)
and l_discount between .06 - 0.01 and .06 + 0.01
and l_quantity < 24

REVENUE
123141078.23


1 row processed.
Query Processed in 0.76 seconds.
```

qual07

```
-- TPC-H/TPC-R Volume Shipping Query (Q7)
-- Functional Query Definition
-- Approved February 1998

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,
to_number (to_char (l_shipdate,'yyyy')) as l_year,
l_extendedprice * (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 = 'FRANCE' and n2.n_name = 'GERMANY')
or (n1.n_name = 'GERMANY' and n2.n_name = 'FRANCE')
)
and l_shipdate between to_date( '1995-01-01', 'YYYY-
MM-DD') and to_date( '1996-12-31', 'YYYY-MM-DD')
) shipping
group by
supp_nation,
cust_nation,
l_year
order by
supp_nation,
cust_nation,
l_year

SUPP_NATION               CUST_NATION
L_YEAR
REVENUE
FRANCE                    GERMANY
1995.00
54639732.73
FRANCE                    GERMANY
1996.00
54633083.31
GERMANY                   FRANCE
1995.00
52531746.67
GERMANY                   FRANCE
1996.00
52520549.02


4 rows processed.
Query Processed in 3.75 seconds.
```

qual08

```
-- TPC-H/TPC-R National Market Share Query (Q8)
-- Variant A
-- Approved February 1998


select
o_year,
sum(case when nation='BRAZIL' then volume else 0
end )/ sum(volume)
as mkt_share
from
(
select
to_number (to_char (o_orderdate, 'yyyy')) as o_year,
l_extendedprice * (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 = 'AMERICA'
and s_nationkey = n2.n_nationkey
and o_orderdate between to_date ('1995-01-01', 'YYYY-
MM-DD') and to_date ('1996-12-31', 'YYYY-MM-DD')
and p_type = 'ECONOMY ANODIZED STEEL'
) all_nations
group by
o_year
order by
o_year
```

```
O_YEAR                  MKT_SHARE
1995.00                 0.03
1996.00                 0.04


2 rows processed.
Query Processed in 5.01 seconds.
```

qual09

```
-- TPC-H/TPC-R Product Type Profit Measure Query (Q9)
-- Functional Query Definition
-- Approved February 1998


select
nation,
o_year,
sum(amount) as sum_profit
from
(
select
n_name as nation,
to_number (to_char (o_orderdate, 'yyyy')) as o_year,
l_extendedprice * (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 '%green%'
) profit
group by
nation,
o_year
order by
nation,
o_year desc
```

```
NATION                  O_YEAR
SUM_PROFIT
ALGERIA                 1998.00
31342867.23
ALGERIA                 1997.00
57138193.02
ALGERIA                 1996.00
56140140.13
ALGERIA                 1995.00
53051469.65
ALGERIA                 1994.00
53867582.13
ALGERIA                 1993.00
54942718.13
ALGERIA                 1992.00
54628034.71
ARGENTINA               1998.00
30211185.71
ARGENTINA               1997.00
50805741.75
ARGENTINA               1996.00
51923746.58
ARGENTINA               1995.00
49298625.77
ARGENTINA               1994.00
50835610.11
ARGENTINA               1993.00
51646079.18
ARGENTINA               1992.00
50410314.99
BRAZIL                  1998.00
27217924.38
BRAZIL                  1997.00
48378669.20
BRAZIL                  1996.00
50482870.36
BRAZIL                  1995.00
47623383.63
BRAZIL                  1994.00
47840165.73
BRAZIL                  1993.00
49054694.04
BRAZIL                  1992.00
48667639.08
CANADA                  1998.00
30379833.77
CANADA                  1997.00
50465052.31
CANADA                  1996.00
52560501.39
CANADA                  1995.00
52375332.81
CANADA                  1994.00
52600364.66
CANADA                  1993.00
52644504.07
CANADA                  1992.00
53932871.70
CHINA                   1998.00
31075466.16
CHINA                   1997.00
50551874.45
CHINA                   1996.00
51039293.88
CHINA                   1995.00
49287534.62
CHINA                   1994.00
50851090.07
CHINA                   1993.00
54229629.83
CHINA                   1992.00
52400529.37
EGYPT                   1998.00
29054433.39
EGYPT                   1997.00
50627611.45
EGYPT                   1996.00
49542212.84
EGYPT                   1995.00
48311550.32
EGYPT                   1994.00
49790644.74
EGYPT                   1993.00
48904292.97
EGYPT                   1992.00
49434932.62
ETHIOPIA                1998.00
28040717.27
ETHIOPIA                1997.00
47455009.87
ETHIOPIA                1996.00
46491097.57
ETHIOPIA                1995.00
46804449.30
ETHIOPIA                1994.00
48516143.92
ETHIOPIA                1993.00
46551891.56
ETHIOPIA                1992.00
44934648.64
```

```
FRANCE                    1998.00
32226407.84
FRANCE                    1997.00
47121485.86
FRANCE                    1996.00
47263135.50
FRANCE                    1995.00
47275997.57
FRANCE                    1994.00
47067209.33
FRANCE                    1993.00
51163370.11
FRANCE                    1992.00
47846235.33
GERMANY                   1998.00
28624942.66
GERMANY                   1997.00
49309074.88
GERMANY                   1996.00
49918683.17
GERMANY                   1995.00
52650718.72
GERMANY                   1994.00
50346900.42
GERMANY                   1993.00
50991895.81
GERMANY                   1992.00
48274126.10
INDIA                     1998.00
29943144.35
INDIA                     1997.00
50665453.23
INDIA                     1996.00
50283092.29
INDIA                     1995.00
50006774.64
INDIA                     1994.00
48995190.76
INDIA                     1993.00
50286902.85
INDIA                     1992.00
50850329.40
INDONESIA                 1998.00
27672340.00
INDONESIA                 1997.00
50512145.73
INDONESIA                 1996.00
51653060.12
INDONESIA                 1995.00
51508779.59
INDONESIA                 1994.00
52817950.32
INDONESIA                 1993.00
47959994.96
INDONESIA                 1992.00
51776605.03
IRAN                      1998.00
29065736.24
IRAN                      1997.00
50042063.05
IRAN                      1996.00
50926653.19
IRAN                      1995.00
51249667.65
IRAN                      1994.00
50337085.87
IRAN                      1993.00
51730763.49
IRAN                      1992.00
49955856.56
IRAQ                      1998.00
31624551.00
IRAQ                      1997.00
55121749.02
IRAQ                      1996.00
55897663.79
IRAQ                      1995.00
54815472.52
IRAQ                      1994.00
54408516.13
IRAQ                      1993.00
53633167.98
IRAQ                      1992.00
55891939.34
JAPAN                     1998.00
27934179.67
JAPAN                     1997.00
44517162.55
JAPAN                     1996.00
42545606.12
JAPAN                     1995.00
43749356.40
JAPAN                     1994.00
44840243.07
JAPAN                     1993.00
44660015.53
JAPAN                     1992.00
45410249.12
JORDAN                    1998.00
26901488.58
JORDAN                    1997.00
45471878.41
JORDAN                    1996.00
46794325.79
JORDAN                    1995.00
45178828.58
JORDAN                    1994.00
45333636.51
JORDAN                    1993.00
47971496.10
JORDAN                    1992.00
44717239.18
KENYA                     1998.00
28597614.34
KENYA                     1997.00
47949733.73
KENYA                     1996.00
46886924.62
KENYA                     1995.00
46072338.76
KENYA                     1994.00
45772061.17
KENYA                     1993.00
46308728.23
..... delete lines ...................
PERU                      1992.00
47523899.05
ROMANIA                   1998.00
30368667.40
ROMANIA                   1997.00
50365683.85
ROMANIA                   1996.00
49598999.01
ROMANIA                   1995.00
47537642.87
ROMANIA                   1994.00
51455283.01
ROMANIA                   1993.00
50407136.89
ROMANIA                   1992.00
48185385.13
RUSSIA                    1998.00
28322384.03
RUSSIA                    1997.00
50106685.18
RUSSIA                    1996.00
51753342.43
RUSSIA                    1995.00
49215820.36
RUSSIA                    1994.00
52205666.44
RUSSIA                    1993.00
51860230.03
RUSSIA                    1992.00
53251677.15
SAUDI ARABIA              1998.00
31541259.81
SAUDI ARABIA              1997.00
52438750.81
SAUDI ARABIA              1996.00
52543737.82
SAUDI ARABIA              1995.00
52938696.53
SAUDI ARABIA              1994.00
51389601.97
SAUDI ARABIA              1993.00
52937508.88
SAUDI ARABIA              1992.00
54843459.64
UNITED KINGDOM            1998.00
28494874.00
UNITED KINGDOM            1997.00
```

```
49381810.90
UNITED KINGDOM            1996.00
51386853.96
UNITED KINGDOM            1995.00
51509586.79
UNITED KINGDOM            1994.00
48086499.71
UNITED KINGDOM            1993.00
49166827.22
UNITED KINGDOM            1992.00
49349122.08
UNITED STATES             1998.00
25126238.95
UNITED STATES             1997.00
50077306.42
UNITED STATES             1996.00
48048649.47
UNITED STATES             1995.00
48809032.42
UNITED STATES             1994.00
49296747.18
UNITED STATES             1993.00
48029946.80
UNITED STATES             1992.00
48671944.50
VIETNAM                   1998.00
30442736.06
VIETNAM                   1997.00
50309179.79
VIETNAM                   1996.00
50488161.41
VIETNAM                   1995.00
49658284.61
VIETNAM                   1994.00
50596057.26
VIETNAM                   1993.00
50953919.15
VIETNAM                   1992.00
49613838.32


175 rows processed.
Query Processed in 13.64 seconds.
```

qual10

```
-- TPC-H/TPC-R Returned Item Reporting Query (Q10)
-- Functional Query Definition
-- Approved February 1998


select  *  from  (
select
c_custkey,
c_name,
sum(l_extendedprice * (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 >= to_date ('1993-10-01',  'YYYY-MM-
DD')
and o_orderdate < add_months(  to_date( '1993-10-01',
'YYYY-MM-DD'),  3)
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)
where rownum <= 20

C_CUSTKEY              C_NAME
REVENUE
C_ACCTBAL              N_NAME
C_ADDRESS                                C_PHONE
C_COMMENT
57040.00               Customer#0000057040
734235.25
632.87                 JAPAN
Eioyzjf4pp                               22-895-641-
3466
requests sleep blithely about the furiously i
143347.00              Customer#0000143347
721002.69
2557.47                EGYPT
1aReFYv,Kw4                              14-742-935-
3718
fluffily bold excuses haggle finally after the u
60838.00               Customer#0000060838
679127.31
2454.77                BRAZIL
64EaJ5vMAHWJlBOxJklpNc2RJiWE             12-913-494-
9813
furiously even pinto beans integrate under the
ruthless foxes; ironic, even dolphins across the slyl
101998.00              Customer#0000101998
637029.57
3790.89                UNITED KINGDOM
01c9CILnNtfOQYmZj                        33-593-865-
6378
accounts doze blithely! enticing, final deposits sleep
blithely special accounts. slyly express accounts pla
125341.00              Customer#0000125341
633508.09
4983.51                GERMANY
S29ODD6bceU8QSuuEJznkNaK                 17-582-695-
5962
quickly express requests wake quickly blithely
25501.00               Customer#0000025501
620269.78
7725.04                ETHIOPIA
  W556MXuoiaYCCZamJI,Rn0B4ACUGdkQ8DZ     15-874-808-
6793
quickly special requests sleep evenly among the
special deposits. special deposi
115831.00              Customer#0000115831
596423.87
5098.10                FRANCE
rFeBbEEyk dl ne7zV5fDrmiq1oK09wV7pxqCgIc 16-715-386-
3788
carefully bold excuses sleep alongside of the thinly
idle
84223.00               Customer#0000084223
594998.02
528.65                 UNITED KINGDOM
nAVZCs6BaWap rrM27N 2qBnzc5WBauxbA       33-442-824-
8191
pending, final ideas haggle final requests. unusual,
regular asymptotes affix according to the even foxes.
54289.00               Customer#0000054289
585603.39
5583.02                IRAN
vXCxoCsU0Bad5JQI ,oobkZ                  20-834-292-
4707
express requests sublate blithely regular requests.
regular, even ideas solve.
39922.00               Customer#0000039922
584878.11
7321.11                GERMANY
Zgy4s50l2GKN4pLDPBU8m342gIw6R            17-147-757-
8036
even pinto beans haggle. slyly bold accounts inte
6226.00                Customer#0000006226
576783.76
2230.09                UNITED KINGDOM
8gPu8,NPGkfyQQ0hcIYUGPIBWc,ybP5g,        33-657-701-
3391
quickly final requests against the regular
instructions wake blithely final instructions. pa
922.00                 Customer#0000000922
576767.53
3869.25                GERMANY
Az9RFaut7NkPnc5zSD2PwHgVwr4jRzq          17-945-916-
9648
boldly final requests cajole blith
```

```
147946.00               Customer#0000147946
576455.13
2030.13                 ALGERIA
iANyZHjqhyy7Ajah0pTrYyhJ                  10-886-956-
3143
furiously even accounts are blithely above the
furiousl
115640.00               Customer#0000115640
569341.19
6436.10                 ARGENTINA
Vtgfia9qI 7EpHgecU1X                      11-411-543-
4901
final instructions are slyly according to the
73606.00                Customer#0000073606
568656.86
1785.67                 JAPAN
xuR0Tro5yChDfOCrjkd2ol                    22-437-653-
6966
furiously bold orbits about the furiously busy
requests wake across the furiously quiet theodolites.
d
110246.00               Customer#0000110246
566842.98
7763.35                 VIETNAM
7KzflgX MDOq7sOkI                        31-943-426-
9837
dolphins sleep blithely among the slyly final
142549.00               Customer#0000142549
563537.24
5085.99                 INDONESIA
ChqEoK43OysjdHbtKCp6dKqjNyvvi9           19-955-562-
2398
regular, unusual dependencies boost slyly; ironic
attainments nag fluffily into the unusual packages?
146149.00               Customer#0000146149
557254.99
1791.55                 ROMANIA
s87fvzFQpU                               29-744-164-
6487
silent, unusual requests detect quickly slyly regul
52528.00                Customer#0000052528
556397.35
551.79                  ARGENTINA
NFztyTOR10UOJ                            11-208-192-
3205
unusual requests detect. slyly dogged theodolites use
slyly. deposit
23431.00                Customer#0000023431
554269.54
3381.86                 ROMANIA
HgiV0phqhaIa9aydNoIlb                    29-915-458-
2654
instructions nag quickly. furiously bold accounts
cajol


20 rows processed.
Query Processed in 4.94 seconds.
```

==========

qual11

```
-- TPC-H/TPC-R Important Stock Identification Query
(Q11)
-- Functional Query Definition
-- Approved February 1998


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 = 'GERMANY'
group by
ps_partkey having
sum(ps_supplycost * ps_availqty) > (
select
sum(ps_supplycost * ps_availqty) * 0.0001000000
from
partsupp,
supplier,
nation
where
ps_suppkey = s_suppkey
and s_nationkey = n_nationkey
and n_name = 'GERMANY'
)
order by
value desc
```

PS_PARTKEY	VALUE
129760.00	17538456.86
166726.00	16503353.92
191287.00	16474801.97
161758.00	16101755.54
34452.00	15983844.72
139035.00	15907078.34
9403.00	15451755.62
154358.00	15212937.88
38823.00	15064802.86
85606.00	15053957.15
33354.00	14408297.40
154747.00	14407580.68
82865.00	14235489.78
76094.00	14094247.04
222.00	13937777.74
121271.00	13908336.00
55221.00	13716120.47
22819.00	13666434.28
76281.00	13646853.68
85298.00	13581154.93
85158.00	13554904.00
139684.00	13535538.72
31034.00	13498025.25
87305.00	13482847.04
10181.00	13445148.75
62323.00	13411824.30
26489.00	13377256.38
96493.00	13339057.83
56548.00	13329014.97
55576.00	13306843.35
159751.00	13306614.48
92406.00	13287414.50
182636.00	13223726.74
199969.00	13135288.21
62865.00	13001926.94
7284.00	12945298.19
197867.00	12944510.52
11562.00	12931575.51
75165.00	12916918.12
97175.00	12911283.50
140840.00	12896562.23
65241.00	12890600.46
166120.00	12876927.22
9035.00	12863828.70
144616.00	12853549.30
176723.00	12832309.74
170884.00	12792136.58
29790.00	12723300.33
95213.00	12555483.73
183873.00	12550533.05
171235.00	12476538.30
21533.00	12437821.32
17290.00	12432159.50
156397.00	12260623.50
122611.00	12222812.98
139155.00	12220319.25
146316.00	12215800.61
171381.00	12199734.52
198633.00	12078226.95
167417.00	12046637.62
59512.00	12043468.76
31688.00	12034893.64
159586.00	12001505.84
8993.00	11963814.30
120302.00	11857707.55
43536.00	11779340.52
9552.00	11776909.16
86223.00	11772205.08
53776.00	11758669.65
131285.00	11616953.74
91628.00	11611114.83
169644.00	11567959.72
182299.00	11567462.05
33107.00	11453818.76
104184.00	11436657.44
67027.00	11419127.14

```
176869.00               11371451.71
30885.00                11369674.79
54420.00                11345076.88
72240.00                11313951.05
178708.00               11294635.17
81298.00                11273686.13
158324.00               11243442.72
117095.00               11242535.24
176793.00               11237733.38
86091.00                11177793.79
116033.00               11145434.36
129058.00               11119112.20
193714.00               11104706.39
117195.00               11077217.96
49851.00                11043701.78
19791.00                11030662.62
75800.00                11012401.62
161562.00               10996371.69
10119.00                10980015.75
39185.00                10970042.56
47223.00                10950022.13
175594.00               10942923.05
111295.00               10893675.61
155446.00               10852764.57
156391.00               10839810.38
40884.00                10837234.19
141288.00               10837130.21
152388.00               10830977.82
33449.00                10830858.72
149035.00               10826130.02
162620.00               10814275.68
118324.00               10791788.10
38932.00                10777541.75
121294.00               10764225.22
48721.00                10762582.49
63342.00                10740132.60
5614.00                 10724668.80
62266.00                10711143.10
100202.00               10696675.55
197741.00               10688560.72
.............. delete lines ...................
71518.00                7932261.69
72922.00                7930400.64
146699.00               7929167.40
92387.00                7928972.67
186289.00               7928786.19
95952.00                7927972.78
196514.00               7927180.70
4403.00                 7925729.04
2267.00                 7925649.37
45924.00                7925047.68
11493.00                7916722.23
104478.00               7916253.60
166794.00               7913842.00
161995.00               7910874.27
23538.00                7909752.06
41093.00                7909579.92
112073.00               7908617.57
92814.00                7908262.50
88919.00                7907992.50
79753.00                7907933.88
108765.00               7905338.98
146530.00               7905336.60
71475.00                7903367.58
36289.00                7901946.50
61739.00                7900794.00
52338.00                7898638.08
194299.00               7898421.24
105235.00               7897829.94
77207.00                7897752.72
96712.00                7897575.27
10157.00                7897046.25
171154.00               7896814.50
79373.00                7896186.00
113808.00               7893353.88
27901.00                7892952.00
128820.00               7892882.72
25891.00                7890511.20
122819.00               7888881.02
154731.00               7888301.33
101674.00               7879324.60
51968.00                7879102.21
72073.00                7877736.11
5182.00                 7874521.73
```

```
1048 rows processed.
Query Processed in 1.93 seconds.
```

qual12

```
-- TPC-H/TPC-R Shipping Modes and Order Priority Query
(Q12)
-- Functional Query Definition
-- Approved February 1998


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 ('MAIL', 'SHIP')
and l_commitdate < l_receiptdate
and l_shipdate < l_commitdate
and l_receiptdate >= to_date( '1994-01-01',  'YYYY-MM-
DD')
and l_receiptdate < add_months(to_date ('1994-01-01',
'YYYY-MM-DD'),  12)
group by
l_shipmode
order by
l_shipmode

L_SHIPMODE HIGH_LINE_COUNT        LOW_LINE_COUNT
MAIL       6202.00                9324.00
SHIP       6200.00                9262.00


2 rows processed.
Query Processed in 3.23 seconds.
```

qual13

```
-- TPC-H/TPC-R Customer Distribution Query (Q13)
-- Functional Query Definition
-- Approved February 1998


select
c_count,
count(*) as custdist
from
(
select
c_custkey,
count(o_orderkey)  as  c_count
from
customer, orders where
c_custkey = o_custkey(+)
and o_comment(+) not like '%special%requests%'
group by
c_custkey
) c_orders
group by
c_count
order by
custdist desc,
c_count desc

C_COUNT                CUSTDIST
0.00                   50004.00
9.00                   6641.00
10.00                  6566.00
11.00                  6058.00
8.00                   5949.00
```

```
12.00                    5553.00
13.00                    4989.00
19.00                    4748.00
7.00                     4707.00
18.00                    4625.00
15.00                    4552.00
17.00                    4530.00
14.00                    4484.00
20.00                    4461.00
16.00                    4323.00
21.00                    4217.00
22.00                    3730.00
6.00                     3334.00
23.00                    3129.00
24.00                    2622.00
25.00                    2079.00
5.00                     1972.00
26.00                    1593.00
27.00                    1185.00
4.00                     1033.00
28.00                    869.00
29.00                    559.00
3.00                     398.00
30.00                    373.00
31.00                    235.00
2.00                     144.00
32.00                    128.00
33.00                    71.00
34.00                    48.00
35.00                    33.00
1.00                     23.00
36.00                    17.00
37.00                    7.00
40.00                    4.00
38.00                    4.00
39.00                    2.00
41.00                    1.00


42 rows processed.
Query Processed in 5.49 seconds.
```

==========

qual14

==========

```
-- TPC-H/TPC-R Promotion Effect Query (Q14)
-- Functional Query Definition
-- Approved February 1998


select
100.00 * sum(case
when p_type like 'PROMO%'
then l_extendedprice * (1 - l_discount)
else 0
end) / sum(l_extendedprice * (1 - l_discount)) as promo_revenue
from
lineitem,
part
where
l_partkey = p_partkey
and l_shipdate >= date '1995-09-01'
and l_shipdate < date '1995-09-01' + interval '1' month

PROMO_REVENUE
16.38


1 row processed.
Query Processed in 0.56 seconds.
```

==========

qual15

==========

```
-- TPC-H/TPC-R Top Supplier Query (Q15)
-- Functional Query Definition
-- Approved February 1998


with revenue as (
select
l_suppkey supplier_no,
sum(l_extendedprice * (1-l_discount)) total_revenue
from
lineitem
where
l_shipdate >= to_date ( '1996-01-01', 'YYYY-MM-DD')
and l_shipdate < add_months(to_date ( '1996-01-01', 'YYYY-MM-DD'), 3)
group by
l_suppkey
)
select
s_suppkey,
s_name,
s_address,
s_phone,
total_revenue
from
supplier,
revenue
where
s_suppkey = supplier_no
and total_revenue = (
select
max(total_revenue)
from
revenue
)
order by
s_suppkey

S_SUPPKEY           S_NAME
S_ADDRESS                      S_PHONE       TOTAL_REVENUE
8449.00             Supplier#000008449
Wp34zim9qYFbVctdW                  20-469-856-8873 1772627.21


1 row processed.
Query Processed in 1.48 seconds.
```

==========

qual16

```
-- TPC-H/TPC-R Parts/Supplier Relationship Query (Q16)
-- Functional Query Definition
-- Approved February 1998


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#45'
and p_type not like 'MEDIUM POLISHED%'
and p_size in (49, 14, 23, 45, 19, 3, 36, 9)
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,
p_brand,
p_type,
p_size

P_BRAND    P_TYPE                      P_SIZE
SUPPLIER_CNT
```

Brand#41	MEDIUM BRUSHED TIN	3.00	28.00
Brand#54	STANDARD BRUSHED COPPER	14.00	27.00
Brand#11	STANDARD BRUSHED TIN	23.00	24.00
Brand#11	STANDARD BURNISHED BRASS	36.00	24.00
Brand#15	MEDIUM ANODIZED NICKEL	3.00	24.00
Brand#15	SMALL ANODIZED BRASS	45.00	24.00
Brand#15	SMALL BURNISHED NICKEL	19.00	24.00
Brand#21	MEDIUM ANODIZED COPPER	3.00	24.00
Brand#22	SMALL BRUSHED NICKEL	3.00	24.00
Brand#22	SMALL BURNISHED BRASS	19.00	24.00
Brand#25	MEDIUM BURNISHED COPPER	36.00	24.00
Brand#31	PROMO POLISHED COPPER	36.00	24.00
Brand#33	LARGE POLISHED TIN	23.00	24.00
Brand#33	PROMO POLISHED STEEL	14.00	24.00
Brand#35	PROMO BRUSHED NICKEL	14.00	24.00
Brand#41	ECONOMY BRUSHED STEEL	9.00	24.00
Brand#41	ECONOMY POLISHED TIN	19.00	24.00
Brand#41	LARGE PLATED COPPER	36.00	24.00
Brand#42	ECONOMY PLATED BRASS	3.00	24.00
Brand#42	STANDARD POLISHED TIN	49.00	24.00
Brand#43	PROMO BRUSHED TIN	3.00	24.00
Brand#43	SMALL ANODIZED COPPER	36.00	24.00
Brand#44	STANDARD POLISHED NICKEL	3.00	24.00
Brand#52	ECONOMY PLATED TIN	14.00	24.00
Brand#52	STANDARD BURNISHED NICKEL	3.00	24.00
Brand#53	MEDIUM ANODIZED STEEL	14.00	24.00
Brand#14	PROMO ANODIZED NICKEL	45.00	23.00
Brand#32	ECONOMY PLATED BRASS	9.00	23.00
Brand#52	SMALL ANODIZED COPPER	3.00	23.00
Brand#11	ECONOMY BRUSHED COPPER	45.00	20.00
Brand#11	ECONOMY PLATED BRASS	23.00	20.00
Brand#11	LARGE BRUSHED COPPER	49.00	20.00
Brand#11	LARGE POLISHED COPPER	49.00	20.00
Brand#12	STANDARD ANODIZED TIN	49.00	20.00
Brand#12	STANDARD PLATED BRASS	19.00	20.00
Brand#13	ECONOMY BRUSHED BRASS	9.00	20.00
Brand#13	ECONOMY BURNISHED STEEL	14.00	20.00
Brand#13	LARGE BURNISHED NICKEL	19.00	20.00
Brand#13	MEDIUM BURNISHED COPPER	36.00	20.00
Brand#13	SMALL BRUSHED TIN	45.00	20.00
Brand#13	STANDARD ANODIZED COPPER	3.00	20.00
Brand#13	STANDARD PLATED NICKEL	23.00	20.00
Brand#14	ECONOMY ANODIZED COPPER	14.00	20.00
Brand#14	ECONOMY PLATED TIN	36.00	20.00
Brand#14	ECONOMY POLISHED NICKEL	3.00	20.00
Brand#14	MEDIUM ANODIZED NICKEL	3.00	20.00
Brand#14	SMALL POLISHED TIN	14.00	20.00
Brand#15	MEDIUM ANODIZED COPPER	9.00	20.00
Brand#15	MEDIUM PLATED TIN	23.00	20.00
Brand#15	PROMO PLATED BRASS	14.00	20.00
Brand#15	SMALL ANODIZED COPPER	45.00	20.00
Brand#15	SMALL PLATED COPPER	49.00	20.00
Brand#15	STANDARD PLATED TIN	3.00	20.00
Brand#21	LARGE ANODIZED COPPER	36.00	20.00
Brand#21	LARGE BRUSHED TIN	3.00	20.00
Brand#21	MEDIUM ANODIZED COPPER	14.00	20.00
Brand#21	PROMO BRUSHED TIN	36.00	20.00
Brand#21	PROMO POLISHED NICKEL	45.00	20.00
Brand#21	SMALL ANODIZED COPPER	9.00	20.00
Brand#21	SMALL POLISHED NICKEL	23.00	20.00
Brand#22	LARGE ANODIZED COPPER	36.00	20.00
Brand#22	LARGE BRUSHED COPPER	49.00	20.00
Brand#22	PROMO ANODIZED TIN	49.00	20.00
Brand#22	PROMO POLISHED BRASS	45.00	20.00
Brand#22	SMALL BURNISHED STEEL	45.00	20.00
Brand#23	MEDIUM ANODIZED STEEL	45.00	20.00
Brand#23	PROMO POLISHED STEEL	23.00	20.00
Brand#23	STANDARD BRUSHED TIN	14.00	20.00
Brand#23	STANDARD PLATED NICKEL	36.00	20.00
Brand#24	PROMO PLATED COPPER	49.00	20.00
Brand#24	PROMO PLATED STEEL	49.00	20.00
Brand#24	PROMO POLISHED STEEL	9.00	20.00
Brand#24	STANDARD BRUSHED TIN	36.00	20.00
Brand#25	LARGE ANODIZED BRASS	3.00	20.00
Brand#25	PROMO BURNISHED TIN	3.00	20.00
Brand#31	ECONOMY POLISHED NICKEL	3.00	20.00
Brand#31	MEDIUM PLATED TIN	45.00	20.00
Brand#31	SMALL ANODIZED STEEL	14.00	20.00
Brand#32	ECONOMY ANODIZED COPPER	36.00	20.00
Brand#32	ECONOMY BRUSHED NICKEL	49.00	20.00
Brand#32	LARGE ANODIZED TIN	19.00	20.00
Brand#32	MEDIUM BURNISHED COPPER	19.00	20.00
Brand#32	SMALL ANODIZED STEEL	45.00	20.00
Brand#33	ECONOMY POLISHED COPPER	19.00	20.00
Brand#33	PROMO PLATED NICKEL	14.00	20.00
Brand#33	SMALL POLISHED TIN	9.00	20.00

```
Brand#33   STANDARD ANODIZED BRASS   49.00
20.00
Brand#33   STANDARD BURNISHED BRASS  45.00
20.00
Brand#34   ECONOMY BRUSHED NICKEL    49.00
20.00
Brand#34   LARGE BRUSHED BRASS       19.00
20.00
Brand#34   SMALL BRUSHED TIN         3.00
20.00
Brand#34   STANDARD PLATED COPPER    9.00
20.00
Brand#35   LARGE ANODIZED NICKEL     3.00
20.00
Brand#35   MEDIUM ANODIZED BRASS     45.00
20.00
Brand#35   MEDIUM ANODIZED STEEL     23.00
20.00
Brand#35   PROMO ANODIZED COPPER     49.00
20.00
Brand#35   SMALL POLISHED COPPER     14.00
20.00
Brand#41   LARGE ANODIZED STEEL      3.00
20.00
Brand#41   LARGE BRUSHED NICKEL      23.00
20.00
Brand#41   LARGE BURNISHED COPPER    3.00
20.00
Brand#41   MEDIUM PLATED STEEL       19.00
20.00
Brand#41   SMALL BURNISHED COPPER    23.00
20.00
Brand#42   MEDIUM BURNISHED BRASS    14.00
20.00
Brand#42   SMALL BURNISHED COPPER    3.00
20.00
Brand#43   ECONOMY POLISHED COPPER   9.00
20.00
Brand#43   SMALL PLATED STEEL        3.00
20.00
Brand#43   STANDARD BURNISHED TIN    23.00
20.00
Brand#44   LARGE ANODIZED STEEL      23.00
20.00
Brand#44   PROMO ANODIZED TIN        23.00
20.00
Brand#51   ECONOMY BRUSHED BRASS     49.00
20.00
Brand#51   ECONOMY POLISHED NICKEL   9.00
20.00
Brand#51   MEDIUM BRUSHED TIN        9.00
20.00
Brand#51   MEDIUM PLATED BRASS       9.00
20.00
..... delete lines ...................
Brand#55   STANDARD PLATED BRASS     49.00
4.00
Brand#55   STANDARD PLATED COPPER    9.00
4.00
Brand#55   STANDARD PLATED COPPER    45.00
4.00
Brand#55   STANDARD PLATED NICKEL    3.00
4.00
Brand#55   STANDARD PLATED NICKEL    19.00
4.00
Brand#55   STANDARD PLATED NICKEL    45.00
4.00
Brand#55   STANDARD PLATED STEEL     14.00
4.00
Brand#55   STANDARD PLATED STEEL     23.00
4.00
Brand#55   STANDARD PLATED STEEL     49.00
4.00
Brand#55   STANDARD PLATED TIN       9.00
4.00
Brand#55   STANDARD PLATED TIN       14.00
4.00
Brand#55   STANDARD PLATED TIN       36.00
4.00
Brand#55   STANDARD POLISHED BRASS   3.00
4.00
Brand#55   STANDARD POLISHED BRASS   9.00
4.00
Brand#55   STANDARD POLISHED BRASS   23.00
4.00
Brand#55   STANDARD POLISHED COPPER  3.00
4.00
Brand#55   STANDARD POLISHED COPPER  23.00
4.00
Brand#55   STANDARD POLISHED COPPER  45.00
4.00
Brand#55   STANDARD POLISHED NICKEL  3.00
4.00
Brand#55   STANDARD POLISHED NICKEL  23.00
4.00
Brand#55   STANDARD POLISHED NICKEL  36.00
4.00
Brand#55   STANDARD POLISHED NICKEL  45.00
4.00
Brand#55   STANDARD POLISHED NICKEL  49.00
4.00
Brand#55   STANDARD POLISHED STEEL   14.00
4.00
Brand#55   STANDARD POLISHED STEEL   23.00
4.00
Brand#55   STANDARD POLISHED TIN     9.00
4.00
Brand#55   STANDARD POLISHED TIN     19.00
4.00
Brand#55   STANDARD POLISHED TIN     36.00
4.00
Brand#11   SMALL BRUSHED TIN         19.00
3.00
Brand#15   LARGE PLATED NICKEL       45.00
3.00
Brand#15   LARGE POLISHED NICKEL     9.00
3.00
Brand#21   PROMO BURNISHED STEEL     45.00
3.00
Brand#22   STANDARD PLATED STEEL     23.00
3.00
Brand#25   LARGE PLATED STEEL        19.00
3.00
Brand#32   STANDARD ANODIZED COPPER  23.00
3.00
Brand#33   SMALL ANODIZED BRASS      9.00
3.00
Brand#35   MEDIUM ANODIZED TIN       19.00
3.00
Brand#51   SMALL PLATED BRASS        23.00
3.00
Brand#52   MEDIUM BRUSHED BRASS      45.00
3.00
Brand#53   MEDIUM BRUSHED TIN        45.00
3.00
Brand#54   ECONOMY POLISHED BRASS    9.00
3.00
Brand#55   PROMO PLATED BRASS        19.00
3.00
Brand#55   STANDARD PLATED TIN       49.00
3.00


18314 rows processed.
Query Processed in 2.15 seconds.
```

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qual17

==========

```
-- TPC-H/TPC-R Small-Quantity-Order Revenue Query (Q17)
-- Functional Query Definition
-- Approved February 1998


select
sum(l_extendedprice) / 7.0 as avg_yearly
from
lineitem,
part
where
p_partkey = l_partkey
and p_brand = 'Brand#23'
and p_container = 'MED BOX'
and l_quantity < (
select
0.2 * avg(l_quantity)
from
lineitem
where
```

```
l_partkey = p_partkey
)

AVG_YEARLY
348406.05


1 row processed.
Query Processed in 7.47 seconds.
```

qual18

```
-- TPC-H/TPC-R Large Volume Customer Query (Q18)
-- Function Query Definition
-- Approved February 1998


select  *  from  (
select
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) > 300
)
and c_custkey = o_custkey
and o_orderkey = l_orderkey
group by
c_name,
c_custkey,
o_orderkey,
o_orderdate,
o_totalprice
order by
o_totalprice desc,
o_orderdate
)
where rownum <= 100

C_NAME                    C_CUSTKEY
O_ORDERKEY             O_ORDERDATE
O_TOTALPRICE           SUM(L_QUANTITY)
Customer#0000128120       128120.00
4722021.00             1994-04-07
544089.09              323.00
Customer#0000144617       144617.00
3043270.00             1997-02-12
530604.44              317.00
Customer#0000013940       13940.00
2232932.00             1997-04-13
522720.61              304.00
Customer#0000066790       66790.00
2199712.00             1996-09-30
515531.82              327.00
Customer#0000046435       46435.00
4745607.00             1997-07-03
508047.99              309.00
Customer#0000015272       15272.00
3883783.00             1993-07-28
500241.33              302.00
Customer#0000146608       146608.00
3342468.00             1994-06-12
499794.58              303.00
Customer#0000096103       96103.00
5984582.00             1992-03-16
494398.79              312.00
Customer#0000024341       24341.00
1474818.00             1992-11-15
491348.26              302.00
Customer#0000137446       137446.00
5489475.00             1997-05-23
487763.25              311.00
Customer#0000107590       107590.00
4267751.00             1994-11-04
485141.38              301.00
Customer#0000050008       50008.00
2366755.00             1996-12-09
483891.26              302.00
Customer#0000015619       15619.00
3767271.00             1996-08-07
480083.96              318.00
Customer#0000077260       77260.00
1436544.00             1992-09-12
479499.43              307.00
Customer#0000109379       109379.00
5746311.00             1996-10-10
478064.11              302.00
Customer#0000054602       54602.00
5832321.00             1997-02-09
471220.08              307.00
Customer#0000105995       105995.00
2096705.00             1994-07-03
469692.58              307.00
Customer#0000148885       148885.00
2942469.00             1992-05-31
469630.44              313.00
Customer#0000114586       114586.00
551136.00              1993-05-19
469605.59              308.00
Customer#0000105260       105260.00
5296167.00             1996-09-06
469360.57              303.00
Customer#0000147197       147197.00
1263015.00             1997-02-02
467149.67              320.00
Customer#0000064483       64483.00
2745894.00             1996-07-04
466991.35              304.00
Customer#0000136573       136573.00
2761378.00             1996-05-31
461282.73              301.00
Customer#0000016384       16384.00
502886.00              1994-04-12
458378.92              312.00
Customer#0000117919       117919.00
2869152.00             1996-06-20
456815.92              317.00
Customer#0000012251       12251.00
735366.00              1993-11-24
455107.26              309.00
Customer#0000120098       120098.00
1971680.00             1995-06-14
453451.23              308.00
Customer#0000066098       66098.00
5007490.00             1992-08-07
453436.16              304.00
Customer#0000117076       117076.00
4290656.00             1997-02-05
449545.85              301.00
Customer#0000129379       129379.00
4720454.00             1997-06-07
448665.79              303.00
Customer#0000126865       126865.00
4702759.00             1994-11-07
447606.65              320.00
Customer#0000088876       88876.00
983201.00              1993-12-30
446717.46              304.00
Customer#0000036619       36619.00
4806726.00             1995-01-17
446704.09              328.00
Customer#0000141823       141823.00
2806245.00             1996-12-29
446269.12              310.00
Customer#0000053029       53029.00
2662214.00             1993-08-13
446144.49              302.00
Customer#0000018188       18188.00
3037414.00             1995-01-25
443807.22              308.00
Customer#0000066533       66533.00
29158.00               1995-10-21
443576.50              305.00
Customer#0000037729       37729.00
4134341.00             1995-06-29
441082.97              309.00
```

```
Customer#0000003566       3566.00
2329187.00              1998-01-04
439803.36               304.00
Customer#0000045538       45538.00
4527553.00              1994-05-22
436275.31               305.00
Customer#0000081581       81581.00
4739650.00              1995-11-04
435405.90               305.00
Customer#0000119989       119989.00
1544643.00              1997-09-20
434568.25               320.00
Customer#0000003680       3680.00
3861123.00              1998-07-03
433525.97               301.00
Customer#0000113131       113131.00
967334.00               1995-12-15
432957.75               301.00
Customer#0000141098       141098.00
565574.00               1995-09-24
430986.69               301.00
Customer#0000093392       93392.00
5200102.00              1997-01-22
425487.51               304.00
Customer#0000015631       15631.00
1845057.00              1994-05-12
419879.59               302.00
Customer#0000112987       112987.00
4439686.00              1996-09-17
418161.49               305.00
Customer#0000012599       12599.00
4259524.00              1998-02-12
415200.61               304.00
Customer#0000105410       105410.00
4478371.00              1996-03-05
412754.51               302.00
Customer#0000149842       149842.00
5156581.00              1994-05-30
411329.35               302.00
Customer#0000010129       10129.00
5849444.00              1994-03-21
409129.85               309.00
Customer#0000069904       69904.00
1742403.00              1996-10-19
408513.00               305.00
Customer#0000017746       17746.00
6882.00                 1997-04-09
408446.93               303.00
Customer#0000013072       13072.00
1481925.00              1998-03-15
399195.47               301.00
Customer#0000082441       82441.00
857959.00               1994-02-07
382579.74               305.00
Customer#0000088703       88703.00
2995076.00              1994-01-30
363812.12               302.00


57 rows processed.
Query Processed in 13.69 seconds.
```

==========

qual19

==========

```
-- TPC-H/TPC-R Discounted Revenue Query (Q19)
-- Functional Query Definition
-- Approved February 1998


select
sum(l_extendedprice* (1 - l_discount)) as revenue
from
lineitem,
part
where
(
p_partkey = l_partkey
and p_brand = 'Brand#12'
and p_container in ('SM CASE', 'SM BOX', 'SM PACK', 'SM PKG')
and l_quantity >= 1 and l_quantity <= 1 + 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#23'
and p_container in ('MED BAG', 'MED BOX', 'MED PKG', 'MED PACK')
and l_quantity >= 10 and l_quantity <= 10 + 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#34'
and p_container in ('LG CASE', 'LG BOX', 'LG PACK', 'LG PKG')
and l_quantity >= 20 and l_quantity <= 20 + 10
and p_size between 1 and 15
and l_shipmode in ('AIR', 'AIR REG')
and l_shipinstruct = 'DELIVER IN PERSON'
)

REVENUE
3083843.06


1 row processed.
Query Processed in 4.68 seconds.
```

==========

qual20

```
-- TPC-H/TPC-R Potential Part Promotion Query (Q20)
-- Function Query Definition
-- Approved February 1998


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 'forest%'
)
and ps_availqty > (
select
0.5 * sum(l_quantity)
from
lineitem
where
l_partkey = ps_partkey
and l_suppkey = ps_suppkey
and l_shipdate >= to_date ('1994-01-01', 'YYYY-MM-DD')
and l_shipdate < add_months( to_date ('1994-01-01',
'YYYY-MM-DD'), 12)
)
)
and s_nationkey = n_nationkey
and n_name = 'CANADA'
order by
s_name

S_NAME                    S_ADDRESS
Supplier#000000020        iybAE,RmTymrZVYaFZva2SH,j
```

```
Supplier#000000091
YV45D7TkfdQanOOZ7q9QxkyGUapU1oOWU6q3
Supplier#000000197
YC2Acon6kjY3zj3Fbxs2k4Vdf7X0cd2F
Supplier#000000226        83qOdU2EYRdPQAQhEtn GRZEd
Supplier#000000285
Br7e1nnt1yxrw6ImgpJ7YdhFDjuBf
Supplier#000000378        FfbhyCxWvcPrO8ltp9
Supplier#000000402        i9Sw4DoyMhzhKXCH9By,AYSgmD
Supplier#000000530        0qwCMwobKY
OcmLyfRXlagA8ukENJv,
Supplier#000000688        D
fw5ocppmZpYBBIPI718hCihLDZ5KhKX
Supplier#000000710        f19YPvOyb
QoYwjKC,oPycpGfieBAcwKJo
Supplier#000000736
l6i2nMwVuovfKnuVgaSGK2rDy65DlAFLegiL7
Supplier#000000761
zlSLelQUj2XrvTTFnv7WAcYZGvvMTx882d4
Supplier#000000884        bmhEShejaS
Supplier#000000887        urEaTejH5POADP2ARrf
Supplier#000000935        ij98czM
2KzWe7dDTOxB8sq0UfCdvrX
Supplier#000000975        ,AC e,tBpNwKb5xMUzeohxlRn,
hdZJo73gFQF8y
Supplier#000001263        rQWr6nf8ZhB2TAiIDIvo5Io
Supplier#000001399        LmrocnIMSyYOWuANx7
Supplier#000001446        lch9HMNU1R7a0LIybsUodVknk6
Supplier#000001454        TOpimgu2TVXIjhiL93h,
Supplier#000001500        wDmF5xLxtQch9ctVu,
Supplier#000001602        uKNWIeafaM644
Supplier#000001626        UhxNRzUu1dtFmp0
Supplier#000001682        pXTkGxrTQVyH1Rr
Supplier#000001699        Q9C4rfJ26oijVPqqcqVXeRI
Supplier#000001700        7hMlCof1Y5zLFg
Supplier#000001726        TeRY7TtTH24sEword7yAaSkjx8
Supplier#000001730        Rc8e,1Pybn r6zo0VJIEiD0UD
vhk
Supplier#000001746
qWsendlOekQG1aW4uq06uQaCm51se8lirv7 hBRd
Supplier#000001752        Fra7outx41THYJaRThdOGiBk
Supplier#000001856
jXcRgzYF0ah05iR8p6w5SbJJLcUGyYiURPvFwUWM
Supplier#000001931        FpJbMU2h6ZR2eBv8I9NIxF
Supplier#000001939        Nrk,JA4bfReUs
Supplier#000001990
DSDJkCgBJzuPg1yuM,CUdLnsRliOxkkHezTCA
Supplier#000002020        jB6r1d7MxP6co
Supplier#000002022         dwebGX7Id2pc25YvY33
Supplier#000002036        20ytTtVObjKUUI2WCB0A
Supplier#000002204
uYmlr46C06udCqanj0KiRsoTQakZsEyssL
Supplier#000002243        nSOEV3JeOU79
Supplier#000002245
hz2qWXWVjOyKhqPYMoEwz6zFkrTaDM
Supplier#000002282
ES21K9dxoW1I1TzWCj7ekdlNwSWnv1Z  6mQ,BKn
Supplier#000002303        nCoWfpB6YOymbgOht7ltfklpkHl
Supplier#000002373        RzHSxOTQmElCjxIBiVA52Z
JB58rJhPRylR
Supplier#000002419        qydBQd14I5l5mVXa4fYY
Supplier#000002481
nLKHUOn2Ml9TOA06Znq9GEMcIlMO2
Supplier#000002571        JZUugz04c iJFLrlGsz9O N,W
1rVHNIReyq
Supplier#000002585
CsPoKpw2QuTY4AV1NkWuttneIa4SN
Supplier#000002630        ZIQAvjNUY9KH5ive zm7k
VlPiDl7CCo21
Supplier#000002719
4nnzQI2CbqREQUuIsXTBVUkaP4mNS3
Supplier#000002721        HVdFAN2JHMQSpKm
Supplier#000002730        lIFxR4fzm31C6,muzJwl84z
Supplier#000002775        yDclaDaBD4ihH
Supplier#000002853        rTNAOItXka
Supplier#000002875        6JgMi
9Qt6VmwL3Ltt1SRlKww0keLQ,RAZa
Supplier#000002934        m,trBENywSArwg3DhB
Supplier#000002941        Naddba 8YTEKekZyP0
Supplier#000002960
KCPCEsRGGo6vx8TygHh60nAYf9rStQT2T
Supplier#000002980
B9k9yVsyaXvWktOSHezqHiAEp9id0SKzkw
Supplier#000003062        LSQNgqY1xnOzz9zBCapy7HwOZQ
Supplier#000003087        ANwe8QsZ4rgj1HSqVz991eWQ
Supplier#000003089        s5b VCIZqMSZVa r
g7LTdcg29GbTE7rI1x
Supplier#000003095        HxON3jJhUi3zjt,r mTD
Supplier#000003201
E87yws6I,t0qNs4QW7UzExKiJnJDZWue
Supplier#000003213        pxrRP4irQ1VoyfQ,dTf3
Supplier#000003241        j06SU,LS9O3mwjAMOViANeIhb
Supplier#000003275        9xO4nyJ2QJcX6vGf
Supplier#000003288
EDdfNt7E5Uc,xLTupoIgYL4yY7ujh,
Supplier#000003313
El2I7we,049SPrvomUm4hZwJoOhZkvLxLJXgVH
Supplier#000003314
jnisU8MzqO4iUB3zsPcrysMw3DDUojS4q7LD
Supplier#000003380
jPv0V,pszouuFT3YsAqlP,kxT3u,gTFiEbRt,x
Supplier#000003403        e3X2o ,KCG9tsHji8A
XXCxiF2hZWBw
Supplier#000003421        Sh3dt9W5oeofFWovnFhrg,
Supplier#000003441        zvFJIzS,oUuShHjpcX
Supplier#000003590        sy79CMLxqb,Cbo
Supplier#000003607        lNqFHQYjwSAkf
Supplier#000003625
qY588W0Yk5iaUy1RXTgNrEKrMAjBYHcKs
Supplier#000003656        eEYmmO2gmD JdfG32XtDgJV,db56
Supplier#000003782
iVsPZg7bk06TqNMwi0LKbLUrC1zmrg
Supplier#000003918        meRvRCsJoAbfqd0Re4
Supplier#000003941        Pmb05mQfBMS618O7WKqZJ 9vyv
Supplier#000003994        W00LZp3NjK0
Supplier#000004005        V723F1wCy2eA4OgIu8TjBtOVUHp
Supplier#000004033        ncsAhv9Je,kFXTNjfb2
Supplier#000004140        0hL7DJyYjcHL
Supplier#000004165
wTJ2dZNQA8P2oi99N6DT47ndHy,XKD2
Supplier#000004207        tF64pwiOM4IkWjN3mS,e06WuAjLx
Supplier#000004236
dl,HPtJmGipxYsSqn9wmqkuWjst,mCeJ8O6T
Supplier#000004246        Xha aXQF7u4qU3LsHD
Supplier#000004278        bBddbpBxIVp Di9
Supplier#000004343        GK3sbopqrQEkWLMvVBFCG
Supplier#000004346        S3076LEOwo
Supplier#000004388        VfZ l1J,mwp4aS
Supplier#000004406
Ah0ZaLu6VwufPWUz,7kbXgYZhauEaHqGIg
Supplier#000004430
yvSsKNSTL5HLXBET4luOsPNLxKzAMk
Supplier#000004522
xXtCKwsZDArxIBGDfzX2PgobGZsBg
Supplier#000004527        p pVXCnxgcklWF6A1o3OHY3qW6
Supplier#000004542        NJSbLJDroYG2y1r3rDiKg
Supplier#000004574        1HvGwnVueZ5CIndc
Supplier#000004655        67NqBc4 t3PG3F8aO
IsqWNq4kGaPowYL
Supplier#000004701        6jX4u47URzIMHf
Supplier#000004711        bEzjp1QdQu ls2ERMxv0km
vn6bu2zXlL1
Supplier#000004987         UFx1upJ8MvOvgFjA8
Supplier#000005000        DeX804 w0H8FrCUvahgy
ilbuzBX3NK
Supplier#000005100        OfvYPs3Io,wEvvLHNaLuCX
Supplier#000005192        JDp4rhXiDw0kf6RH
Supplier#000005195        Woi3b2ZaicPh ZSfu1EfXhE
..... delete lines ...................
Supplier#000007885
u3sicchh5ZpyTUpN1cJKNcAoabIWgY
Supplier#000007918        r,v9mBQ6LoEYyj1
Supplier#000007926        ErzCF80K9Uy
Supplier#000007957        ELwnio14ssoU1 dRyZIL OK3Vtzb
Supplier#000007965        F7Un5lJ7p5hhj
Supplier#000007968
DsF9UlZ2Fo6HXN9aErvyg1ikHoD582HSGZpP
Supplier#000007998        LnASFBfYRFOo9d6d,asBvVq9Lo2P
Supplier#000008168        aOa82a8ZbKCnfDLX
Supplier#000008231        IK7eGw Yj90sTdpsP,vcqWxLB
Supplier#000008243        2AyePMkDqmzVzjGTizXthFLo8h
EiudCMxOmIIG
Supplier#000008275        BlbNDfWg,gpXKQlLN
Supplier#000008323        75I18sZmASwm
POeheRMdj9tmpyeQ,BfCXN5BIAb
Supplier#000008366
h778cEj14BuW9OEKlvPTWq4iwASR6EBBXN7zeS8
Supplier#000008423
RQhKnkAhR0DAr3Ix4Q1weMMn00hNe Kq
Supplier#000008480        4sSDA4ACReklNjEm5T6b
Supplier#000008532
Uc29q4,5xVdDOF87UZrxhr4xWS0ihEUXuh
```

```
Supplier#000008595        MH0iB73GQ3z UW3O DbCbqmc
Supplier#000008610
SgVgP90vP452sUNTgzL9zKwXHXAzV6tV
Supplier#000008705        aE,trRNdPx,4yinTD9O3DebDIp
Supplier#000008742        HmPlQEzKCPEcTUL14,kKq
Supplier#000008841        I 85Lu1sekbg2xrSIzm0
Supplier#000008895
2cH4okfaLSZTTg8sKRbbJQxkmeFu2Esj
Supplier#000008967        2kwEHyMG
7FwozNImAUE6mH0hYtqYculJM
Supplier#000008972        w2vF6 D5YZO3visPXsqVfLADTK
Supplier#000009032        qK,trB6Sdy4Dz1BRUFNy
Supplier#000009147        rOAuryHxpZ9eOvx
Supplier#000009252        F7cZaPUHwh1 ZKyj3xmAVWC1XdP
ue1p5m,i
Supplier#000009278        RqYTzgxj93CLX 0mcYfCENOefD
Supplier#000009327        uoqMdf7e7Gj9dbQ53
Supplier#000009430        igRqmneFt
Supplier#000009567        r4Wfx4c3xsEAjcGj71HHZByornl
D9vrztXlv4
Supplier#000009601        51m637bO,Rw5DnHWFUvLacRx9
Supplier#000009709        rRnCbHYgDgl9PZYnyWKVYSUW0vKg
Supplier#000009753        wLhVEcRmd7PkJF4FBnGK7Z
Supplier#000009796        z,y4Idmr15DOvPUqYG
Supplier#000009799         4wNjXGa4OKWl
Supplier#000009811        E3iuyq7UnZxU7oPZIe2Gu6
Supplier#000009812
APFRMy3lCbgFga53n5t9DxzFPQPgnjrGt32
Supplier#000009862        rJzweWeN58
Supplier#000009868        ROjGgx5gvtkmnUUoeyy7v
Supplier#000009869
ucLqxzrpBTRMewGSM29t0rNTM30g1Tu3Xgg3mKag
Supplier#000009899        7XdpAHrzr1t,UQFZE
Supplier#000009974
7wJ,J5DKcxSU4Kp1cQLpbcAvB5AsvKT


204 rows processed.
Query Processed in 2.17 seconds.
```

==========

qual21

==========

```
-- TPC-H/TPC-R Suppliers Who Kept Orders Waiting Query
(Q21)
-- Functional Query Definition
-- Approved February 1998


select * from (
select
s_name,
count(*)  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 = 'SAUDI ARABIA'
group by
s_name
order by
numwait desc,
s_name)
where rownum <= 100

S_NAME                    NUMWAIT
Supplier#000002829        20.00
Supplier#000005808        18.00
Supplier#000000262        17.00
Supplier#000000496        17.00
Supplier#000002160        17.00
Supplier#000002301        17.00
Supplier#000002540        17.00
Supplier#000003063        17.00
Supplier#000005178        17.00
Supplier#000008331        17.00
Supplier#000002005        16.00
Supplier#000002095        16.00
Supplier#000005799        16.00
Supplier#000005842        16.00
Supplier#000006450        16.00
Supplier#000006939        16.00
Supplier#000009200        16.00
Supplier#000009727        16.00
Supplier#000000486        15.00
Supplier#000000565        15.00
Supplier#000001046        15.00
Supplier#000001047        15.00
Supplier#000001161        15.00
Supplier#000001336        15.00
Supplier#000001435        15.00
Supplier#000003075        15.00
Supplier#000003335        15.00
Supplier#000005649        15.00
Supplier#000006027        15.00
Supplier#000006795        15.00
Supplier#000006800        15.00
Supplier#000006824        15.00
Supplier#000007131        15.00
Supplier#000007382        15.00
Supplier#000008913        15.00
Supplier#000009787        15.00
Supplier#000000633        14.00
Supplier#000001960        14.00
Supplier#000002323        14.00
Supplier#000002490        14.00
Supplier#000002993        14.00
Supplier#000003101        14.00
Supplier#000004489        14.00
Supplier#000005435        14.00
Supplier#000005583        14.00
Supplier#000005774        14.00
Supplier#000007579        14.00
Supplier#000008180        14.00
Supplier#000008695        14.00
Supplier#000009224        14.00
Supplier#000000357        13.00
Supplier#000000436        13.00
Supplier#000000610        13.00
Supplier#000000788        13.00
Supplier#000000889        13.00
Supplier#000001062        13.00
Supplier#000001498        13.00
Supplier#000002056        13.00
Supplier#000002312        13.00
Supplier#000002344        13.00
Supplier#000002596        13.00
Supplier#000002615        13.00
Supplier#000002978        13.00
Supplier#000003048        13.00
Supplier#000003234        13.00
Supplier#000003727        13.00
Supplier#000003806        13.00
Supplier#000004472        13.00
Supplier#000005236        13.00
Supplier#000005906        13.00
Supplier#000006241        13.00
Supplier#000006326        13.00
Supplier#000006384        13.00
Supplier#000006394        13.00
Supplier#000006624        13.00
Supplier#000006629        13.00
Supplier#000006682        13.00
Supplier#000006737        13.00
Supplier#000006825        13.00
Supplier#000007021        13.00
```

```
Supplier#000007417        13.00
Supplier#000007497        13.00
Supplier#000007602        13.00
Supplier#000008134        13.00
Supplier#000008234        13.00
Supplier#000009435        13.00
Supplier#000009436        13.00
Supplier#000009564        13.00
Supplier#000009896        13.00
Supplier#000000379        12.00
Supplier#000000673        12.00
Supplier#000000762        12.00
Supplier#000000811        12.00
Supplier#000000821        12.00
Supplier#000001337        12.00
Supplier#000001916        12.00
Supplier#000001925        12.00
Supplier#000002039        12.00
Supplier#000002357        12.00
Supplier#000002483        12.00


100 rows processed.
Query Processed in 14.83 seconds.
=====================================================
```

qual22

```
=====================================================
-- @(#)22.sql   2.1.4.2
-- TPC-D Global Sales Opportunity Query (Q22)
-- Functional Query Definition
-- Approved February 1998


select
cntrycode,
count(*) as numcust,
sum(c_acctbal) as totacctbal
from
(
select
substr(c_phone, 1, 2) as cntrycode,
c_acctbal
from
customer
where
substr(c_phone,1, 2) in
('13', '31', '23', '29', '30', '18', '17')
and c_acctbal > (
select
avg(c_acctbal)
from
customer
where
c_acctbal > 0.00
and substr(c_phone, 1, 2) in
('13', '31', '23', '29', '30', '18', '17')
)
and not exists (
select
*
from
orders
where
o_custkey = c_custkey
)
) custsale
group by
cntrycode
order by
cntrycode

CNTRYCODE NUMCUST               TOTACCTBAL
13        888.00                6737713.99
17        861.00                6460573.72
18        964.00                7236687.40
23        892.00                6701457.95
29        948.00                7158866.63
30        909.00                6808436.13
31        922.00                6806670.18


7 rows processed.
Query Processed in 2.07 seconds.
```

Appendix D. Seed and Query Substitution Parameters

This Appendix contains Seed values and substitution parameters for each stream

```
================================================
```

seed values

```
================================================
session 00 107012729
session 01 107012730
session 02 107012731
session 03 107012732
session 04 107012733
session 05 107012734
session 06 107012735
session 07 107012736
session 08 107012737

================================================
```

stream 00 substitution parameters

```
================================================
14      1995-05-01
2       29      NICKEL  MIDDLE EAST
9       mint
20      lavender        1993-01-01      VIETNAM
6       1996-01-01      0.09    24
17      Brand#51        LG BOX
18      312
8       EGYPT   MIDDLE EAST     LARGE PLATED TIN
21      CANADA
13      express requests
3       BUILDING        1995-03-31
22      31      17      16      12      15      22
19
16      Brand#15        STANDARD POLISHED       13
37      8       11      1       3       30      15
4       1997-11-01
11      IRAQ    0.0000000333
15      1994-03-01
1       101
10      1994-11-01
19      Brand#23        Brand#15        Brand#31        5
        20      27
5       AFRICA  1996-01-01
7       UNITED STATES   EGYPT
12      RAIL    SHIP    1995-01-01
================================================
```

stream 01 substitution parameters

```
================================================
21      SAUDI ARABIA
3       HOUSEHOLD       1995-03-17
18      314
5       AMERICA 1997-01-01
11      UNITED STATES   0.0000000333
7       MOZAMBIQUE      VIETNAM
6       1997-01-01      0.07    25
20      slate   1997-01-01      IRAQ
17      Brand#53        LG PACK
12      AIR     SHIP    1995-01-01
16      Brand#55        LARGE ANODIZED 7        41
30      4       40      21      16      5
15      1996-10-01
13      express accounts
10      1993-08-01
2       17      COPPER  ASIA
8       VIETNAM ASIA    LARGE ANODIZED TIN
14      1995-08-01
19      Brand#25        Brand#53        Brand#25        1
        10      23
9       linen
22      11      19      23      26      10      18
24
1       109
4       1995-08-01

================================================
```

stream 02 substitution parameters

```
6       1997-01-01      0.04    25
17      Brand#55        LG DRUM
14      1995-12-01
16      Brand#35        PROMO BURNISHED         35
44      4       23      22      46      3       1
19      Brand#22        Brand#31        Brand#25        6
        11      20
10      1994-05-01
9       lace
2       5       STEEL   AFRICA
15      1994-07-01
8       JORDAN  MIDDLE EAST     MEDIUM POLISHED NICKEL
5       ASIA    1997-01-01
22      15      28      14      26      22      17
16
12      REG AIR SHIP    1995-01-01
7       INDIA   JORDAN
13      express accounts
18      315
1       117
4       1993-05-01
20      drab    1995-01-01      ARGENTINA
3       AUTOMOBILE      1995-03-02
11      JAPAN   0.0000000333
21      JORDAN
================================================
```

stream 03 substitution parameters

```
================================================
8       ETHIOPIA        AFRICA  MEDIUM BURNISHED NICKEL
5       EUROPE  1997-01-01
4       1995-12-01
6       1997-01-01      0.02    24
17      Brand#52        MED BOX
7       ALGERIA ETHIOPIA
1       64
18      313
22      25      20      27      14      17      26
11
14      1996-03-01
9       grey
10      1993-02-01
15      1997-02-01
11      ALGERIA 0.0000000333
20      pink    1994-01-01      MOROCCO
2       43      BRASS   ASIA
21      ETHIOPIA
19      Brand#34        Brand#24        Brand#24        1
        12      27
13      express accounts
16      Brand#15        SMALL POLISHED 23       10
22      25      13      2       11      5
12      SHIP    MAIL    1997-01-01
3       HOUSEHOLD       1995-03-19
================================================
```

stream 04 substitution parameters

```
================================================
5       MIDDLE EAST     1997-01-01
21      RUSSIA
14      1996-06-01
19      Brand#31        Brand#52        Brand#13        6
        13      23
15      1994-10-01
17      Brand#54        MED PACK
12      FOB     REG AIR 1996-01-01
6       1997-01-01      0.07    25
4       1993-09-01
9       forest
8       RUSSIA  EUROPE  SMALL BRUSHED NICKEL
16      Brand#55        LARGE BRUSHED  21       6       4
        12      3       5       20      18
11      JORDAN  0.0000000333
2       30      NICKEL  AFRICA
10      1993-12-01
18      314
1       72
13      special accounts
7       PERU    RUSSIA
22      15      14      16      26      22      11
23
3       AUTOMOBILE      1995-03-04
20      brown   1997-01-01      ETHIOPIA
================================================
```

stream 05 substitution parameters

```
================================================
21      KENYA
15      1997-05-01
4       1996-04-01
6       1993-01-01      0.04    25
7       INDONESIA       KENYA
16      Brand#35        STANDARD BURNISHED      30
27      2       22      6       7       3       9
19      Brand#33        Brand#35        Brand#12        2
        14      30
18      312
14      1996-09-01
22      30      27      13      26      11      34
10
11      ARGENTINA       0.0000000333
13      special accounts
3       FURNITURE       1995-03-21
1       80
2       18      COPPER  EUROPE
5       AFRICA  1993-01-01
8       KENYA   AFRICA  SMALL PLATED NICKEL
20      medium  1995-01-01      SAUDI ARABIA
12      TRUCK   REG AIR 1996-01-01
17      Brand#51        MED DRUM
10      1994-09-01
9       deep
================================================
```

stream 06 substitution parameters

```
================================================
10      1993-06-01
3       AUTOMOBILE      1995-03-07
15      1995-02-01
13      special deposits
6       1993-01-01      0.02    24
8       FRANCE  EUROPE  SMALL ANODIZED NICKEL
9       coral
7       ARGENTINA       FRANCE
4       1994-01-01
11      KENYA   0.0000000333
22      20      11      14      16      22      13
23
18      313
12      RAIL    REG AIR 1996-01-01
1       88
5       AMERICA 1993-01-01
16      Brand#15        MEDIUM PLATED   33      28      5
        21      10      31      27      25
2       6       STEEL   AFRICA
14      1997-01-01
19      Brand#45        Brand#23        Brand#12        7
        15      26
20      turquoise       1994-01-01      IRAN
17      Brand#53        JUMBO BAG
21      FRANCE
================================================
```

stream 07 substitution parameters

```
================================================
18      315
8       UNITED KINGDOM EUROPE  STANDARD POLISHED BRASS
20      green   1997-01-01      UNITED STATES
21      UNITED KINGDOM
2       44      BRASS   EUROPE
4       1996-08-01
22      34      15      31      14      24      20
18
17      Brand#55        JUMBO PACK
1       96
11      BRAZIL  0.0000000333
9       brown
19      Brand#42        Brand#55        Brand#51        2
        16      23
3       FURNITURE       1995-03-23
13      special deposits
5       EUROPE  1993-01-01
7       CHINA   UNITED KINGDOM
10      1994-03-01
16      Brand#55        ECONOMY BRUSHED         36
19      22      6       21      16      17      29
6       1993-01-01      0.07    25
14      1997-04-01
15      1997-09-01
12      AIR     REG AIR 1997-01-01
================================================
```

stream 08 substitution parameters

```
19      Brand#44        Brand#43        Brand#55        7
        17      30
1       104
15      1995-05-01
17      Brand#51        JUMBO DRUM
5       MIDDLE EAST     1993-01-01
8       MOROCCO AFRICA  STANDARD BURNISHED BRASS
9       beige
12      REG AIR AIR     1997-01-01
14      1997-07-01
7       IRAN    MOROCCO
4       1994-05-01
3       MACHINERY       1995-03-09
20      royal   1996-01-01      KENYA
16      Brand#35        SMALL ANODIZED  40      1
33      11      21      10      44      4
6       1993-01-01      0.05    25
22      24      32      10      22      20      33
15
10      1994-12-01
13      special deposits
2       31      NICKEL  AMERICA
21      MOZAMBIQUE
18      312
11      MOROCCO 0.0000000333
```

Appendix E. Implementation-Specific Layer/Driver Code

==========

runTPCHall

```
#!/bin/ksh
. $KIT_DIR/env

ECHO=echo

sqlplus=$ORACLE_HOME/bin/sqlplus
svrmgrl=$ORACLE_HOME/bin/svrmgrl
GTIME=${KIT_DIR}/utils/gtime

RUN_ID_FILE=${KIT_DIR}/audit/r_id

if [ ! -f $RUN_ID_FILE ]
then
  echo "0" > $RUN_ID_FILE
fi

RUN_ID=`cat $RUN_ID_FILE`
RUN_ID=`expr $RUN_ID + 1`
echo $RUN_ID > $RUN_ID_FILE

OUT_DIR=${KIT_DIR}/audit/tests/${RUN_ID}
if [ ! -d $OUT_DIR ]
then
  mkdir $OUT_DIR
fi

SCRIPT_LOG_FILE=${OUT_DIR}/main.out
RDB_TABLES=${OUT_DIR}/rdbtablest
FIRST_TEN=${OUT_DIR}/firstten
LD1DBCRE=${OUT_DIR}/Ld1dbcre
LD2SCTSO=${OUT_DIR}/Ld2sctso
LD3DAPOP=${OUT_DIR}/Ld4dapop
LD4IXCRE=${OUT_DIR}/Ld5ixcre
LD5ANLYZ=${OUT_DIR}/Ld5anlyz

echo Start TPC-H Benchmark SEQUENCE NUMBER: $RUN_ID >
$SCRIPT_LOG_FILE
echo >> $SCRIPT_LOG_FILE
echo "Starting a new Oracle log file:
$ORACLE_HOME/rdbms/log/alert_${ORACLE_SID}.log" >>
$SCRIPT_LOG_FILE
echo >> $SCRIPT_LOG_FILE

mv $ORACLE_HOME/rdbms/log/alert_${ORACLE_SID}.log
$ORACLE_HOME/rdbms/log/alert_${ORACLE_SID}.
log.preAudit.$RUN_ID
touch $ORACLE_HOME/rdbms/log/alert_${ORACLE_SID}.log

echo "Start: load database `date`" >> $SCRIPT_LOG_FILE
3tb_asm_dbcre.sh > $LD1DBCRE
3tb_asm_sctso.sh > $LD2SCTSO
STIME=`$GTIME`
echo "Start: timed load portion `date`" >>
$SCRIPT_LOG_FILE
3tb_asm_dapop.sh > $LD3DAPOP
3tb_asm_ixcre.sh > $LD4IXCRE
3tb_asm_anlyz.sh > $LD5ANLYZ
echo "End: timed load portion `date`" >>
$SCRIPT_LOG_FILE

$KIT_DIR/audit/gen_seed.sh $KIT_DIR/audit/seed
echo Generated seed: `cat $KIT_DIR/audit/seed` >>
$SCRIPT_LOG_FILE

echo "Start: dbtables.sql and count.sql" >>
$SCRIPT_LOG_FILE
$sqlplus ${DATABASE_USER} @$KIT_DIR/audit/dbtables >
${RDB_TABLES} 2>&1
$sqlplus ${DATABASE_USER} @$KIT_DIR/audit/firstten >
${FIRST_TEN} 2>&1
echo "End: dbtables.sql and count.sql `date`" >>
$SCRIPT_LOG_FILE


runTPCHpt ${SCALE_FACTOR} 1 ${RUN_ID}

runTPCHpt ${SCALE_FACTOR} 2 ${RUN_ID}

sleep 600
tshut >> $SCRIPT_LOG_FILE

cp $ORACLE_HOME/rdbms/log/alert_${ORACLE_SID}.log
$OUT_DIR

echo "End TPC-H Benchmark SEQUENCE NUMBER: $RUN_ID
`date`" >> $SCRIPT_LOG_FILE
```

==========

runTPCHpt

```
#!/bin/ksh
. $KIT_DIR/env
SCRIPT_DIR=${KIT_DIR}/scripts
SQL_DIR=${KIT_DIR}/sql
UPD_DIR=${KIT_DIR}/update
SRC_DIR=${KIT_DIR}/utils
QRY_DIR=${KIT_DIR}/queries # this is the location of
the query template file
QGEN_DIR=${KIT_DIR}/dbgen
QGEN=${QGEN_DIR}/qgen
QEXEC=${SRC_DIR}
DSS_QUERY=${KIT_DIR}/queries
export DSS_QUERY

UPD_SQL=${UPD_DIR}/sql
UPD_SPT=${UPD_DIR}/scripts
UPD_SRC=${UPD_DIR}/source
UPD_DAT=${UPD_DIR}/data

TPCD_BIN=${KIT_DIR}/audit/bin

GTIME=${SRC_DIR}/gtime
SEED_FILE=${KIT_DIR}/audit/seed

DF=/dev/null
HID=1
INTERVAL=60
COUNT=1200

# The defaults

QPROG=${QEXEC}/qexec

usage () {

echo " "
echo "Usage: $0 [-p <program for query stream>] [-u1
<program for UF1>]"
echo "          [-u2 <program for UF2>] [-o] [-s] [-h]
[-u <user/password>]"
echo "          <scale factor> <run_number>"
echo ""
echo "scale factor     : The scale factor of the run."
echo "update ||ism     : The parallelism to use for
the UFs."
echo ""
echo "-p <program>     : Program for Query Stream."
echo "                   Default is $QPROG."
echo "-u1 <program>    : Program for UF1."
echo "                   Default is $U1PROG."
echo "-u2 <program>    : Program for UF2."
echo "                   Default is $U2PROG."
echo "-o               : Collect Oracle statistics."
echo "-s               : Collect System statistics."
echo "-u <user/passwd> : User/Password. Default is
tpch/tpch."
echo "-h               : Displays this message."
}
set -- `getopt "p:u1:u2:osu:h" "$@"` || usage

while :
do
   case "$1" in
   -u1) shift; U1PROG=$1;;
   -u2) shift; U2PROG=$1;;
   -p) shift; QPROG=$1;;
   -o) OSTAT=1;;
   -s) SSTAT=1;;
   -h) usage; exit 0;;
   --) shift; break;;
   esac
```

```
   shift;
done


if [ "$#" -ne "3" ]
then
  usage
  exit 1
fi

SF=$1
PARA=$2
RUN_ID=$3

OUT_DIR=${KIT_DIR}/audit/tests/${RUN_ID}
if [ ! -d $OUT_DIR ]
then
       mkdir $OUT_DIR
fi

TPCD_LOG=${OUT_DIR}
TPCD_RPT=${OUT_DIR}
OUT=${OUT_DIR}

let UF_SET="($PARA-1)*($NUM_STREAMS+1)+1"
START_SET=1
let STOP_SET=$NUM_STREAMS
let START_SET_UPDATE="($PARA-1)*($NUM_STREAMS+1)+2"
let STOP_SET_UPDATE="$START_SET_UPDATE+$NUM_STREAMS-1"

TPCD_LOG_FILE=${TPCD_LOG}/m${PARA}s0
TPCD_RPT_FILE=${TPCD_RPT}/m${PARA}s0inter
QRY_FILE=${TPCD_RPT}/qtemp.${PARA}s0
QUERY_PARAMETER=${TPCD_LOG}/qp${PARA}.0
SCRIPT_LOG_FILE=${TPCD_LOG}/m${PARA}timing
UF1_LOG=${TPCD_LOG}/m${PARA}s0rf1
UF2_LOG=${TPCD_LOG}/m${PARA}s0rf2
STREAM_COUNT_LOG=${TPCD_LOG}/m${PARA}tstrcnt

echo "TPC-H Test - RUN:${PARA} SEQUENCE:${RUN_ID}
`date`" > $SCRIPT_LOG_FILE
echo "TPC-H Test - RUN:${PARA} SEQUENCE:${RUN_ID}
`date`" > $TPCD_RPT_FILE
echo "Generates query template file with seed: `cat
$SEED_FILE` for stream 0" >> $SCRIPT_LOG_FILE
echo >> $SCRIPT_LOG_FILE

${QGEN} -c -r `cat $SEED_FILE` -p 0 -s ${SF} -l
$QUERY_PARAMETER > ${QRY_FILE}

START=`$GTIME`
echo "Start Power Test - RUN:${PARA} SEQUENCE:$
{RUN_ID} Execution Starts $START, `date`" >>
$SCRIPT_LOG_FILE
echo "" >> $SCRIPT_LOG_FILE

# Execute UF1

SDATE=`date`
UF1_START=`$GTIME`
echo "Start UF1  $UF1_START, `date`" >>
$SCRIPT_LOG_FILE

${ECHO} ${UPD_SPT}/runuf1.sh ${UF_SET} >> $UF1_LOG
2>&1
# Execute Query Stream

UF1_END=`${GTIME}`
E1DATE=`date`

UF1_TIME=`echo $UF1_END - $UF1_START | bc`
echo UF1: Execution Time: $UF1_TIME >>
${TPCD_RPT_FILE}
echo Start Time: $UF1_START, $SDATE >>
${TPCD_RPT_FILE}
echo End Time: $UF1_END, $E1DATE >> ${TPCD_RPT_FILE}
echo "" >> ${TPCD_RPT_FILE}

echo "End UF1 $UF1_END, ${E1DATE}" >> $SCRIPT_LOG_FILE
echo >> $SCRIPT_LOG_FILE

echo "Start Query Part `$GTIME`, `date` " >>
$SCRIPT_LOG_FILE

${QPROG} ${DATABASE_USER} q${QRY_FILE} l$
{TPCD_LOG_FILE} r${TPCD_RPT_FILE}  > $DF  2>&1

# Execute UF2

UF2_START=`${GTIME}`
E2DATE=`date`

echo "End Query Part `$GTIME`, ${E2DATE}" >>
$SCRIPT_LOG_FILE
echo "" >> $SCRIPT_LOG_FILE

echo "Start UF2  $UF2_START, `date`" >>
$SCRIPT_LOG_FILE
${ECHO} ${UPD_SPT}/runuf2.sh ${UF_SET} >> $UF2_LOG
2>&1
UF2_END=`${GTIME}`
END=`${GTIME}`
EDATE=`date`

echo "End UF2 $UF2_END, $EDATE" >>  $SCRIPT_LOG_FILE
echo >>  $SCRIPT_LOG_FILE

echo "End TPC-H Power Test - RUN:${PARA} SEQUENCE:$
{RUN_ID}, $END, $EDATE" >> $SCRIPT_LOG_FILE
MEA_INT=`echo $END - $START | bc`
echo "Elapsed Time for TPC-H Power Test - RUN:${PARA}
SEQUENCE:${RUN_ID} is $MEA_INT" >> $SCRIPT_LOG_FILE
echo >> $SCRIPT_LOG_FILE

UF2_TIME=`echo $UF2_END - $UF2_START | bc`
echo UF2: Execution Time: $UF2_TIME >>
${TPCD_RPT_FILE}echo Start Time: $UF2_START, $E2DATE
>> ${TPCD_RPT_FILE}
echo End Time: $UF2_END, $EDATE >> ${TPCD_RPT_FILE}

${KIT_DIR}/audit/abridge.pl ${TPCD_LOG_FILE}

i=$START_SET
PSEED=`cat $SEED_FILE`

while [ $i -le $STOP_SET ]; do
  TPCD_LOG_FILE=${TPCD_LOG}/mt${RUN_ID}_${i}.log
  TPCD_RPT_FILE=${TPCD_RPT}/mt${RUN_ID}_${i}.rpt
        QUERY_PARAMETER=${TPCD_LOG}/qp${PARA}.${i}
  QRY_FILE=${TPCD_RPT}/qtemp.${PARA}s${i}

  PSEED=`expr $PSEED + 1`
  ${QGEN} -c -r ${PSEED} -p ${i} -s ${SF} -l
$QUERY_PARAMETER > ${QRY_FILE}

  i=`expr $i + 1`
done

TH_START_D=`date`
TH_START_T=`${GTIME}`
echo >> $SCRIPT_LOG_FILE

rm -f /tmp/th_pipe1
mknod /tmp/th_pipe1 p
rm -f /tmp/th_pipe2
mknod /tmp/th_pipe2 p
i=$START_SET

echo "Start Throughput Test - RUN:${PARA} SEQUENCE:$
{RUN_ID} $TH_START_T, $TH_START_D"  >>
$SCRIPT_LOG_FILE

# starts a script to count the streams during the
throughtput run
(scnt.sh $PARA $RUN_ID > $STREAM_COUNT_LOG &)
scnt_PID=$!

while [ $i -le $STOP_SET ]; do
  M_SDATE=`date`
  M_STIME=`${GTIME}`
        TPCD_LOG_FILE=${TPCD_LOG}/m${PARA}s${i}
        TPCD_RPT_FILE=${TPCD_RPT}/m${PARA}s${i}inter
  echo "Start Query Stream $i $M_STIME, ${M_SDATE}" >>
$SCRIPT_LOG_FILE
        QRY_FILE=${TPCD_RPT}/qtemp.${PARA}s${i}
  ${QPROG} ${DATABASE_USER} q${QRY_FILE} l$
{TPCD_LOG_FILE} r${TPCD_RPT_FILE} | grep -v "Connected
to ORACLE" >> $SCRIPT_LOG_FILE &
  i=`expr $i + 1`
done

(${KIT_DIR}/audit/runTPCHus $RUN_ID $START_SET_UPDATE
```

```
$STOP_SET_UPDATE ${SF} $PARA >> $SCRIPT_LOG_FILE 2>&1
&)

wait
THQ_END_T=`$GTIME`
THQ_END_D=`date`
echo End all Query Streams $THQ_END_T, $THQ_END_D >>
$SCRIPT_LOG_FILE
print > /tmp/th_pipe1
read < /tmp/th_pipe2

TH_END_D=`date`
TH_END_T=`$GTIME`
echo End Update Stream ${TH_END_T}, ${TH_END_D} >>
$SCRIPT_LOG_FILE
echo >> $SCRIPT_LOG_FILE
echo "End Throughput Test ${TH_END_T}, ${TH_END_D}" >>
$SCRIPT_LOG_FILE
echo Execution Time Throughput Test: `echo ${TH_END_T}
- ${TH_START_T} | bc` >> $SCRIPT_LOG_FILE

i=$START_SET
while [ $i -le $STOP_SET ]; do
       TPCD_LOG_FILE=${TPCD_LOG}/m${PARA}s${i}
  ${KIT_DIR}/audit/abridge.pl ${TPCD_LOG_FILE}
       i=`expr $i + 1`
done
#kill -9 $scnt_PID
/usr/bin/pkill scnt

=====================================================
```

runTPCHus

```
=====================================================
#!/bin/ksh
. $KIT_DIR/env

SCRIPT_DIR=${KIT_DIR}/scripts
SQL_DIR=${KIT_DIR}/sql
UPD_DIR=${KIT_DIR}/update
UPD_SPT=${UPD_DIR}/scripts
SRC_DIR=${KIT_DIR}/utils
QRY_DIR=${KIT_DIR}/queries # this is the location of
the query template file
QGEN_DIR=${KIT_DIR}/dbgen
QGEN=${QGEN_DIR}/qgen

DSS_QUERY=${KIT_DIR}/queries
export DSS_QUERY

RUN_ID=$1
START_SET_UPDATE=$2
STOP_SET_UPDATE=$3
SF=$4
PARA=$5

OUT_DIR=${KIT_DIR}/audit/tests/${RUN_ID}
if [ ! -d $OUT_DIR ]
then
       mkdir $OUT_DIR
fi


TPCD_RPT=$OUT_DIR
SCRIPT_LOG_FILE=${OUT_DIR}/m${PARA}timing
OUT=$OUT_DIR

GTIME=${SRC_DIR}/gtime
HID=1

START=`$GTIME`
echo "Start Update Stream $START, `date`" >>
$SCRIPT_LOG_FILE
echo "" >> $SCRIPT_LOG_FILE


#waiting for all the query streams to finish first
read < /tmp/th_pipe1

i=$START_SET_UPDATE
j=1
while [ $i -le $STOP_SET_UPDATE ]; do

  # Execute UF1

  UF1_LOG=${OUT_DIR}/m${PARA}s${j}rf1
  UF2_LOG=${OUT_DIR}/m${PARA}s${j}rf2
  RPT_FILE=${OUT_DIR}/m${PARA}s${j}inter

  SDATE=`date`
  UF1_START=`$GTIME`
       echo "Start UF1-${j} at ${UF1_START}, ${SDATE}"
>> ${RPT_FILE}

  ${UPD_SPT}/runuf1.sh ${i} >> ${UF1_LOG} 2>&1
  UF1_END=`${GTIME}`
       EDATE=`date`
  echo "End UF1-${j} at ${UF1_END}, ${EDATE}" >>
${RPT_FILE}
       echo UF1-${j} Execution Time: `echo ${UF1_END}
- ${UF1_START} | bc` >> ${RPT_FILE}

  # Execute UF2

  SDATE=`date`
  UF2_START=`${GTIME}`
  echo "Start UF2-${j} ${UF2_START}, ${SDATE}" >>
${RPT_FILE}

  ${UPD_SPT}/runuf2.sh ${i} >> ${UF2_LOG} 2>&1
  UF2_END=`${GTIME}`
  EDATE=`date`
  echo "End UF2-${j} at $UF2_END, ${EDATE}" >>
${RPT_FILE}
       echo UF2-${j} Execution Time: `echo ${UF2_END}
- ${UF2_START} | bc` >> ${RPT_FILE}

  i=`expr $i + 1`
  j=`expr $j + 1`
done

print > /tmp/th_pipe2

=====================================================
```

runuf1.sh

```
=====================================================
#!/bin/ksh
. $KIT_DIR/env
UPDATE_DIR=${KIT_DIR}/update
SCRIPT_DIR=${UPDATE_DIR}/scripts
LOG_DIR=${UPDATE_DIR}/log
GTIME=${SCRIPT_DIR}/gtime
SF=${SCALE_FACTOR}
PAR_HINT=${UPDATE_DOP_INS}

LOGPATH=.
PASSWD=${DATABASE_USER}

if [ $# -lt 1 ];
then
   echo runuf1.sh setnum
   exit 1
fi
SETNUM=$1
i=1
PID=""

# perform the update function 1

START=`$GTIME`

# first create the temp tables

sqlplus /NOLOG << !

connect $PASSWD;
set timing  on
set serveroutput on
set echo on

drop directory data_dir;
create directory data_dir as '${KIT_DIR}/
update/update_sets';

drop table temp_l_et;
create table temp_l_et(
    l_shipdate          date ,
    l_orderkey          number ,
    l_discount          number ,
    l_extendedprice     number ,
    l_suppkey           number ,
```

```
    l_quantity          number ,
    l_returnflag        char(1) ,
    l_partkey           number ,
    l_linestatus        char(1) ,
    l_tax               number ,
    l_commitdate        date ,
    l_receiptdate       date ,
    l_shipmode          char(10) ,
    l_linenumber        number ,
    l_shipinstruct      char(25) ,
    l_comment           varchar(44)
)
organization external (
type ORACLE_LOADER
default directory data_dir
access parameters
(
                records delimited by newline
                badfile 'l_et.${SETNUM}.bad'
                logfile 'l_et.${SETNUM}.log'
                fields terminated by '|'
                missing field values are null
        )
        location (
        'lineitem.tbl.u${SETNUM}'))
reject limit unlimited;

drop table temp_o_et;
create table temp_o_et(
    o_orderdate         date ,
    o_orderkey          number ,
    o_custkey           number ,
    o_orderpriority     char(15) ,
    o_shippriority      number ,
    o_clerk             char(15) ,
    o_orderstatus       char(1) ,
    o_totalprice        number ,
    o_comment           varchar(79)
)
organization external (
type ORACLE_LOADER
default directory data_dir
access parameters
(
                records delimited by newline
                badfile 'o_et.${SETNUM}.bad'
                logfile 'o_et.${SETNUM}.log'
                fields terminated by '|'
                missing field values are null
        )
        location (
        'orders.tbl.u${SETNUM}'))
reject limit unlimited;

alter table temp_l_et parallel  ${PAR_HINT};
alter table temp_o_et parallel  ${PAR_HINT};


alter session force parallel dml parallel (degree
${PAR_HINT});
alter session set isolation_level = serializable;



insert into orders (select * from temp_o_et);

insert into lineitem (select * from temp_l_et);

commit;

drop table temp_l_et;
drop table temp_o_et;

exit;
!

END=`$GTIME`

# Done

echo ""
echo "Update Function 1 Set $SETNUM done!"
echo "Elapsed Time is `echo $END - $START | bc`"
echo ""
=====================================================
```

runuf2.sh

```
=====================================================
#!/bin/ksh
. $KIT_DIR/env
UPDATE_DIR=${KIT_DIR}/update
SCRIPT_DIR=${UPDATE_DIR}/scripts
GTIME=${SCRIPT_DIR}/gtime
LOG_DIR=${UPDATE_DIR}/log
PAR_HINT=${UPDATE_DOP_DEL}
SF=${SCALE_FACTOR}
PASSWD=${DATABASE_USER}

if [ $# -lt 1 ]
then
   usage
   exit 1
fi

SETNUM=$1

i=1
PID=""

START=`$GTIME`
# first create the temp tables

sqlplus /NOLOG << !

connect $PASSWD;
set timing  on
set serveroutput on
set echo on

drop directory data_dir;
create directory data_dir as '${KIT_DIR}/
update/update_sets';

drop table temp_okey_et;
drop table temp_okey;

create table temp_okey_et(
    t_orderkey          number
)
organization external (
type ORACLE_LOADER
default directory data_dir
access parameters
(
                records delimited by newline
                badfile 'okey.${SETNUM}.bad'
                logfile 'okey.${SETNUM}.log'
                fields terminated by '|'
                missing field values are null
        )
        location (
        'delete.${SETNUM}'))
reject limit unlimited;

alter table temp_okey_et parallel 16;

create table temp_okey parallel  16  nologging as
select * from temp_okey_et;

create unique index i_temp_okey on temp_okey
(t_orderkey) parallel 16 nologging compute statistics;
analyze table temp_okey estimate statistics sample 2
percent;

alter session  force parallel dml parallel
${PAR_HINT};
alter session set isolation_level=serializable;



delete from (select /*+ index(o) use_nl(o) */ o.rowid
from orders o, temp_okey t where o.o_orderkey =
t.t_orderkey order by 1);

delete from (select /*+ index(l) use_nl(l) */ l.rowid
from lineitem l,temp_okey t where l.l_orderkey =
t.t_orderkey order by 1);

commit;

drop table temp_okey;
```

```
drop table temp_okey_et;
exit;
!

END=`$GTIME`

# Done

echo ""
echo "Update Function 2 Set $SETNUM done!"
echo "Elapsed Time is `echo $END - $START | bc`"
echo ""

================================================
```

env

```
########### PATHS ###################################
#export KIT_DIR=/export/btmp/home/oracle/kit
export KIT_DIR=/c0t1d0/export/home/oracle/kit
export SCHEMA_DIR=$KIT_DIR/schema
export PERL=/opt/PERL/bin/perl
export BUMPX_DIR=$KIT_DIR/bumpx
export BUMPX_OUT=$KIT_DIR/bumpx
export UTILS=$KIT_DIR/utils
# change to a regular directory
export TEST_DB=$KIT_DIR/acid
export QUAL_DB=$TEST_DB
export DBGEN=$KIT_DIR/dbgen
export ACID_DIR=$KIT_DIR/acid
export QEXEC=$KIT_DIR/utils
export QUERIES=$KIT_DIR/queries
export ANSWERS=$KIT_DIR/answers
export
ANS2VAL=/export/btmp/home/oracle/kit/acid/answers
export ACID_OUT=$ACID_DIR/acid_out
export DSS_CONFIG=$DBGEN
export DSS_QUERY=$KIT_DIR/queries
export DSS_PATH=$ADE_VIEW_ROOT
export MAINT=$KIT_DIR/maintenance
export CC=cc
export FRAME=$KIT_DIR/frame
export REGR_TEST=$KIT_DIR/internal/regression_test
export SCALE_FACTOR=3000
# set for acid tests
export UPDATE_DOP_INS=36
export UPDATE_DOP_DEL=144
############ FRAME STUFF
export FRAME_PATH=$KIT_DIR/frame
export ORACORE3INCL=$ORACLE_HOME/rdbms/demo
export ORACORE3PUBL=$ORACLE_HOME/rdbms//public
export RDBMSPUBL=$ORACLE_HOME/rdbms/public
export NETWORKPUBL=$ORACLE_HOME/network/public
export RDBMSDEMO=$ORACLE_HOME/rdbms/demo
export PLSQLDEMO=$ORACLE_HOME/plsql/demo
export PLSQLPUBL=$ORACLE_HOME/plsql/public
export O=$ORACLE_HOME
export PATH=./:${BUMPX_DIR}:${UTILS}:${DBGEN}:
${MAINT}:${ACID_DIR}:${FRAME}/bin:${FRAME}/bin:${PATH}
#
########### ENVIRONMENT VARIABLES ##################
export WORKLOAD=TPCH
export HOST=
export OPTLEVEL=X02
export GETOPT=-DSTDLIB_HAS_GETOPT
export PLATFORM=
#export INITORA=$KIT_DIR/schema/test_db/testdb.ora
export INITORA=$KIT_DIR/schema/test_db/sf100.ora

########### ALIASES ##################################

########### RULES - do not change these #############
case "$SCALE_FACTOR" in
  1) export NUM_STREAMS=2;;
  10) export NUM_STREAMS=3;;
  100) export NUM_STREAMS=4;;
  300) export NUM_STREAMS=6;;
  1000) export NUM_STREAMS=7;;
  3000) export NUM_STREAMS=8;;
  10000) export NUM_STREAMS=9;;
esac
DATABASE_USER=tpcd/tpcd

================================================
```

qexecpl.c

```
#include <stdio.h>
#include <string.h>
#include <setjmp.h>
#include <sys/param.h>
#include <errno.h>
#include <math.h>
#include <string.h>
#include <sys/types.h>
#include <time.h>
#include <stdlib.h>

#include "qexecpl.h"

/* Function Prototypes */

extern double gettime();

/* function prototypes from gen.c */

int get_statement();

/* Declare error handling functions */

void sql_error();

/* Other prototypes */

int define_output_variables();
void process_select_list();
void usage();
void SQLinit();
void SQLexec();
void SQLexit();
void *memalloc();
void print_header();
void print_rows();
int OFEN();
void remove_newline();

char logname[UNAME_LEN];  /* username/passwd combo */
char *passwd;

double tr_start = 0.0;    /* query start time
*/
double tr_end = 0.0;      /* query end time
*/

double s_tr_start = 0.0;  /* statement start time
*/
double s_tr_end = 0.0;    /* statement end time
*/

/* For our purpose of timing, we will treat comments
as delimiters */
/* for queries.   Thus, we will collect query timings
whenever we  */
/* encounter a comment (of course not for the first
comment in a   */
/* file).
*/

int end_flag = 0;         /* flag to indicate that we
have reached */
                          /* the end of a query
*/

int stmt_cnt = 0;         /* Number of statements
processed.     */
int qry_cnt = 0;          /* Number of query
processed.          */

double product = 1.0;     /* cumulative product of
query times   */
int rows_ret = 0;         /* the number of rows
fetched          */
int num_sel_list = 0;     /* the number of select list
item      */

long num_to_fetch = -1;   /* Number of rows to fetch.
-1 means fetch all */

sltype slist[MAX_SEL_LIST];  /* Array for describing
Select List         */
```

```
dltype *dlist[MAX_SEL_LIST]; /* Array of ptrs for
Defining Select List   */

char stmt[SQL_LEN];       /* The SQL statement or
comment line.  */
char qn[3];               /* Number of the query being
executed  */
char qnp[3];              /* Number of the previous
query executed  */
char cmnt[5000];            /* Buffer to save the
comment.          */
#ifdef LINUX
FILE *qtemp;      /* fd for query template
*/
FILE *logfile;   /* log and report files
*/
FILE *rep;
#else
FILE *qtemp = stdin;      /* fd for query template
*/
FILE *logfile = stdout;   /* log and report files
*/
FILE *rep = stdout;
#endif
void *defbuf;             /* Buffer pointer for ODEFIN
*/
int deflen = 0;           /* Size of data type for
ODEFIN        */
int deftype = 1;          /* Oracle type number for
ODEFIN       */

int pfmem = PFMEMSIZE;    /* Memory to prefetch rows
*/

time_t tim;               /* To get wall clock time
*/

/* OCI handles */

OCIEnv *tpcenv = NULL;
OCIServer *tpcsrv = NULL;
OCIError *errhp = NULL;
OCISvcCtx *tpcsvc = NULL;
OCISession *tpcusr = NULL;
OCIStmt *curq = NULL;
OCIStmt *cur_dml = NULL;
OCIStmt *cur_ddl = NULL;
OCIParam *tpcpar = NULL;

sword status = OCI_SUCCESS;  /* OCI return value */

/* usage: prints the usage of the program */

void usage() {

  fprintf(stderr,"\nUsage: qexec username/password
[q<path name for query template file>]\n");
  fprintf(stderr,"                [l<path name for
log>] [r<path name for reports>]\n\n");
  fprintf(stderr,"Options:\n");
  fprintf(stderr,"q<path for query>         : full
path name for the query template file.\n");
  fprintf(stderr,"                            (default
is stdin)\n");
  fprintf(stderr,"l<path name for log>      : full
path name for log files\n");
  fprintf(stderr,"                            (default
is stdout)\n");
  fprintf(stderr,"r<path name for reports>  : full
path name for reports\n");
  fprintf(stderr,"                            (default
is stdout)\n");
  exit(-1);
}



/* type: 0 if environment handle is passed, 1 if error
handle is passwd */

void sql_error(errhp,status,type)
     OCIError *errhp;
     sword status;
     sword type;
{
  char msg[2048];
  ub4 errcode;
  ub4 msglen;
  int i,j;

  switch(status) {
  case OCI_SUCCESS_WITH_INFO:
    fprintf(stderr, "Error: Statement returned with
info.\n");
    if (type)
      (void) OCIErrorGet(errhp,1,NULL,(sb4*)&errcode,
(text*)msg,
                         2048,OCI_HTYPE_ERROR);
    else
      (void) OCIErrorGet(errhp,1,NULL,(sb4*)&errcode,
(text*)msg,
                         2048,OCI_HTYPE_ENV);
    fprintf(stderr,"%s\n",msg);
    break;
  case OCI_ERROR:
    fprintf(stderr, "Error: OCI call error.\n");
    if (type)
      (void) OCIErrorGet(errhp,1,NULL,(sb4*)&errcode,
(text*)msg,
                         2048,OCI_HTYPE_ERROR);
    else
      (void) OCIErrorGet(errhp,1,NULL,(sb4*)&errcode,
(text*)msg,
                         2048,OCI_HTYPE_ENV);
    fprintf(stderr,"%s\n",msg);
    break;
  case OCI_INVALID_HANDLE:
    fprintf(stderr, "Error: Invalid Handle.\n");
    if (type)
      (void) OCIErrorGet(errhp,1,NULL,(sb4*)&errcode,
(text*)msg,
                         2048,OCI_HTYPE_ERROR);
    else
      (void) OCIErrorGet(errhp,1,NULL,(sb4*)&errcode,
(text*)msg,
                         2048,OCI_HTYPE_ENV);
    fprintf(stderr,"%s\n",msg);
    break;
  }

  /* Rollback just in case */

  (void) OCITransRollback(tpcsvc,errhp,OCI_DEFAULT);

  fprintf(stderr, "Exiting Oracle...\n");
  fflush(stderr);

  SQLexit();

  exit(1);
}

#ifdef LINUX
int main(argc,argv)
#else
void main(argc,argv)
#endif
     int argc;
     char *argv[];
{

  int i,pos,pos2;
  int retcode;      /* Return code for get_statement
*/
#ifdef LINUX
  logfile=fopen("/dev/stdout","w");
  qtemp=fopen("/dev/stdin","rw");
  rep=fopen("/dev/stdout","w");
#endif
  /* Initialize some variables */

  if ((argc > 5) || (argc < 2)) {
    usage();
  }

  /* argv[1] -- User and Password for Database */

  strcpy(logname, argv[1]);

  /* Process  optional parameters */

  argc -= 1;
```

```
  argv += 1;

  while(--argc) {
    ++argv;
    switch(argv[0][0]) {
    case 'q':
      if ((qtemp = fopen(++(argv[0]),"r")) == NULL) {
       fprintf(stderr,"Unable to open file '%s'\n",
argv[0]);
       fprintf(stderr,"%s: %s\n", argv[0], strerror
(errno));
       exit(-1);
      }
      break;
    case 'r':
      if ((rep = fopen(++(argv[0]),"a")) == NULL) {
       fprintf(stderr,"Unable to open file '%s'\n",
argv[0]);
       fprintf(stderr,"%s: %s\n", argv[0], strerror
(errno));
       exit(-1);
      }
      break;
    case 'l':
      if ((logfile = fopen(++(argv[0]),"a")) == NULL)
{
       fprintf(stderr,"Unable to open file '%s'\n",
argv[0]);
       fprintf(stderr,"%s: %s\n", argv[0], strerror
(errno));
       exit(-1);
      }
      break;
    default:
      fprintf(stderr,"Invalid Option: %c\n", argv[0]
[0]);
      usage();
      break;
    }
  }

  /* Do some initialization and establish connection
with the database */

  SQLinit();

  /* May want to add some triggering mechanism here */

  time(&tim);
  fprintf(logfile, "Begin Execution at %s\n\n", ctime
(&tim));
  fprintf(rep, "Begin Executing this Stream at %
s\n\n", ctime(&tim));
  /* Get the next statement and start processing it */

  while ((retcode = get_statement()) > 0) {

    switch (retcode) {

      /* If this is a comment, skips it */
    case COMMENT:
      /*if (end_flag) {
        end_flag = 0;  */    /* reset query end flag */
       /* save the comment so that we can print it out
later on  */
        /* strcpy(cmnt, stmt);
        break;
      } */
      if (stmt[3]== '@') {
         pos=4;
         strcpy(qnp,qn);
         while (stmt[pos] != ')') {
           pos++;
         }
         pos2=0;
         pos++;
         while (stmt[pos] != '.') {
           /*printf ("qn %d %c \n",pos2,stmt[pos]);*/
           qn[pos2]=stmt[pos];
           pos2++;
           pos++;
         }
         qn[pos2] = 0;
         /* printf("found a new query: %s\n",qn); */
      }
      /* save the comment so that we can print it out
later on  */
      strcat(cmnt, stmt);
      break;

      /* if this is a set_row_fetch command */
    case SET_FETCHROW:
      fprintf(logfile,"Setting the number of rows to
fetch to: %ld\n\n",
              num_to_fetch);
      break;

      /* if this is a SQL statement */
    case SQL_STMT:

      /* Executes the query */
      SQLexec();

      stmt_cnt++;
      qry_cnt++;
      fflush(rep);
      fflush(logfile);
      /*
      fprintf(logfile,"\nStatement Started at %.2f\n",
s_tr_start);
      fprintf(logfile,"Statement Ended at %.2f\n",
s_tr_end);

      fprintf(logfile,"Statement Processed in %.2f
seconds.\n",
              (s_tr_end - s_tr_start));
      fprintf(rep, "Query %s: Execution Time: %.2f
started %.2f ended %.2f\n",
                    qn,(s_tr_end - s_tr_start)
s_tr_start,s_tr_end);
      fflush(rep);
      fflush(logfile);*/
      break;

      /* Should never reach here */
    default:
      fprintf(stderr, "Invalid statement type!!\n");
      SQLexit();
      break;
    }
  }

  /* Get Timing for the last query */

  tr_end = gettime();

  fprintf(logfile,"Query Processed in %.2f
seconds.\n\n",(tr_end - s_tr_start));

  /* print comments for this query that we have saved
*/

  /* fprintf(logfile, "%s\n", cmnt); */

  /* fprintf(rep, "Query %s : Execution time %.2f\n",
qn,(tr_end - s_tr_start));*/
  fprintf(rep, "Query %s: Execution Time: %.2f started
%.2f ended %.2f\n",
                    qn,(tr_end - s_tr_start),
s_tr_start,tr_end);

  time(&tim);
  fprintf(logfile,"\nEnded Executing this Stream at %
s\n", ctime(&tim));
  fprintf(logfile,"\nStream Started at %.2f\n",
tr_start);
  fprintf(logfile,"Stream Ended at %.2f\n", tr_end);
  fprintf(logfile,"Stream Processed in %.2f
seconds\n\n",(tr_end - tr_start));

  fprintf(rep,"\nEnded Executing this Stream at %s\n",
ctime(&tim));
  fprintf(rep,"\nStream Started at %.2f\n", tr_start);
  fprintf(rep,"Stream Ended at %.2f\n", tr_end);
  fprintf(rep,"Stream Processed in %.2f seconds\n\n",
         (tr_end - tr_start));

  fprintf(logfile, "\nSQL statements processed: %d\n",
stmt_cnt);
  /*fprintf(logfile, "Queries processed: %d\n",
qry_cnt);*/
```

```
  fflush(rep);
  fflush(logfile);

  /* Close the query template file */

  fclose(qtemp);

  /*  Disconnect from ORACLE. */

  SQLexit();
  exit(0);
}


/* SQLinit(): Perform initialization tasks.
*/
/*            Logs on to Oracle, opens some files and
open a cursor for */
/*            later use.
*/

void SQLinit() {

  int i;

  /* preallocate MAX_PREALLOC members of the dlist
array                    */
  /* initializes others to NULL so that we can
determine who to free later */

  for (i=0; i<MAX_SEL_LIST; i++) {
    if (i < MAX_PREALLOC) {
      dlist[i] = (dltype *) memalloc (sizeof(dltype));
      dlist[i]->defhdl = NULL;
/*      OCIhalloc(curq,&(dlist[i]->defhdl),
OCI_HTYPE_DEFINE); */
    }
    else
      dlist[i] = NULL;
  }

  /* Connect to ORACLE.  Program will call sql_error()
*/
  /* if an error occurs in connecting to the default
database. */

  (void) OCIInitialize(OCI_DEFAULT,(dvoid *)0,0,0,0);

  if((status=OCIEnvInit((OCIEnv **)
&tpcenv,OCI_DEFAULT,0,(dvoid **)0)) !=
     OCI_SUCCESS)
    sql_error(tpcenv, status, 0);

  OCIhalloc(tpcenv,&errhp,OCI_HTYPE_ERROR);
  OCIhalloc(tpcenv,&curq,OCI_HTYPE_STMT);
  OCIhalloc(tpcenv,&cur_dml,OCI_HTYPE_STMT);
  OCIhalloc(tpcenv,&cur_ddl,OCI_HTYPE_STMT);
  OCIhalloc(tpcenv,&tpcsvc,OCI_HTYPE_SVCCTX);
  OCIhalloc(tpcenv,&tpcsrv,OCI_HTYPE_SERVER);
  OCIhalloc(tpcenv,&tpcusr,OCI_HTYPE_SESSION);

  /* get username and password */

  passwd = strchr(logname, '/');
  *passwd = '\0';
  passwd++;

  if ((status = OCIServerAttach(tpcsrv,errhp,(text *)
0,0,OCI_DEFAULT)) != OCI_SUCCESS)
    sql_error(errhp,status,1);

  OCIaset
(tpcsvc,OCI_HTYPE_SVCCTX,tpcsrv,0,OCI_ATTR_SERVER,errh
p);
  OCIaset(tpcusr,OCI_HTYPE_SESSION,logname,strlen
(logname),OCI_ATTR_USERNAME,
          errhp);
  OCIaset(tpcusr,OCI_HTYPE_SESSION,passwd,strlen
(passwd),OCI_ATTR_PASSWORD,
          errhp);

  if ((status = OCISessionBegin(tpcsvc, errhp, tpcusr,
OCI_CRED_RDBMS,
                                OCI_DEFAULT)) !=
OCI_SUCCESS)
    sql_error(errhp,status,1);

  OCIaset
(tpcsvc,OCI_HTYPE_SVCCTX,tpcusr,0,OCI_ATTR_SESSION,err
hp);

/*
  if ((status=OCILogon((OCIEnv *)tpcenv,(OCIError *)
errhp,(OCISvcCtx *)tpcsvc,
                       (text *)logname, strlen(logname),
(text *)passwd,
                       strlen(passwd), (text *) 0, 0)) !=
OCI_SUCCESS)
    sql_error(errhp, status, 1);
*/
  printf("\nConnected to ORACLE as user: %s\n\n",
logname);

}



/* SQLexec()  Executes the SQL statement.
*/
/*            Parse the SQL statement.
*/
/*            If DDL or DML statements, execute right
away.            */
/*            Else describe and define select list
outputs,            */
/*                 execute and fetch results.
*/

void SQLexec()
{
  int i;
  ub2 stmttyp = OCI_STMT_SELECT;     /* default is a
SELECT statement */

  /* Clause 5.3.6.2: QI(i,s) is the time between the
first character */
  /*                 of this query text is submitted
and the first   */
  /*                 character of the next query text
is submitted.  */

  if (qry_cnt) {
     time(&tim);
     s_tr_end = gettime();
     fprintf(logfile,"Query Processed in %.2f
seconds.\n\n",
      (s_tr_end - s_tr_start));

     /* print comments for this query that we have
saved */

     /* fprintf(logfile, "%s\n", cmnt); */

     /*fprintf(rep, "Query %s : Execution time %.
2f\n", qnp,(s_tr_end - s_tr_start));*/
     fprintf(rep, "Query %s: Execution Time: %.2f
started %.2f ended %.2f\n",
                  qnp,(s_tr_end - s_tr_start),
s_tr_start,s_tr_end);

     /* Let's fflush stuff so that we can see what's
going on */

     fflush(logfile);
     fflush(rep);
  }
  else
     tr_start = gettime();

  s_tr_start = gettime();

  /* prepare the statement */

  if ((status = OCIStmtPrepare(curq, errhp, (text*)
stmt, (ub4) strlen(stmt),
                               OCI_NTV_SYNTAX,
OCI_DEFAULT)) != OCI_SUCCESS)
    sql_error(errhp,status,1);

  /* Prints the query text and comment to the logfile
*/
```

```
  fprintf(logfile, "\n%s\n", cmnt);
  cmnt[0]=0;
  fprintf(logfile, "\n%s\n", stmt);

  /* if this is a DDL or DML statement, execute it
right away */
  /* only worries about SELECT statements right now,
cannot   */
  /* execute a stored PL/SQL procedure in thie version
*/

  OCIaget
(curq,OCI_HTYPE_STMT,&stmttyp,NULL,OCI_ATTR_STMT_TYPE,
errhp);

  if (stmttyp != OCI_STMT_SELECT) {
    OCIsexec(tpcsvc,curq,errhp,1);
    return;
  }

  /* otherwise, this is a select statement */
  /* Describe and define output variables  */

  /* first let's execute it to get the select-list
definition */

  OCIaset(curq, OCI_HTYPE_STMT, &pfmem, 0,
OCI_ATTR_PREFETCH_MEMORY, errhp);

  OCIsexec(tpcsvc,curq,errhp,0);

  num_sel_list = define_output_variables();

  /* Executes the query and fetches the rows */

  (void) process_select_list(num_sel_list);

  /* Need to get the number of rows fetched first   */
  /* since the following statments will screw it up */

  OCIaget
(curq,OCI_HTYPE_STMT,&rows_ret,NULL,OCI_ATTR_ROW_COUNT
,errhp);

  /* To control memory usage, let's free up the extra
dlist entries */
  /* that we have allocated.
*/

  i=MAX_PREALLOC;
  while(dlist[i] != NULL) {
    free(dlist[i]);
    dlist[i++] = NULL;
  }

  /* reset set_fetchrows */

  num_to_fetch = -1;

}


void SQLexit() {

  int i;

  OCILogoff(tpcsvc,errhp);
  OCIhfree(tpcenv,OCI_HTYPE_STMT);
  OCIhfree(tpcsvc,OCI_HTYPE_SVCCTX);
  OCIhfree(tpcsrv,OCI_HTYPE_SERVER);
  OCIhfree(tpcusr,OCI_HTYPE_SESSION);

  /* free all memory */

  for (i=0; i<MAX_SEL_LIST; i++) {
    if (dlist[i] != NULL) {
      free(dlist[i]);
    }
  }

  /* Flush all output */

  fflush(rep);
  fflush(logfile);

}


/* define_output_variables(): Describe and define
select-list items for */
/*                            a query statement.
*/
/*                            Returns the number of
select-list items   */
/*                            for this query.
*/

int define_output_variables()
{

  int i;
  int retflag = 0;

  for (i=0; i<MAX_SEL_LIST; i++) {

    slist[i].buflen = MAX_COLNAME_SIZE;

    if (OCIParamGet(curq, OCI_HTYPE_STMT, errhp,
(dvoid **) &tpcpar,
                            POS(i)) != OCI_SUCCESS)
      break;


    /* dsize and nullok fields of dlist not used */

    OCIaget(tpcpar, OCI_DTYPE_PARAM, &(slist[i].
dbsize),
            NULL, OCI_ATTR_DATA_SIZE, errhp);
    OCIaget(tpcpar, OCI_DTYPE_PARAM, &(slist[i].
dbtype),
            NULL, OCI_ATTR_DATA_TYPE, errhp);
    OCIaget(tpcpar, OCI_DTYPE_PARAM, &(slist[i].buf),
            &(slist[i].buflen), OCI_ATTR_NAME, errhp);
    OCIaget(tpcpar, OCI_DTYPE_PARAM, &(slist[i].
precision),
            NULL, OCI_ATTR_PRECISION, errhp);
    OCIaget(tpcpar, OCI_DTYPE_PARAM, &(slist[i].
scale),
            NULL, OCI_ATTR_SCALE, errhp);

    /* For formatting purpose, remove trailing blanks
in select-list name. */

/*
    if (slist[i].buflen < MAX_COLNAME_SIZE)
      (slist[i].buf)[slist[i].buflen] = '\0';
*/
    /* Well, we need to allocate for entries for dlist
*/

    if (i >= MAX_PREALLOC) {
      dlist[i] = (dltype *) memalloc(sizeof(dltype));
      dlist[i]->defhdl = NULL;
    }

    /* Let's check the sizes and types for this select
list item */

    switch (slist[i].dbtype) {

    case OCI_TYPECODE_NUMBER:

      /* The odescr will not give a good estimate to
the scale if */
      /* no scale was given in the Oracle table
definition.       */

#ifdef HAVE_SCALE
      if (slist[i].scale != 0) {
        defbuf = (double *) dlist[i]->fbuf;
        deflen = FLT;
        deftype = OCI_TYPECODE_DOUBLE;
        slist[i].dbtype = OCI_TYPECODE_DOUBLE;
      } else {
        defbuf = (int *) dlist[i]->ibuf;
        deflen = INT;
        deftype = OCI_TYPECODE_INTEGER;
        slist[i].dbtype = OCI_TYPECODE_INTEGER;
      }
#else
      defbuf = (double *) dlist[i]->fbuf;
```

```
      deflen = FLT;
      deftype = OCI_TYPECODE_FLOAT;
      slist[i].dbtype = OCI_TYPECODE_FLOAT;
#endif /* HAVE_SCALE */

      break;

    default:

      /* default is character string */

      defbuf = (char **) dlist[i]->sbuf;
      deflen = MAX_STR_LEN;
      deftype = SQLT_STR;
/*      deftype = OCI_TYPECODE_CHAR; */
      break;
    }

    /* Define the column */

    if ((status=OCIDefineByPos(curq,&(dlist[i]-
>defhdl),errhp,POS(i),

defbuf,deflen,deftype,NULL,
                               dlist[i]-
>rlen,NULL,OCI_DEFAULT))!=OCI_SUCCESS)
      sql_error(errhp,status,1);
  }
  return i;
}


/* process_select_list(): Fetch rows from a query.
*/

void process_select_list(num)
     int num;        /* number of select list items */
{

  int i,j;
  int ntf;
  int num_so_far;
  sword stats = OCI_SUCCESS;

  /* Print the headers for the query execution result
*/

  print_header(num);

  /* See if we need to limit the rows to fetch */

  ntf = (num_to_fetch >= 0) ? num_to_fetch :
MAX_ARRAY;

  /* Fetch the rows and print them out */

  if ((ntf > MAX_ARRAY) || (num_to_fetch == -1)) {

    stats = OCIStmtFetch(curq, errhp, MAX_ARRAY,
OCI_FETCH_NEXT, OCI_DEFAULT);

    OCIaget
(curq,OCI_HTYPE_STMT,&rows_ret,NULL,OCI_ATTR_ROW_COUNT
,errhp);

    print_rows(num,rows_ret);

    /* To avoid 1022 from OFEN */
    /* More rows to fetch...   */

    if (stats != OCI_NO_DATA) {
      if (num_to_fetch == -1) {
        while ((stats = OCIStmtFetch
(curq,errhp,MAX_ARRAY,OCI_FETCH_NEXT,
                                    OCI_DEFAULT)) ==
OCI_SUCCESS) {
          OCIaget(curq,OCI_HTYPE_STMT,&num_so_far,NULL,
                  OCI_ATTR_ROW_COUNT,errhp);
          print_rows(num,(num_so_far-rows_ret));
          rows_ret = num_so_far;
        }
        /* Print the final rows */
        OCIaget(curq,OCI_HTYPE_STMT,&num_so_far,NULL,
                OCI_ATTR_ROW_COUNT,errhp);
        print_rows(num,(num_so_far-rows_ret));
        rows_ret = num_so_far;
      } else {
        ntf -= MAX_ARRAY;

        while ((stats = OCIStmtFetch(curq,errhp,
                                     ((ntf>MAX_ARRAY) ?
MAX_ARRAY:ntf),
                                     OCI_FETCH_NEXT,
OCI_DEFAULT)) ==
                OCI_SUCCESS) {
          ntf -= MAX_ARRAY;
          OCIaget(curq,OCI_HTYPE_STMT,&num_so_far,NULL,
                  OCI_ATTR_ROW_COUNT,errhp);
          print_rows(num,(num_so_far-rows_ret));
          rows_ret = num_so_far;
          if (ntf <= 0) break;
        }
        OCIaget(curq,OCI_HTYPE_STMT,&num_so_far,NULL,
                OCI_ATTR_ROW_COUNT,errhp);
        print_rows(num,(num_so_far-rows_ret));
        rows_ret = num_so_far;
      }
    }
  } else {
    OCIStmtFetch(curq, errhp, ntf, OCI_FETCH_NEXT,
OCI_DEFAULT);
    OCIaget
(curq,OCI_HTYPE_STMT,&rows_ret,NULL,OCI_ATTR_ROW_COUNT
,errhp);
    print_rows(num,rows_ret);
  }

  fprintf(logfile,"\n\n%d row%c processed.\n",
rows_ret,
          rows_ret == 1 ? '\0' : 's');

}


int get_statement()
{

  char line[128];
  char *pos, *str;

  /* Reset statement buffer */

  stmt[0] = '\0';

  while (fgets(line, 127, qtemp) != NULL) {

    /* skip blank lines */
    if (line[0] == '\n')
      continue;

    /* remove blanks */

    str = line;

    while (*str == ' ') str++;

    /* Let's get the line together first */

    strcat(stmt, str);

    /* if this is a comment line */
    if ((str[0] == '-') && (str[1] == '-'))
      return COMMENT;

    /* see if this is a set_fetchrows line */
    if (strncmp(str, "set_fetchrows", 13) == 0) {
      pos = strchr(str, ';');
      *pos = '\0';
      pos = strchr(str, '=');
      num_to_fetch = atol(++pos);
      return SET_FETCHROW;
    }

    /* if this is the end of the current statement */
    if ((pos = strchr(stmt, ';')) != NULL) {
      *pos = '\0';
      return SQL_STMT;
    }
  }
  return END_OF_FILE;
}
```

```
/* memalloc(): Allocates memory, exit program if we
have a problem. */

void *memalloc(size)
     int size;
{

  void *tmp;

  if ((tmp = (void *) malloc(size)) == NULL) {
    fprintf(stderr, "Error in malloc\n");
    SQLexit();
    return NULL;       /* should never reach here */
  } else {
    return tmp;
  }
}



void print_header(nsel)
     int nsel;           /* Number of select list
items */
{

  int i, diff;
  char colname[MAX_COLNAME_SIZE];
  int len = 0;           /* Running column length */
  int cwid = 0;

  fprintf(logfile, "\n");

  for (i=0; i<nsel; i++) {

    /* extract the column name */

    strncpy((char *)colname, (char *)slist[i].buf,
slist[i].buflen);
    colname[slist[i].buflen] = '\0';

    /* format the output a little */

    cwid = MAX(slist[i].dbsize, slist[i].buflen);

    /* do a little bit of formatting */

    if (cwid > 80) {
      fprintf(logfile,"\n");
      len = 0;
    } else if ((len += cwid) > 80) {
      fprintf(logfile,"\n");
      len = cwid;
    }
#ifdef FORMAT1
    if ((slist[i].dbtype == INT_TYPE) || (slist[i].
dbtype == FLT_TYPE))
      fprintf(logfile, "%*s ", cwid, slist[i].buf);
    else  /* string type */
      fprintf(logfile, "%*s ", -cwid, slist[i].buf);
#else
      fprintf(logfile, "%*s ", -cwid, colname);
#endif /* FORMAT1 */
  }

  fprintf(logfile,"\n");
}


void print_rows(ncol, nrow)
     int ncol;
     int nrow;
{

  int i,j;
  int len;
  int diff;
  int cwid;

  for (i=0;i<nrow;i++) {

    len = 0;

    for (j=0;j<ncol;j++) {

      cwid = MAX(slist[j].dbsize, slist[j].buflen);

      /* do a little bit of formatting */

      if (cwid > 80) {
        fprintf(logfile,"\n");
        len = 0;
      } else if ((len += cwid) > 80) {
        fprintf(logfile,"\n");
        len = cwid;
      }

      switch(slist[j].dbtype) {
      case INT_TYPE:
#ifdef HAVE_SCALE
        fprintf(logfile, "%*ld|", cwid,       (dlist
[j]->ibuf)[i]);
        break;
#endif /* HAVE_SCALE */
      case FLT_TYPE:
#ifdef FORMAT1
        fprintf(logfile,"%*.2f ", cwid, (dlist[j]-
>fbuf)[i]);
#else
        fprintf(logfile,"%*.2f ", -cwid, (dlist[j]-
>fbuf)[i]);
#endif /* FORMAT1 */
        break;
      default:
        fprintf(logfile, "%*s ", -(cwid), (dlist[j]-
>sbuf)[i]);
        break;
      }
    }
    fprintf(logfile, "\n");
  }
}


/* remove_newline(): Remove newline character from
str. */

void remove_newline(str)
     char *str;
{

  char *p;

  while ((p = strchr(str,'\n')) != NULL)
    *p = ' ';
}
```

==========

qexecpl.h

```
#ifndef QSTREAMPL_H

#define QSTREAMPL_H

#include <stdio.h>
#include <string.h>
#include <sys/param.h>
#include <sys/types.h>
#include <time.h>
#include <errno.h>
#include <math.h>

#include <oratypes.h>

#include <oratypes.h>

#ifndef OCIDFN
#include <ocidfn.h>
#endif /* OCIDFN */

#ifndef OCI_ORACLE
#include <oci.h>
#endif /* OCI_ORACLE */
/*
#ifdef __STDC__
#include <ociapr.h>
#else
#include <ocikpr.h>
#endif *//* __STDC__ */

/* some basic definitions */
```

```
#define UNAME_LEN 64
#define MAX_FILE_PATH_LEN 128

#ifndef TRUE
#define TRUE 1
#endif /* TRUE */

#ifndef FALSE
#define FALSE 1
#endif /* FALSE */
#ifndef LINUX
#define MAX(x,y) ((x >= y) ? x : y)
#define MIN(x,y) ((x <= y) ? x : y)
#endif
/* defines and typedefs for parsing */

#define CRT_TBL  1
#define INS_STMT 3
#define SEL_STMT 4
#define UPD_STMT 5
#define DRP_VIEW 7
#define DRP_TBL  8
#define DEL_STMT 9
#define CRT_VIEW 10

/* defines and typedefs for query description */

#define MAX_COLNAME_SIZE 32   /* Maximum length of
Column name  */
#define MAX_SEL_LIST 16       /* Maximum items on a
select list */

#define END_OF_LIST 1007      /* Error code when we
reach the end of the */
                              /* select list.
*/

/* types for describe */

#define CHAR_TYPE 1
#define NUM_TYPE  2
#define INT_TYPE  3
#define FLT_TYPE  4
#define STR_TYPE  5
#define DATE_TYPE 12

#define NUMWIDTH 16           /* Width of the numeric
fields    */

#define POS(i) (i+1)          /* The position is 1...n
instead  */
#define IND(i) (i-1)          /* of 0..n-1 as in an
array.      */

typedef struct des
{
  ub2 dbsize;
  ub4 buflen;
/*  sb2 dsize;  */
  sb4 scale;
/*  sb2 nullok; */
  OCITypeCode dbtype;
/*  text buf[MAX_COLNAME_SIZE]; */
  text *buf;
  ub1 precision;
} sltype;


/* defines and typedefs for query select list
definition */

#define MAX_ARRAY 50       /* Maximum array size for
array fetch */
#define PFMEMSIZE 65536    /* Memory size of prefetch
buffer     */

#define MAX_STR_LEN 256    /* Maximum size for string
variables         */
#define MAX_PREALLOC 8     /* Maximum number of
preallocated select list */
                           /* definitions.
*/

#define INT sizeof(long)
#define STR sizeof(char)
#define FLT sizeof(double)

#define FLTP (double *)
#define INTP (long *)
#define STRP (char **)

typedef struct def
{
  long ibuf[MAX_ARRAY];
  double fbuf[MAX_ARRAY];
  char sbuf[MAX_ARRAY][MAX_STR_LEN];
  ub2 rlen[MAX_ARRAY];         /* return length     */
  OCIDefine *defhdl;
} dltype;

extern int errno;

#define SQL_LEN 2048

#ifndef NULL
#define NULL 0
#endif

#ifndef NULLP
# define NULLP (void *)NULL
#endif /* NULLP */

#ifndef DISCARD
# define DISCARD (void)
#endif

#ifndef sword
# define sword int
#endif

#ifndef ub1
#define ub1 unsigned char
#endif

#define NA              -1      /* ANSI SQL NULL */
#define VER7            2
#define NOT_SERIALIZABLE  8177  /* ORA-08177:
transaction not serializable */

#define ADR(object) ((ub1 *)&(object))
#define SIZ(object) ((sword)sizeof(object))
#define SID(sid) ((sid == -1) ? 0 : sid)

/* For get_statement */

#define END_OF_FILE -1
#define COMMENT 1
#define SQL_STMT   2
#define SET_FETCHROW 3


#define OCIhalloc(envh,hndl,htyp) \
    if((status=OCIHandleAlloc((dvoid *)envh,(dvoid **)
hndl,htyp,0,(dvoid **)0))!=OCI_SUCCESS) \
       sql_error(envh,status,0); \
    else \
       DISCARD 0

#define OCIhfree(hndl,htyp) \
    if((status=OCIHandleFree((dvoid *)hndl,htyp)) ==
OCI_SUCCESS) \
       fprintf(stderr, "Error freeing handle of type %
d\n", htyp)

#define OCIaget(hndl,htyp,attp,size,atyp,errh) \
    if((status=OCIAttrGet((dvoid *)hndl,htyp,(dvoid *)
attp,(dvoid *)size,atyp,errh)) != OCI_SUCCESS) \
       sql_error(errh,status,1); \
    else \
       DISCARD 0

#define OCIaset(hndl,htyp,attp,size,atyp,errh) \
    if((status=OCIAttrSet((dvoid *)hndl,htyp,(dvoid *)
attp,size,atyp,errh)) != OCI_SUCCESS) \
       sql_error(errh,status,1); \
    else \
       DISCARD 0

#define OCIsexec(svch,stmh,errh,iter) \
    if((status=OCIStmtExecute
(svch,stmh,errh,iter,0,NULL,NULL,OCI_DEFAULT)) !=
OCI_SUCCESS) \
```

```
      sql_error(errh,status,1); \
    else \
      DISCARD 0


#define ISOTXT "alter session set isolation_level =
serializable"
#define PDMLTXT "alter session force parallel dml
parallel (degree 84)"
#define PDDLTXT "alter session force parallel ddl
parallel (degree 84)"

#endif /* QSTREAMPL_H */
```

==========

gtime.c

```
#include<stdio.h>
#include<stdlib.h>

# include <sys/time.h>

main ()
{

  struct timeval tv;

        (void) gettimeofday (&tv, (struct timezone *)
0);

  printf ("%.2f\n", ((double) tv.tv_sec + (1.0e-6 *
(double) tv.tv_usec)) ) ;

}

/* end of file gtime.c */
```

Appendix F. Misc database scripts

Activity Between Database Load and Run1 When the load finished, the runTPCHall script automatically selected a seed value and saved it.

The database was restarted.

Then the 2 auditor scripts count.sql and dbtables.sql were run to validate that the database structure was correct.

==========

count.sql

```
==========
select * from lineitem where rownum < 11;
select * from orders where rownum < 11;
select * from part where rownum < 11;
select * from partsupp where rownum < 11;
select * from supplier where rownum < 11;
select * from customer where rownum < 11;
select * from nation where rownum < 11;
select * from region where rownum < 11;
```

==========

dbtables.sql

```
==========
set numwidth 25
SELECT COUNT(*) FROM LINEITEM;

SELECT * FROM LINEITEM
WHERE L_ORDERKEY IN
 ( 4, 26598,  148577,  387431, 56704, 517442, 600000)
AND L_LINENUMBER = 1
ORDER BY L_ORDERKEY;



SELECT * FROM REGION;

SELECT COUNT(*) FROM NATION;

SELECT * FROM NATION
WHERE N_NATIONKEY IN (3,10,14,20)
ORDER BY N_NATIONKEY;



SELECT COUNT(*) FROM ORDERS;

SELECT * FROM ORDERS
WHERE O_ORDERKEY IN ( 7, 44065, 287590, 411111,
483876, 599942 )
ORDER BY O_ORDERKEY;



SELECT COUNT(*) FROM PART;

SELECT * FROM PART
WHERE P_PARTKEY IN (1,984,8743,9028,13876,17899,20000)
ORDER BY P_PARTKEY;

SELECT COUNT(*) FROM PARTSUPP;

SELECT* FROM PARTSUPP
   WHERE PS_PARTKEY = 3398
   AND PS_SUPPKEY = (SELECT MIN(PS_SUPPKEY)
      FROM PARTSUPP WHERE PS_PARTKEY = 3398);

SELECT* FROM PARTSUPP
   WHERE PS_PARTKEY =15873
   AND PS_SUPPKEY = (SELECT MIN(PS_SUPPKEY)
      FROM PARTSUPP WHERE PS_PARTKEY = 15873);

SELECT* FROM PARTSUPP
   WHERE PS_PARTKEY = 11394
   AND PS_SUPPKEY = (SELECT MIN(PS_SUPPKEY)
      FROM PARTSUPP WHERE PS_PARTKEY = 11394);

SELECT* FROM PARTSUPP
   WHERE PS_PARTKEY = 6743
   AND PS_SUPPKEY = (SELECT MIN(PS_SUPPKEY)
      FROM PARTSUPP WHERE PS_PARTKEY = 6743);

SELECT* FROM PARTSUPP
   WHERE PS_PARTKEY = 19763
   AND PS_SUPPKEY = (SELECT MIN(PS_SUPPKEY)
      FROM PARTSUPP WHERE PS_PARTKEY =19763);



SELECT COUNT(*) FROM SUPPLIER;

SELECT * FROM SUPPLIER
WHERE  S_SUPPKEY IN (83,265,492,784,901,1000)
ORDER BY S_SUPPKEY;



DROP TABLE MINMAX;

CREATE TABLE MINMAX
(TNAME CHAR(15),
KEYMIN INTEGER,
KEYMAX INTEGER);

INSERT INTO MINMAX
SELECT 'LINEITEM_ORD',MIN(L_ORDERKEY),MAX(L_ORDERKEY)
FROM LINEITEM ;

INSERT INTO MINMAX
SELECT 'LINEITEM_NBR',MIN(L_LINENUMBER),MAX
(L_LINENUMBER)
FROM LINEITEM;

INSERT INTO MINMAX
SELECT 'ORDERTBL',MIN(O_ORDERKEY),MAX(O_ORDERKEY)
FROM ORDERS;

INSERT INTO MINMAX
SELECT 'CUSTOMER',MIN(C_CUSTKEY),MAX(C_CUSTKEY)
FROM CUSTOMER;

INSERT INTO MINMAX
SELECT 'PART',MIN(P_PARTKEY),MAX(P_PARTKEY)
FROM PART;

INSERT INTO MINMAX
SELECT 'SUPPLIER',MIN(S_SUPPKEY),MAX(S_SUPPKEY)
FROM SUPPLIER;

INSERT INTO MINMAX
SELECT 'PARTSUPP_PART',MIN(PS_PARTKEY),MAX(PS_PARTKEY)
FROM PARTSUPP;

INSERT INTO MINMAX
SELECT 'PARTSUPP_SUPP',MIN(PS_SUPPKEY),MAX(PS_SUPPKEY)
FROM PARTSUPP ;

INSERT INTO MINMAX
SELECT 'NATION',MIN(N_NATIONKEY),MAX(N_NATIONKEY)
FROM NATION;

INSERT INTO MINMAX
SELECT 'REGION',MIN(R_REGIONKEY),MAX(R_REGIONKEY)
FROM REGION;

SELECT * FROM MINMAX;
```

==========

tshut

```
==========
#!/bin/ksh

if [ "$2" != "" -a "$2" != "1" ]; then
  INUM=$2
  if [ -f $ORACLE_HOME/work/t_init$INUM.ora ]; then
    export ORACLE_SID="$ORACLE_SID"$INUM
  fi
fi

if [ "$1" = "abort" ]; then
svrmgrl << !
connect internal
shutdown abort
```

```
exit
!
else
svrmgrl << !
connect internal
shutdown immediate
exit
!
fi
```

Appendix G. Pricing information

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For Sun pricing please contact:

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