TPC Benchmark™ H
Full Disclosure Report

Sun Microsystems Sun Fire™ X4100 Server Using ParAccel Analytic Database™

Submitted for Review
Report Date: Oct 29, 2007

TPC Benchmark H Full Disclosure Report

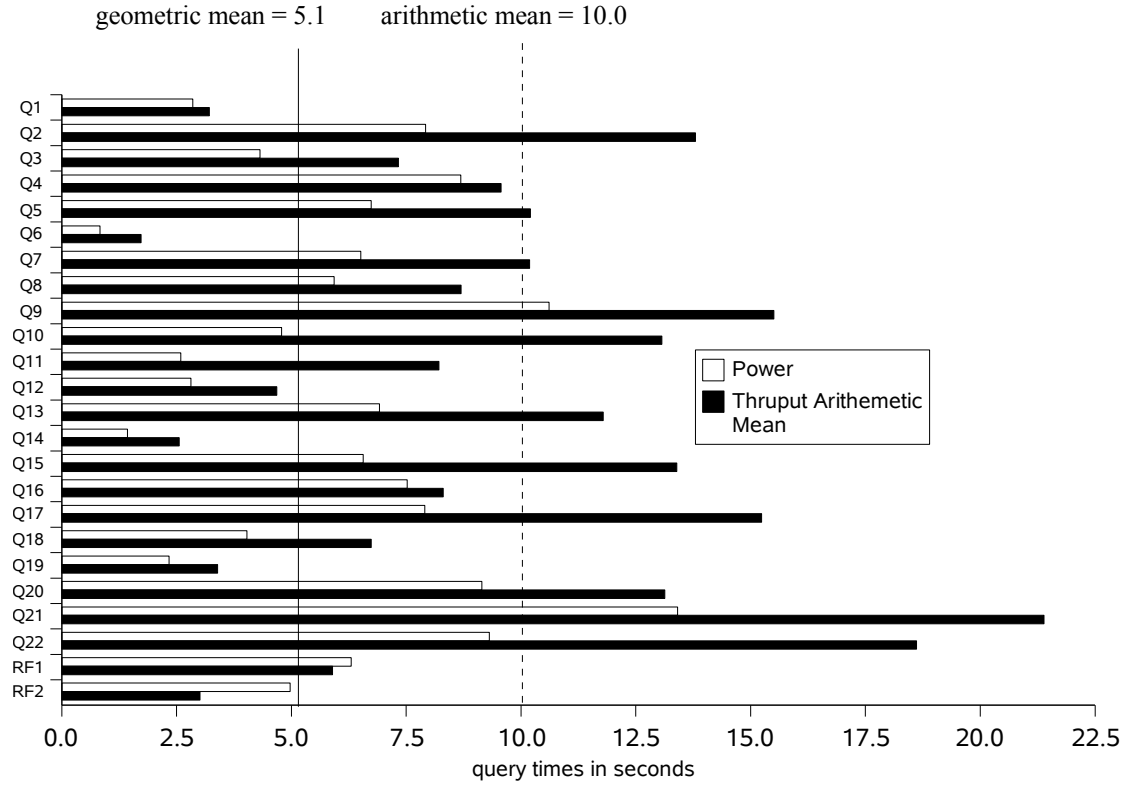
First Printing

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

Sun microsystems / PARACCEL	**Sun Fire™ X4100 Server with ParAccel Analytic Database™**	**TPC-H Rev. 2.6.0** **Report Date: Oct 29, 2007** **Revision Date:Nov8, 2007**

Total System Cost	Composite Query per Hour Metric	Price/Performance
$263,460.06	**98,857.0** QphH@100GB	**$2.65** per QphH@100GB

Database Size	Database Manager	Operating System	Other Software	Availability Date
100GB	**ParAccel Analytic Database™**	**Linux Red Hat RHEL 4.4 Enterprise Server**		**October 29, 2007**



Database Load Time = 0Hrs10Min42ec	Load Includes Backup: N	Total Storage/Database Size=40.08

RAID (Base tables): Y	RAID (Base tables and auxiliary data structures): Y	RAID (All): Y

System Configuration:

15 x SunFire X4100 Server, each server with

2 AMD Opteron 2.8GHz processors (each processor is 1 chip, 2 cores, 2 threads)

16 GB memory

2 x 146 GB (10K RPM) internal SAS disks

Total Storage: 4,079.19 GB (in this calculation 1 GB is defined as 1024 * 1024 * 1024) bytes

Sun Fire™ X4100 Server with ParAccel Analytic Database™

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Description	Part Number	Source	Unit Price	Qty	Ext. Price	3 Yr. maint
Server Hardware						
SunFire X4100 M2 x64 Server 2 X AMD Opteron Model 2220 (2.8GHz) processor 4 X 2GB DDR2-667 Memory 2 X 146 GB HDD	A86-FPZ2BH8GKBA	2	6,590.00	15	98,850.00	
4 GB Memory Kit DDR2-667 DIMMS (2 X 2GB) for SunFire X4100 M2	4226A-Z	2	750.00	30	22,500.00	
Server Discount (14%)		2			-16,989.00	
SunFire X4100 M2 Server upgrade to 3 years. 24x7 hardware only support with 4 hour response	W9D-A87-24-3H	2	792.00	15		11,880.00
Support Discount (10%)		2				-1,188.00
Cisco Catalyst 3750-24TS 24-port switch	WS-C3750-24TS-E	2	5,990.00	2	11,980.00	
3750 Discount @ 38%		2	-2,239.47	2	-4478.94	
Cisco Catalyst 3750-24TS 24-port switch 1 year premium service	CON-OSP-375024TE	2	1,006.00	6		6,036.00
3750 Support Discount		2	-111.78	6		-670.68
Ethernet 100Base-TX cable	A3L791-05-GRN	2	5.99	30	179.70	
Cable discount		2	-1.13	30	-33.90	
APC Smart-UPS 30000VA USB	592679	3	1,182.99	3	3,548.97	
1 Year PC/Peripheral Extended Service $701-$1200	54439	3	53.99	9		485.91
Server Hardware Subtotal					115,556.83	16,543.23
External Storage						
None						
Server Software						
ParAccel Analytic Database, per GB data	PAR-ADB	1	1,000.00	100	100,000.00	
ParAccel Support $10 per Gb data per year	PAR-SUP-B	1	10.00	100		3,000.00
ParAccel Discount 5%		1			-5,000.00	-150.00
RHEL 4.4 24x7 Support per node 3 years (up to 2 sockets)		2	3,702.00	15		55,530.00
RHEL Discount		2	-1,468.00	15		-22,020.00
Server Software Subtotal					95,000.00	36,360.00
			Total		210,556.83	52,903.23
			3 Yr. Cost		263,460.06	
			QphH @100GB		98,857	
			$/QphH @100GB		$2.67	

Service for Sun products from Sun Microsystems, Inc.
Service for ParAccel products is from ParAccel, Inc.
Service for RHEL is from Red Hat Inc.
Service for APC Smart-UPS is from cdw.com

Sources

1. ParAccel, Inc.
2. Continental Resources, Inc.
3. cdw.com

Audited by: Francois Raab, InfoSizing, Inc. (www.sizing.com)

Sun Fire™ X4100 Server with ParAccel Analytic Database™

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Numerical Quantities

Measurement Results:

Database Scale Factor	= 100GB
Total Data Storage / Database Size	= 40.08
Start of database load time	= 15:07:14
End of database load time	= 15:17:56
Database Load Time	= 0Hrs10Min42ec
Query Streams for Throughput Test	= 5
TPC-H Power	= 70,827.4
TPC-H Throughput	= 137,979.1
TPC-H Composite Query-per-Hour Rating (QphH@100GB)	= 98,857.0
Total System Price Over 3 Years	= $263,460.06
TPC-H Price/Performance Metric ($/QphH@100GB)	= $2.65

Measurement Intervals:

Measurement Interval in Throughput Test (Ts)	= 287 seconds

Duration of Stream Execution:

Seed	Start Date	Start Time	End Date	End Time	Duration
1023151756	2007-10-23	15:46:29	2007-10-23	15:48:54	2mins:25secs
1023151757	2007-10-23	15:48:54	2007-10-23	15:52:35	3mins:41secs
1023151758	2007-10-23	15:48:54	2007-10-23	15:52:26	3mins:32secs
1023151759	2007-10-23	15:48:54	2007-10-23	15:52:26	3mins:32secs
1023151760	2007-10-23	15:48:54	2007-10-23	15:52:33	3mins:39secs
1023151761	2007-10-23	15:48:54	2007-10-23	15:52:56	4mins:02secs
	2007-10-23	15:52:56	2007-10-23	15:53:41	0mins:45secs

Sun Fire™ X4100 Server with ParAccel Analytic Database™

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TPC-H Timing Intervals (in seconds)

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
Stream 00	2.9	7.9	4.3	8.7	6.7	0.8	6.5	5.9	10.6	4.8	2.6	2.8
Stream 01	2.8	9.4	10.2	5.0	9.6	2.0	13.3	7.8	19.1	7.8	6.0	5.9
Stream 02	2.5	13.2	6.8	13.7	9.6	1.2	7.5	7.2	19.3	7.2	8.5	4.3
Stream 03	3.4	11.9	4.9	11.3	11.3	2.2	10.3	10.7	14.7	13.0	7.2	3.1
Stream 04	3.4	16.9	8.0	8.0	13.1	1.8	9.2	11.0	13.2	10.2	12.4	4.2
Stream 05	4.0	17.7	6.8	9.9	7.5	1.4	10.6	6.8	11.2	27.1	6.9	5.9
Minimum	2.5	7.9	4.3	5.0	6.7	0.8	6.5	5.9	10.6	4.8	2.6	2.8
Average	3.2	12.8	6.8	9.4	9.6	1.6	9.6	8.2	14.7	11.7	7.3	4.4
Maximum	4.0	17.7	10.2	13.7	13.1	2.2	13.3	11.0	19.3	27.1	12.4	5.9

	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	RF1	Rf2
Stream 00	6.9	1.4	6.6	7.5	7.9	4.0	2.3	9.1	13.4	9.3	6.3	5.0
Stream 01	13.9	2.1	11.5	8.5	16.1	7.5	3.7	13.4	27.7	17.4	7.3	3.6
Stream 02	15.4	3.6	14.3	9.0	13.2	6.5	3.7	12.7	15.4	16.8	4.5	3.1
Stream 03	8.7	1.1	12.3	7.2	16.3	7.5	2.3	16.1	17.7	18.6	6.3	2.3
Stream 04	9.8	4.0	15.2	8.0	12.5	5.3	3.4	10.0	20.2	18.5	6.5	3.4
Stream 05	11.1	2.0	13.7	8.9	18.1	6.9	3.9	13.5	26.0	21.7	5.0	2.7
Minimum	6.9	1.1	6.6	7.2	7.9	4.0	2.3	9.1	13.4	9.3	4.5	2.3
Average	11.0	2.4	12.3	8.2	14.0	6.3	3.2	12.5	20.1	17.1	6.0	3.3
Maximum	15.4	4.0	15.2	9.0	18.1	7.5	3.9	16.1	27.7	21.7	7.3	5.0

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INFO SIZING

TPC TRANSACTION PROCESSING PERFORMANCE COUNCIL CERTIFIED AUDITOR

October 27, 2007

Benchmark Sponsors:

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Chief Technology Officer, ParAccel, Inc.
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9605 Scranton Road, Suite 625
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I verified the TPC Benchmark™ H performance of the following configuration:

Platform: **Sun Fire X4100 Server, 15-node cluster**

Database Manager: **ParAccel Analytic Database™**

Operating System: **Red Hat Linux Enterprise Server**

The results were:

CPU (Speed)	Memory	Disks	QphH@100GB
Sun Fire X4100 Server**, 15-node cluster (each node with)**			
2 x AMD Opteron (2.8 GHz)	16 GB Main	2 x 146 GB	**98,857.0**

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:

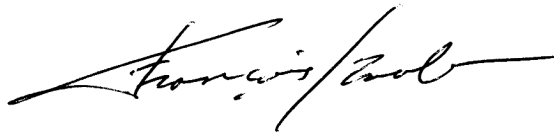
- The database records were defined with the proper layout and size
- The database population was generated using DBGEN
- The database was properly scaled to 100GB and populated accordingly
- The compliance of the database auxiliary data structures was verified
- The database load time was correctly 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
- 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 5 query streams
- The ratio between the longest and the shortest query was such that no query timing was adjusted
- The execution times for queries and refresh functions were correctly measured and reported
- The repeatability of the measured results was verified
- The required amount of database log was configured
- The system pricing was verified for major components and maintenance
- The major pages from the FDR were verified for accuracy

Additional Audit Notes:

Three system crash tests were performed. One for a compute node (every node in the cluster), one for the leader node (one node in the cluster), and one with the full 5-node load protected by each UPS. The 5-node crash test included the leader node. The third crash test was executed on later DBMS binaries. Based on the successful execution of all the other ACID tests with the measured binaries, it is my opinion that the durability requirements have been demonstrated.

Respectfully Yours,



François Raab, President

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 ParAccel, Inc. 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 Linux and ParAccel Analytic Database™ parameters used in this benchmark.

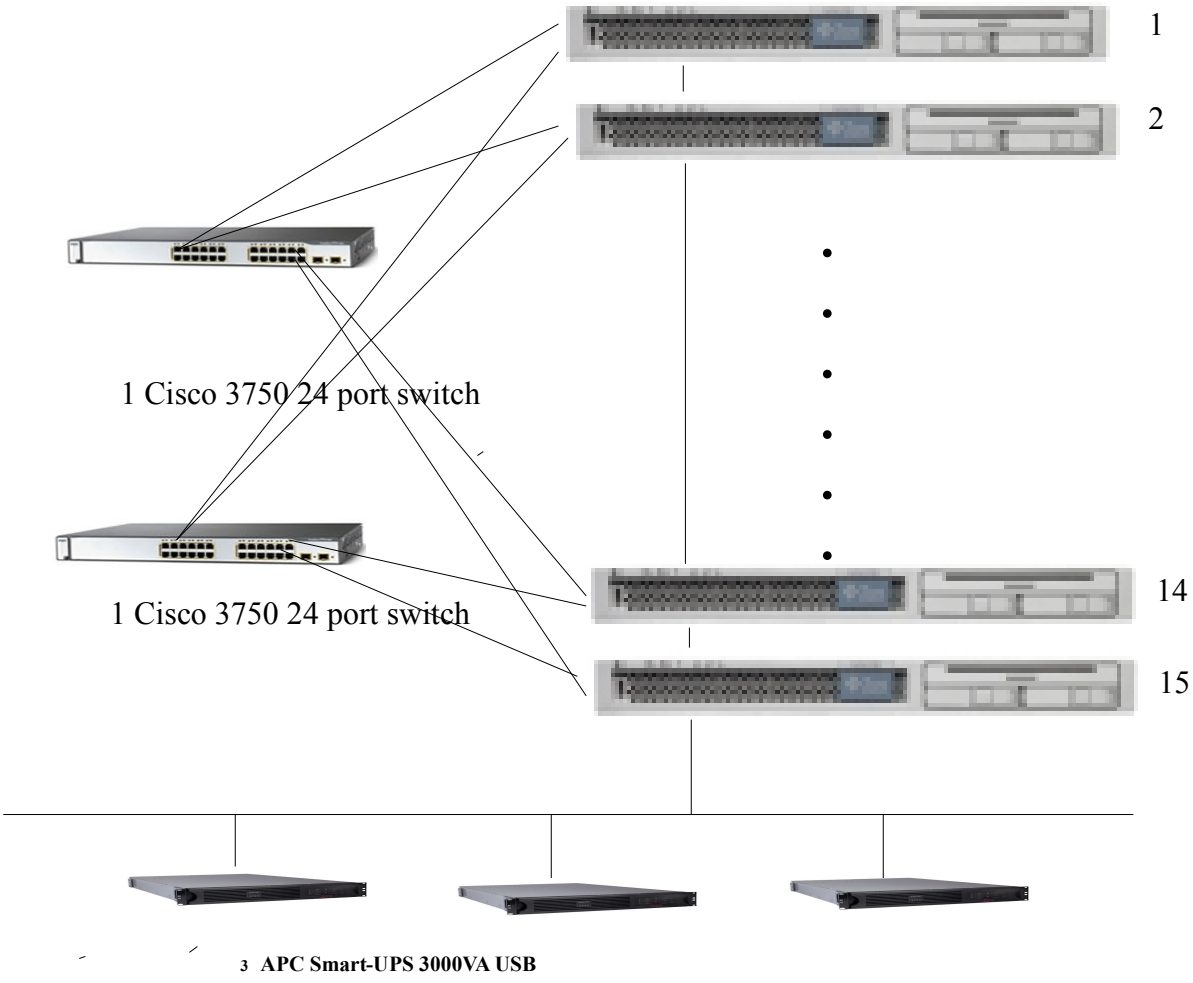
1.3. Configuration Diagram

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

The priced configuration is as follows:

15 SunFire X4100 Servers (each with): **Plus** **2 Cisco 3750 24 Port Switches**

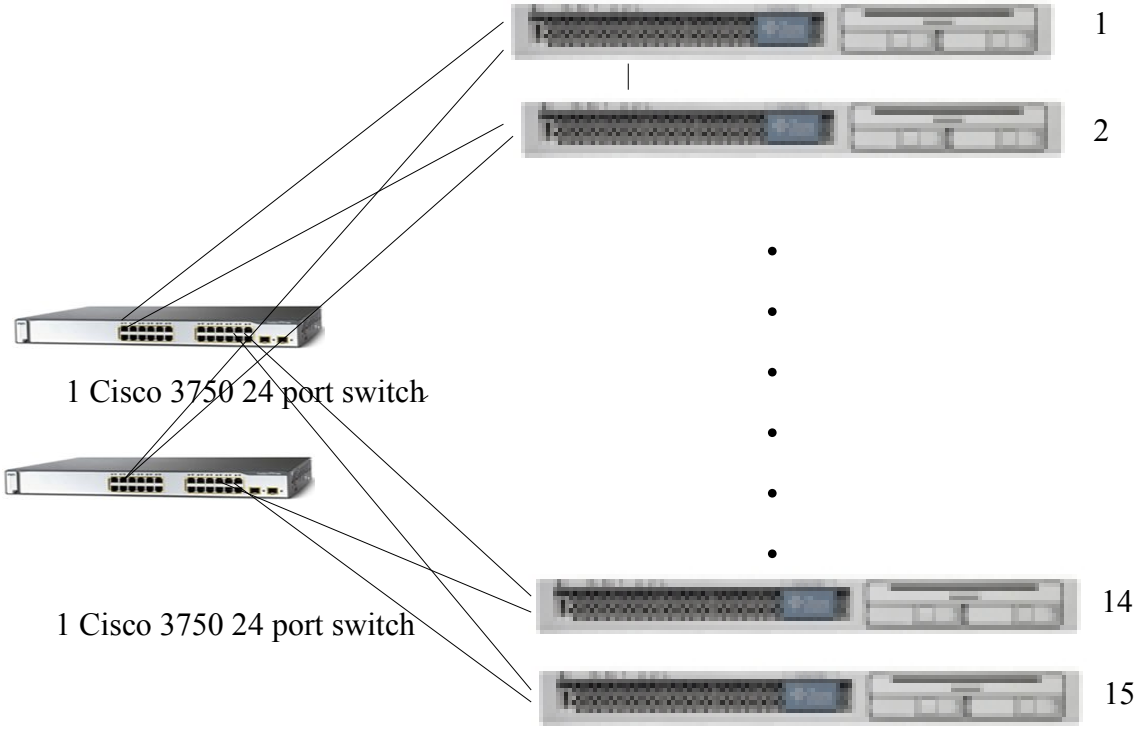
- **2 X 2.8 GHz AMD Opteron Processors** **and** **2 APC Smart-UPS 3000VA USB**
- **16 GB Memory**
- **2 X 143 GB Internal disks**



The measured configuration is as follows:

15 SunFire X4100 Servers (each with): **And** **2 Cisco 3750 24 Port Switches**

- **2 X 2.8 Ghz AMD Opteron Porcessors**
- **16 GB Memory**
- **2 X 143 GB Internal disks**



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 for the TPC-H database.

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.

2.2. Horizontal Partitioning

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

Data is horizontally distributed across all nodes based on hashing the primary key (or the first column if no primary key is specified) for each table. No additional data partitioning was used. See Appendix B for details.

2.3. Replication

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

No form of data 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 2.6.0 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 2.6.0 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 query text and query output. The standard queries were used throughout with the following modifications:

- In Q7, Q8 and Q9, the "date_part" function is used to extract part of a date (e.g., "year").
- In Q2, Q3, Q10, Q18 and Q21, the "limit" function is used to restrict the number of output rows.
- The semicolon (;) is used as a command delimiter.

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.

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).

Appendix B contains the source code for the refresh functions.

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 tests 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 nine 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.
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 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 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 iso6-Query against the qualification database, was started using a randomly selected O_KEY.
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 iso6-Query.

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.

All disks containing TPC-H tables are housed on mirrored (RAID1) volumes. A permanent irrecoverable failure of a single durable medium was simulated by removing one side of a mirror from one of the X4100 servers. The system continued to work as if nothing had happened, as is to be expected when half a a mirror is no longer functioning.

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.

Three system crash tests were performed. One for a compute node (every node in the cluster), one for the leader node (one node in the cluster), and one with the full 5-node load protected by each UPS. The 5-node crash test included the leader node.

In each case power was cut off to the appropriate node, or nodes. When power was restored, the 5-node cluster automatically rebooted. The database was manually 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).

Each cluster node was protected by a UPS, which results in limiting the single point of failure of memory to a single node. The failure was tested as described in 4.5.2. Note, enough UPSs were provided so as to be able to keep all nodes alive after a power failure to the entire cluster.

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*
Lineitem	*600,037,902*
Orders	*150,000,000*
Partsupp	*80,000,000*
Part	*20,000,000*
Customer	*15,000,000*
Supplier	*1,000,000*
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 were stored on 1 RAID 1 volume per server. The volume was constructed using the system RAID Controller.

The following table shows all the disk slices.

Partition	Use	Size (in GB)
sda1	Boot partition	0.1
sda2	Root; data	142
sda3	swap	2

- Secondary swap area was created in /swap/swapfile with size = 16GB

5.3. Database partition/replication mapping

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

The rows of each table are horizontally distributed across all nodes based on hashing the primary key (or the first column if no primary key is specified) for each table. No additional data partitioning was used. In addition, no form of data replication was used.

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.

RAID 1 was used for all base tables and auxiliary data structures.

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 2.6.0 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 =0Hrs10Min42ec

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.

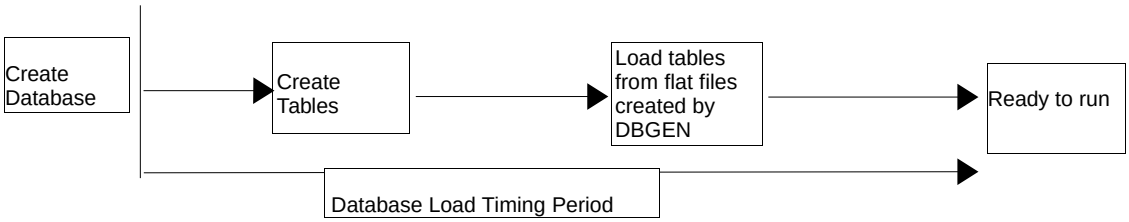
The data storage ratio is computed from the following information:

Disk Type	# of Disks	GB* per disk	Total Disk Space in GB**
Internal	30	146	4079.19
		Total Space	4079.19
		Data Storage Ratio	40.79

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

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 test database was loaded using flat files. All load scripts are included in Appendix B.
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 only the necessary adjustments for size differences.

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. The DBMS on the SUT was rebooted between the conclusion of the load test and the beginning of the performance test
2. No other activity on the SUT occurred between the conclusion of the load test and the beginning of the performance test

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 timing intervals for each query and both update functions are reported on the page titled “Numerical Quantities”, contained in the beginning of this document and replicated in the Executive Summary document.

6.4. Number of Streams for the Throughput Test

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

5 query streams and one refresh stream 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 start times and finish times for each query stream in the throughput test are reported on the page titled “Numerical Quantities”, contained in the beginning of this document and replicated in the Executive Summary 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 reported on the page titled "Numerical Quantities", contained in the beginning of this document and replicated in the Executive Summary 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:

Stream ID	Refresh Function	Start Date	Start Time	End Date	End Time
stream01	RF1	2007-10-23	15:52:56	2007-10-23	15:53:04
stream01	RF2	2007-10-23	15:53:04	2007-10-23	15:53:07
stream02	RF1	2007-10-23	15:53:07	2007-10-23	15:53:12
stream02	RF2	2007-10-23	15:53:12	2007-10-23	15:53:15
stream03	RF1	2007-10-23	15:53:15	2007-10-23	15:53:21
stream03	RF2	2007-10-23	15:53:21	2007-10-23	15:53:23
stream04	RF1	2007-10-23	15:53:23	2007-10-23	15:53:30
stream04	RF2	2007-10-23	15:53:30	2007-10-23	15:53:33
stream05	RF1	2007-10-23	15:53:33	2007-10-23	15:53:38
stream05	RF2	2007-10-23	15:53:38	2007-10-23	15:53:41

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 reported on the page titled "Numerical Quantities", contained in the beginning of this document and replicated in the Executive Summary 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 reported on the page titled "Numerical Quantities", contained in the beginning of this document and replicated in the Executive Summary 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 three metrics:

Run ID	QppH @100GB	QptH @100GB	QppH @100GB
Run 1	70,827.4	137,979.1	98,857.0
Run 2	91,851.0	157,142.9	120,140.8
% Difference	22.89%	12.20%	17.72%

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.

No activity occurred between Run 1 and Run 2.

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 entire test is run by executing the ntest shellscript.

The text of ntest is reproduced in Appendix E and the texts of the subscripts invoked by ntest are reproduced in Appendix B.

The scripts that perform the query streams within the power and throughput tests are generated by the gen_streams_new .ksh script (which in turn invokes QGEN to generate the actual query stream files).

The Power Test is performed when ntest executes update_power.sql, which in turn runs the refresh functions and the power stream queries.

The Throughput Test is performed when ntest concurrently executes the 5 query stream scripts, stream[1-5].sql, together with the script update_throughput5.sql. The latter starts the refresh stream.

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.

All database configuration was done through scripts disclosed in Appendix B.

The performance tests are performed using pSql. It is a Postgres -provided utility that allows SQL statements to be executed against the ParAccel Analytic Database™. The psql utility is invoked from the command-line on the SUT. It reads input from files containing SQL statements and sends results to stdout. The performance test scripts utilizing psql can be found in Appendix E.

The ACID tests are performed using pSQL. All the ACID test scripts are reproduced in Appendix B.

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 for the pricing spreadsheet and Appendix G for the actual price quotes used to create the spreadsheet.

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 $263,460.06. For details of pricing, see the second page of the Executive Summary.

Discounts were taken from actual price quotes,available to any buyer with like conditions, provided by Continental Resources Inc. and ParAccel Inc. The respective price quotes are included in Appendix G of this document.

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 and software components used in the measured configuration are generally available as of October 29, 2007.

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 follows the table of contents.

Appendix A. ParAccel and Linux Parameters

This Appendix contains Linux kernel parameters and environment variables and ParAccel system parameters.

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

ParAccel Server Configuration Parameters

(altered from default)

```
================================================
not applicable
```

Linux Parameters

(altered from default)

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

/boot/grub/grub.conf

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

Added acpi=off to kernel boot parameters
Added ramdisk_size=64000 to kernel boot parameters

The following kernel parameters were changed during
the run time:
kernel.msgmni=1000
kernel.sem = 128000 1048576 32 3072
vm.dirty_writeback_centisecs = 2000
net.core.rmem_max = 8388608
net.core.rmem_default = 8388608
```

Appendix B. Programs and Scripts

```
================================================
load_tpch.sh
================================================

#! /bin/bash
source $HOME/.bashrc

psql dev -f create_tpch_schema.sql

echo XXXXXXXXXXXXXX load data
XXXXXXXXXXXXXXX
psql dev -c "copy customer from
'/tpch_data/customer.tbl' delimiter as '|'"
psql dev -c "copy lineitem from
'/tpch_data/lineitem.tbl' delimiter as '|'"
psql dev -c "copy orders from
'/tpch_data/orders.tbl' delimiter as '|' "
psql dev -c "copy part from
'/tpch_data/part.tbl' delimiter as '|' "
psql dev -c "copy partsupp from
'/tpch_data/partsupp.tbl' delimiter as '|'
"
psql dev -c "copy supplier from
'/tpch_data/supplier.tbl' delimiter as '|'
"
psql dev -c "copy nation from
'/tpch_data/nation.tbl' delimiter as '|'"
psql dev -c "copy region from
'/tpch_data/region.tbl' delimiter as '|'"
echo XXXXXXXXXXXXXX analyze all
XXXXXXXXXXXXXX
psql dev -c "analyze"


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

create_tpch_schema.sql

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

BEGIN;

create table part (
  p_partkey int4 not null encode delta,
  p_name varchar(55) not null,
  p_mfgr char(25) not null encode bytedict,
  p_brand char(10) not null encode bytedict,
  p_type varchar(25) not null,
  p_size int4 not null encode bytedict,
  p_container char(10) not null encode bytedict,
  p_retailprice numeric(12,2) not null encode
delta32k,
  p_comment varchar(23) not null encode text255,
  PRIMARY KEY (p_partkey)
);

create table region (
  r_regionkey int4 not null encode always8,
  r_name char(25) not null encode bytedict,
  r_comment varchar(152) not null,
  PRIMARY KEY (r_regionkey)
);

create table nation (
  n_nationkey int4 not null encode always8,
  n_name char(25) not null encode bytedict,
  n_regionkey int4 not null encode always8,
  n_comment varchar(152) not null,
  PRIMARY KEY (n_nationkey),
  FOREIGN KEY (n_regionkey) REFERENCES region
(r_regionkey)
);

create table supplier (
  s_suppkey int4 not null,
  s_name char(25) not null,
  s_address varchar(40) not null,
  s_nationkey int4 not null encode always8,
  s_phone char(15) not null,
  s_acctbal numeric(12,2) not null,
  s_comment varchar(101) not null encode text255,
  PRIMARY KEY (s_suppkey),
  FOREIGN KEY (s_nationkey) REFERENCES nation
(n_nationkey)
);


create table partsupp (
  ps_partkey int4 not null encode delta,
  ps_suppkey int4 not null encode delta32k,
  ps_availqty int4 not null encode delta32k,
  ps_supplycost numeric(12,2) not null encode zeros,
  ps_comment varchar(199) not null encode text255,
  PRIMARY KEY (ps_partkey, ps_suppkey),
  FOREIGN KEY (ps_partkey) REFERENCES part
(p_partkey),
  FOREIGN KEY (ps_suppkey) REFERENCES supplier
(s_suppkey)
);

create table customer (
  c_custkey int4 not null encode delta,
  c_name varchar(25) not null,
  c_address varchar(40) not null,
  c_nationkey int4 not null encode bytedict,
  c_phone char(15) not null,
```

```
  c_acctbal numeric(12,2) not null encode zeros,
  c_mktsegment char(10) not null encode bytedict,
  c_comment varchar(117) not null encode text255,
  PRIMARY KEY (c_custkey),
  FOREIGN KEY (c_nationkey) REFERENCES nation
(n_nationkey)
);

create table orders (
  o_orderkey int4 not null encode delta,
  o_custkey int4 not null,
  o_orderstatus char(1) not null,
  o_totalprice numeric(12,2) not null encode always32,
  o_orderdate date not null encode delta32k,
  o_orderpriority char(15) not null encode bytedict,
  o_clerk char(15) not null,
  o_shippriority int4 not null encode runlength,
  o_comment varchar(79) not null encode text255,
  PRIMARY KEY (o_orderkey),
  FOREIGN KEY (o_custkey) REFERENCES customer
(c_custkey)
);

create table lineitem (
  l_orderkey int4 not null encode delta,
  l_partkey int4 not null,
  l_suppkey int4 not null,
  l_linenumber int4 not null encode always8,
  l_quantity numeric(12,2) not null encode bytedict,
  l_extendedprice numeric(12,2) not null encode
always32,
  l_discount numeric(12,2) not null encode bytedict,
  l_tax numeric(12,2) not null encode bytedict,
  l_returnflag char(1) not null,
  l_linestatus char(1) not null,
  l_shipdate date not null encode delta,
  l_commitdate date not null encode delta,
  l_receiptdate date not null encode delta,
  l_shipinstruct char(25) not null encode bytedict,
  l_shipmode char(10) not null encode bytedict,
  l_comment varchar(44) not null encode text255,
  FOREIGN KEY (l_orderkey) REFERENCES orders
(o_orderkey),
  FOREIGN KEY (l_partkey,l_suppkey) REFERENCES
partsupp (ps_partkey,ps_suppkey)
);

COMMIT;
```

==========

createdb.sh

==========

```
#!/bin/sh

createdb tpch
```

==========

create_rf1.sql

==========

```
create or replace function rf1(id int) returns int as
$procedure$
declare
  streamid integer;
  str_sql varchar(500);
begin
  streamid := id;

  str_sql = 'copy orders from
\'/tpch_data/orders.tbl.u' || streamid ||
    '\' with delimiter \'|\'';
  execute str_sql;

  str_sql = 'copy lineitem from
\'/tpch_data/lineitem.tbl.u' || streamid ||
    '\' with delimiter \'|\'';
  execute str_sql;

  return streamid;
end;
$procedure$
language plpgsql;
```

==========

create_rf2.sql

==========

```
create or replace function rf2(id int) returns int as
$procedure$
declare
  streamid integer;
  str_sql varchar(500);
begin
  streamid := id;

  create table delete_ids (
    d_orderkey int4 not null encode delta
  );

  str_sql = 'copy delete_ids from
\'/tpch_data/delete.' || streamid ||
    '\' with delimiter \'|\'';
  execute str_sql;

  analyze delete_ids;

  delete from lineitem where l_orderkey in (select
d_orderkey from delete_ids);
  delete from orders where o_orderkey in (select
d_orderkey from delete_ids);

  drop table delete_ids;

  return streamid;
end;
$procedure$
language plpgsql;
```

==========

load_region.sql

==========

```
select 'LOAD REGION START - ',
date_part('epoch',LOCALTIMESTAMP(3)), localtimestamp ;
copy region from '/tpch_data/region.tbl';
select 'LOAD REGION STOP  - ',
date_part('epoch',LOCALTIMESTAMP(3)), localtimestamp ;
```

==========

load_nation.sql

==========

```
select 'LOAD NATION START - ',
date_part('epoch',LOCALTIMESTAMP(3)), localtimestamp ;
copy nation from '/tpch_data/nation.tbl';
select 'LOAD NATION STOP  - ',
date_part('epoch',LOCALTIMESTAMP(3)), localtimestamp ;
```

==========

load_customer.sql

==========

```
select 'LOAD CUSTOMER START - ',
date_part('epoch',LOCALTIMESTAMP(3)), localtimestamp ;
copy customer from '/tpch_data/customer.tbl' WITH
PARALLEL;
select 'LOAD CUSTOMER STOP  - ',
date_part('epoch',LOCALTIMESTAMP(3)), localtimestamp ;
```

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

load_part.sql

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

select 'LOAD PART START - ',
date_part('epoch',LOCALTIMESTAMP(3)), localtimestamp ;
copy part from '/tpch_data/part.tbl' WITH PARALLEL;
select 'LOAD PART STOP  - ',
date_part('epoch',LOCALTIMESTAMP(3)), localtimestamp ;


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

load_supplier.sql

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

select 'LOAD SUPPLIER START - ',
date_part('epoch',LOCALTIMESTAMP(3)), localtimestamp ;
copy supplier from '/tpch_data/supplier.tbl' WITH
PARALLEL;
select 'LOAD SUPPLIER STOP - ',
date_part('epoch',LOCALTIMESTAMP(3)), localtimestamp ;

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

load_partsupp.sql

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

select 'LOAD PARTSUPP START - ',
date_part('epoch',LOCALTIMESTAMP(3)), localtimestamp ;
copy partsupp from '/tpch_data/partsupp.tbl' WITH
PARALLEL;
select 'LOAD PARTSUPP STOP  - ',
date_part('epoch',LOCALTIMESTAMP(3)), localtimestamp ;

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

load_orders.sql

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

select 'LOAD ORDERS START - ',
date_part('epoch',LOCALTIMESTAMP(3)), localtimestamp ;
copy orders from '/tpch_data/orders.tbl' WITH
PARALLEL;
select 'LOAD ORDERS STOP  - ',
date_part('epoch',LOCALTIMESTAMP(3)), localtimestamp ;

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

load_lineitem.sql

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

select 'LOAD LINEITEM START - ',
date_part('epoch',LOCALTIMESTAMP(3)), localtimestamp ;
copy lineitem from '/tpch_data/lineitem.tbl' WITH
PARALLEL;
select 'LOAD LINEITEM STOP  - ',
date_part('epoch',LOCALTIMESTAMP(3)), localtimestamp ;


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

create_tables_int.sh

```
================================================
BEGIN;

-- Create the tpch tables with optimal compression.

create table part (
  p_partkey int4 not null encode delta,
  p_name varchar(55) not null,
  p_mfgr char(25) not null encode bytedict,
  p_brand char(10) not null encode bytedict,
  p_type varchar(25) not null,
  p_size int4 not null encode bytedict,
  p_container char(10) not null encode bytedict,
  p_retailprice numeric(12,2) not null encode
delta32k,
  p_comment varchar(23) not null encode text255
);

create table region (
  r_regionkey int4 not null encode always8,
  r_name char(25) not null encode bytedict,
  r_comment varchar(152) not null
);

create table nation (
  n_nationkey int4 not null encode always8,
  n_name char(25) not null encode bytedict,
  n_regionkey int4 not null encode always8,
  n_comment varchar(152) not null
);

create table supplier (
  s_suppkey int4 not null,
  s_name char(25) not null,
  s_address varchar(40) not null,
  s_nationkey int4 not null encode always8,
  s_phone char(15) not null,
  s_acctbal numeric(12,2) not null,
  s_comment varchar(101) not null encode text255
);


create table partsupp (
  ps_partkey int4 not null encode delta,
  ps_suppkey int4 not null encode delta32k,
  ps_availqty int4 not null encode delta32k,
  ps_supplycost numeric(12,2) not null encode zeros,
  ps_comment varchar(199) not null encode text255
);

create table customer (
  c_custkey int4 not null encode delta,
  c_name varchar(25) not null,
  c_address varchar(40) not null,
  c_nationkey int4 not null encode bytedict,
  c_phone char(15) not null,
  c_acctbal numeric(12,2) not null encode zeros,
  c_mktsegment char(10) not null encode bytedict,
  c_comment varchar(117) not null encode text255
);

create table orders (
  o_orderkey int4 not null encode delta,
  o_custkey int4 not null,
  o_orderstatus char(1) not null,
  o_totalprice numeric(12,2) not null encode always32,
  o_orderdate date not null encode delta32k,
  o_orderpriority char(15) not null encode bytedict,
  o_clerk char(15) not null,
  o_shippriority int4 not null encode runlength,
  o_comment varchar(79) not null encode text255
);

create table lineitem (
  l_orderkey int4 not null encode delta,
  l_partkey int4 not null,
  l_suppkey int4 not null,
  l_linenumber int4 not null encode always8,
  l_quantity numeric(12,2) not null encode bytedict,
  l_extendedprice numeric(12,2) not null encode
always32,
  l_discount numeric(12,2) not null encode bytedict,
  l_tax numeric(12,2) not null encode bytedict,
  l_returnflag char(1) not null,
  l_linestatus char(1) not null,
  l_shipdate date not null encode delta,
  l_commitdate date not null encode delta,
  l_receiptdate date not null encode delta,
  l_shipinstruct char(25) not null encode bytedict,
  l_shipmode char(10) not null encode bytedict,
  l_comment varchar(44) not null encode text255
);

COMMIT;
```

```
#!/bin/bash
echo "----------------------------"
echo "Running the 22 TPC-H queries"
echo "----------------------------"
for query in 1 2 3 4 5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20 21 22; do psql dev -f
q$query.sql > q$query.out; done
echo
"-------------------------------------"
echo "Finished running the 22 TPC-H
queries"
echo
"-------------------------------------"
```

==========

ACID Test Execution Code

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

acid_trans.sh

==========

```
#!/bin/bash
#
# TPC-H ACID Transaction
#
# Copyright 2007 ParAccel, Inc
#
O_KEY=$1
L_KEY=$2
DELTA=$3
COMMIT=$4
SLEEP=$5

echo ACID Trans -- Started at: `date`

if [ -z $SLEEP ]
   then
     let "SLEEP = 0"
     echo ACID Trans -- No Sleep before ${COMMIT}
   else
     let "SLEEP = $SLEEP"
     echo ACID Trans -- With Sleep = $SLEEP before
${COMMIT}
fi

# Perform updates and insert for the ACID test

echo ACID Trans -- o_orderkey = ${O_KEY}, line_number
= ${L_KEY}, delta = $DELTA

psql -q -t dev <<EOFb >> /dev/null
BEGIN TRANSACTION;

-- 1. Update Orders a first time to remove old
lineitem from total price

update ORDERS
   set O_TOTALPRICE = O_TOTALPRICE - (
     select ROUND( ROUND(L_EXTENDEDPRICE * (1.0 -
L_DISCOUNT), 2) * (1.0 + L_TAX), 2 )
       from LINEITEM
      where L_ORDERKEY = $O_KEY
        and L_LINENUMBER = $L_KEY )
 where O_ORDERKEY = $O_KEY ;

-- 2. Update Linetime to increase quantity

update LINEITEM
   set L_EXTENDEDPRICE = L_EXTENDEDPRICE + ROUND(
ROUND(L_EXTENDEDPRICE/L_QUANTITY, 2) * $DELTA, 2 ),
       L_QUANTITY = L_QUANTITY +  $DELTA
 where L_ORDERKEY = $O_KEY
   and L_LINENUMBER = $L_KEY ;

-- 3. Update Orders a second time to add updated
lineitem to total price

update ORDERS
   set O_TOTALPRICE = O_TOTALPRICE + (
     select ROUND( ROUND(L_EXTENDEDPRICE * (1.0 -
L_DISCOUNT), 2)* (1 + L_TAX), 2 )
       from LINEITEM
      where L_ORDERKEY = $O_KEY
        and L_LINENUMBER = $L_KEY )
 where O_ORDERKEY = $O_KEY ;

-- 4. Insert History records of transaction

insert into HISTORY
   (select L_PARTKEY, L_SUPPKEY, L_ORDERKEY,
L_LINENUMBER, $DELTA, LOCALTIMESTAMP
      from LINEITEM
     where L_ORDERKEY = $O_KEY
       and L_LINENUMBER = $L_KEY );

select sleep($SLEEP);

$COMMIT TRANSACTION;
EOFb
RC=$?
echo ACID Trans -- Completed at: `date`
exit $RC
```

==========

acid_setup.sh

==========

```
#!/bin/bash
#
# TPC-H ACID Setup
#
# Copyright 2007 ParAccel, Inc
#

echo ParAccel ACID Setup Starts `date`
echo


if [ -z "$2" ]
then
  OUTFILE="orderkeys.txt"
else
  OUTFILE="$2"
fi

# Clean history table
psql -q -t dev <<EOF10
     delete from HISTORY;
     \q
EOF10

# Create file with order keys to be used for
consistency testing

if [ -f $OUTFILE ]
then
  rm $OUTFILE
fi

# Get Max Order Key
MAX_O_KEY=`psql -q -t dev <<EOF10
     select  max(O_ORDERKEY)
        from ORDERS;
     \q
EOF10`

echo Maximum Order Key $MAX_O_KEY

i="0"
```

```
while [ $i -lt $1 ]
do
# Get Random Orderkey and maximum lineitem
  DELTA=$RANDOM
  let "DELTA %= 101"
  if [ $DELTA -eq 0 ]; then
     DELTA=1
  fi
  O_KEY=$RANDOM
  let "O_KEY %= ${MAX_O_KEY}"
  L_KEY=`psql -q -t dev <<EOF11
     select  max(L_LINENUMBER)
        from LINEITEM
       where L_ORDERKEY = $O_KEY;
  \q
EOF11`
if [ ${L_KEY}x != "x" ]; then
  echo $O_KEY $L_KEY $DELTA
  echo $O_KEY $L_KEY $DELTA >> $OUTFILE
  i=$[$i+1]

fi
done

echo
echo ParAccel ACID  Setup Complete `date`

exit
```

==========

create_history.dll

==========

```
create table HISTORY
(
H_P_KEY int,
H_S_KEY int,
H_O_KEY int,
H_L_KEY int,
H_DELTA int,
H_DATE_T datetime
);
```

==========

atomicity test

==========

==========

acid_atomicity.sh

==========

```
#!/bin/bash
#
# TPC-H ACID Atomicity Test
#
# Copyright 2007 ParAccel, Inc
#

echo Atomicity Test -- Started at: `date`
echo

#
############################################################
####
# Run ROLLBACK case

# Clean history table
echo Atomicity Test -- Clearing History Table
psql -q -t dev <<EOF11
     delete from HISTORY;
     \q
EOF11
echo

# Testing ROLLBACK case
echo Atomicity Test -- Starting ROLLBACK loop at:
`date`
echo
i="0"
while read O_KEY L_KEY DELTA
do
if [ ${L_KEY}x != "x" ]; then
  echo
-------------------------------------------------------
-------
  echo Atom - Rollback -- For O_KEY = $O_KEY L_KEY =
$L_KEY DELTA = $DELTA
  echo Atom - Rollback -- Before Values
  i=$[$i+1]
  psql -q -t dev <<EOF12
     select
            L_EXTENDEDPRICE as L_EXTENDED,
            L_QUANTITY as L_QUANTITY,
               L_DISCOUNT as L_DISCOUNT,
               L_TAX as L_TAX,
            O_TOTALPRICE as O_TOTAL
       from ORDERS,
            LINEITEM
      where O_ORDERKEY = $O_KEY
        and L_ORDERKEY = O_ORDERKEY
        and L_LINENUMBER = $L_KEY;
     \q
EOF12

./acid_trans.sh $O_KEY $L_KEY $DELTA ROLLBACK

  echo
  echo Atom - Rollback -- After Values
  psql -q -t dev <<EOF13
     select
            L_EXTENDEDPRICE as L_EXTENDED,
            L_QUANTITY as L_QUANTITY,
               L_DISCOUNT as L_DISCOUNT,
               L_TAX as L_TAX,
            O_TOTALPRICE as O_TOTAL
       from ORDERS,
            LINEITEM
      where O_ORDERKEY = $O_KEY
        and L_ORDERKEY = O_ORDERKEY
        and L_LINENUMBER = $L_KEY;
     \q
EOF13

fi
done < orderkeys.txt

echo
echo Atom - Rollback -- Records in History Table
psql -q -t dev <<EOF14
     select *
       from HISTORY;
     \q
EOF14

#
############################################################
####
# Run COMMIT case

echo
echo Atomicity Test -- Starting COMMIT loop at: `date`
echo
i="0"
while read O_KEY L_KEY DELTA
do
if [ ${L_KEY}x != "x" ]; then
  echo
-------------------------------------------------------
-------
  echo Atom - Commit -- For O_KEY = $O_KEY L_KEY =
$L_KEY DELTA = $DELTA
  echo Atom - Commit -- Before Values
  i=$[$i+1]
  psql -q -t dev <<EOF22
```

```
     select
            L_EXTENDEDPRICE as L_EXTENDED,
            L_QUANTITY as L_QUANTITY,
               L_DISCOUNT as L_DISCOUNT,
               L_TAX as L_TAX,
            O_TOTALPRICE as O_TOTAL
       from ORDERS,
            LINEITEM
      where O_ORDERKEY = $O_KEY
        and L_ORDERKEY = O_ORDERKEY
        and L_LINENUMBER = $L_KEY;
     \q
EOF22

./acid_trans.sh $O_KEY $L_KEY $DELTA COMMIT

  echo
  echo Atom - Commit -- After Values
  psql -q -t dev <<EOF23
     select
            L_EXTENDEDPRICE as L_EXTENDED,
            L_QUANTITY as L_QUANTITY,
               L_DISCOUNT as L_DISCOUNT,
               L_TAX as L_TAX,
            O_TOTALPRICE as O_TOTAL
       from ORDERS,
            LINEITEM
      where O_ORDERKEY = $O_KEY
        and L_ORDERKEY = O_ORDERKEY
        and L_LINENUMBER = $L_KEY;
     \q
EOF23

fi
done < orderkeys.txt

echo
echo Atom - Commit -- Records in History Table
psql -q -t dev <<EOF24
     select *
       from HISTORY;
     \q
EOF24

echo
echo Atomicity Test -- Completed at: `date`
exit
```

==========

consistency test

==========

==========

acid_consistency_main.sh

==========

```
#!/bin/bash
#
# TPC-H ACID Consistency Main
#
# Copyright 2007 ParAccel, Inc
#
NUMOFKEYS=100
echo Consistency Test -- Starts `date`
echo
./acid_setup.sh $NUMOFKEYS con_orderkeys1.txt
./acid_setup.sh $NUMOFKEYS con_orderkeys2.txt
./acid_setup.sh $NUMOFKEYS con_orderkeys3.txt
./acid_setup.sh $NUMOFKEYS con_orderkeys4.txt
./acid_setup.sh $NUMOFKEYS con_orderkeys5.txt
./acid_setup.sh $NUMOFKEYS con_orderkeys6.txt
./acid_setup.sh $NUMOFKEYS con_orderkeys7.txt
./acid_setup.sh $NUMOFKEYS con_orderkeys8.txt
./acid_setup.sh $NUMOFKEYS con_orderkeys9.txt
# Get sample number of keys for verification
tail -3 con_orderkeys1.txt > con_samplekeys.txt
tail -3 con_orderkeys2.txt >> con_samplekeys.txt
tail -3 con_orderkeys3.txt >> con_samplekeys.txt
tail -3 con_orderkeys4.txt >> con_samplekeys.txt
tail -3 con_orderkeys5.txt >> con_samplekeys.txt
tail -3 con_orderkeys6.txt >> con_samplekeys.txt
tail -3 con_orderkeys7.txt >> con_samplekeys.txt
tail -3 con_orderkeys8.txt >> con_samplekeys.txt
tail -3 con_orderkeys9.txt >> con_samplekeys.txt
echo
echo Consistency Test -- Pre Verify Start `date`
echo
# loop through sample keys for verification
while read O_KEY LKEY DELTA
do
    psql -q -t dev <<EOF10
    select O_ORDERKEY,
           O_TOTALPRICE,
           sum(round(round(L_EXTENDEDPRICE*
           (1-L_DISCOUNT),2)*(1+L_TAX),2)),
           round(O_TOTALPRICE -
sum(round(round(L_EXTENDEDPRICE*
           (1-L_DISCOUNT),2)*(1+L_TAX),2)),1)
    from ORDERS join LINEITEM
      on O_ORDERKEY = L_ORDERKEY
     and O_ORDERKEY = $O_KEY
   group by 1, 2;
\q
EOF10
done < con_samplekeys.txt
echo
echo Consistency Test -- Pre Verify Complete `date`
echo
echo Consistency Test -- Start Transactions
./acid_consistency_loop.sh con_orderkeys1.txt >
con_log1 &
sleep 3
./acid_consistency_loop.sh con_orderkeys2.txt >
con_log2 &
sleep 3
./acid_consistency_loop.sh con_orderkeys3.txt >
con_log3 &
sleep 3
./acid_consistency_loop.sh con_orderkeys4.txt >
con_log4 &
sleep 3
./acid_consistency_loop.sh con_orderkeys5.txt >
con_log5 &
sleep 3
./acid_consistency_loop.sh con_orderkeys6.txt >
con_log6 &
sleep 3
./acid_consistency_loop.sh con_orderkeys7.txt >
con_log7 &
sleep 3
./acid_consistency_loop.sh con_orderkeys8.txt >
con_log8 &
sleep 3
./acid_consistency_loop.sh con_orderkeys9.txt >
con_log9 &
wait
echo
echo Consistency Test -- Transactions Completed
echo
echo Consistency Test -- Post Verify Starts `date`
echo

# loop through sample keys for verification
while read O_KEY LKEY DELTA
do
    psql -q -t dev <<EOF10
    select O_ORDERKEY,
           O_TOTALPRICE,
           sum(round(round(L_EXTENDEDPRICE*
           (1-L_DISCOUNT),2)*(1+L_TAX),2)),
           round(O_TOTALPRICE -
sum(round(round(L_EXTENDEDPRICE*
           (1-L_DISCOUNT),2)*(1+L_TAX),2)),1)
    from ORDERS join LINEITEM
```

```
      on O_ORDERKEY = L_ORDERKEY
     and O_ORDERKEY = $O_KEY
   group by 1, 2;
\q
EOF10
done < con_samplekeys.txt

echo Consistency Test -- Post Verify Complete `date`
echo
echo Consistency Test -- Complete `date`
```

==========

acid_consistency_loop.sh

==========

```
#!/bin/bash
#
# TPC-H ACID Consistency Transaction Loop
#
# Copyright 2007 ParAccel, Inc
#

echo Transaction Loop -- Starts `date`
echo
KEYFILE=$1
echo Transaction Loop -- Reading from $KEYFILE
# Loop through the orderkey and linenumber in
consistency_values.txt

while read O_KEY L_KEY DELTA
do
   ./acid_trans.sh $O_KEY $L_KEY $DELTA COMMIT
   sleep 1
done < $KEYFILE

echo Transaction Loop -- Completed `date`
```

==========

isolation tests

==========

==========

acid_isolation_main1.sh

==========

```
#!/bin/bash
#
# TPC-H ACID Isolation Main 1
#
# Copyright 2007 ParAccel, Inc
#

echo ISO Test 1 -- Test Starting at `date`
read O_KEY L_KEY DELTA < orderkeys.txt
echo ISO Test 1 -- Before Query
./acid_query.sh $O_KEY
echo ISO Test 1 -- Starting Transaction
# Run Transaction
./acid_trans.sh $O_KEY $L_KEY $DELTA COMMIT 15 &
sleep 5
echo ISO Test 1 -- Starting Query
./acid_query.sh $O_KEY
echo ISO Test 1 -- Query Completed
wait
echo ISO Test 1 -- All Completed
./acid_query.sh $O_KEY
echo ISO Test 1 -- End of Test at `date`
exit 0
```

==========

acid_isolation_main2.sh

==========

```
#!/bin/bash
#
# TPC-H ACID Isolation Main 2
#
# Copyright 2007 ParAccel, Inc
#

echo ISO Test 2 -- Test Starting at `date`
read O_KEY L_KEY DELTA < orderkeys.txt
echo ISO Test 2 -- Before Query
./acid_query.sh $O_KEY
echo ISO Test 2 -- Starting Transaction
# Run Transaction
./acid_trans.sh $O_KEY $L_KEY $DELTA ROLLBACK 15 &
sleep 5
echo ISO Test 2 -- Starting Query
./acid_query.sh $O_KEY
echo ISO Test 2 -- Query Completed
wait
echo ISO Test 2 -- All Completed
./acid_query.sh $O_KEY
echo ISO Test 2 -- End of Test at `date`
exit 0
```

==========

acid_isolation_main3.sh

==========

```
#!/bin/bash
#
# TPC-H ACID Isolation Main 1
#
# Copyright 2007 ParAccel, Inc
#

echo ISO Test 3 -- Test Starting at `date`
read O_KEY L_KEY DELTA < orderkeys.txt
echo ISO Test 3 -- Before Query
./acid_query.sh $O_KEY
echo ISO Test 3 -- Starting Transaction 1
# Run Transaction 1
./acid_trans.sh $O_KEY $L_KEY $DELTA COMMIT 15 &
sleep 5
echo ISO Test 3 -- Starting Transaction 2
# Run Transaction 2
./acid_trans.sh $O_KEY $L_KEY $DELTA COMMIT
echo ISO Test 3 -- Transaction 2 Completed
wait
echo ISO Test 3 -- All Completed
./acid_query.sh $O_KEY
echo ISO Test 3 -- Test Completed at `date`
exit 0
```

==========

acid_isolation_main4.sh

==========

```
#!/bin/bash
#
# TPC-H ACID Isolation Main 1
#
# Copyright 2007 ParAccel, Inc
#

echo ISO Test 4 -- Test Starting at `date`
read O_KEY L_KEY DELTA < orderkeys.txt
echo ISO Test 4 -- Before Query
./acid_query.sh $O_KEY
echo ISO Test 4 -- Starting Transaction 1
# Run Transaction 1
./acid_trans.sh $O_KEY $L_KEY $DELTA ROLLBACK 15 &
sleep 5
echo ISO Test 4 -- Starting Transaction 2
# Run Transaction 2
./acid_trans.sh $O_KEY $L_KEY $DELTA COMMIT
```

```
echo ISO Test 4 -- Transaction 2 Completed
wait
echo ISO Test 4 -- All Completed
./acid_query.sh $O_KEY
echo ISO Test 4 -- Test Completed at `date`
exit 0
```

acid_isolation_main5.sh

```
#!/bin/bash
#
# TPC-H ACID Isolation Main 5
#
# Copyright 2007 ParAccel, Inc
#

echo ISO Test 5 -- Test Starting at `date`

read O_KEY L_KEY DELTA < orderkeys.txt

echo ISO Test 5 -- Fetching PartKey and SupKey
P_KEY=`psql -q -t dev <<EOF1
     select L_PARTKEY
       from LINEITEM
      where L_ORDERKEY = $O_KEY
        and L_LINENUMBER  = $L_KEY
     \q
EOF1`

S_KEY=`psql -q -t dev <<EOF2
     select L_SUPPKEY
       from LINEITEM
      where L_ORDERKEY = $O_KEY
        and L_LINENUMBER  = $L_KEY
     \q
EOF2`
echo ISO Test 5 -- PartKey = $P_KEY, SuppKey = $S_KEY

echo ISO Test 5 -- Before Query
./acid_query.sh $O_KEY
echo ISO Test 5 -- Starting Transaction 1
# Run Transaction 1
./acid_trans.sh $O_KEY $L_KEY $DELTA COMMIT 15 &
sleep 5
echo ISO Test 5 -- Starting Partsup Query
# Run Transaction 2
./iso5_query.sh $P_KEY $S_KEY
echo ISO Test 5 -- Partsup Query Completed
wait
echo ISO Test 5 -- All Completed
./acid_query.sh $O_KEY
echo ISO Test 5 -- Test Completed at `date`
exit 0
```

acid_isolation_main6.sh

```
#!/bin/bash
#
# TPC-H ACID Isolation Main 6
#
# Copyright 2007 ParAccel, Inc
#

echo ISO Test 6 -- Test Starting at `date`
read O_KEY1 L_KEY1 DELTA1 < orderkeys.txt
tail -1 orderkeys.txt > /tmp/orderkeys.tail
read O_KEY2 L_KEY2 DELTA2 < /tmp/orderkeys.tail

echo ISO Test 6 -- Before Query
./acid_query.sh $O_KEY1
echo ISO Test 6 -- Starting ISO 6 Query
./iso6_query.sh $O_KEY2 &
sleep 2
echo ISO Test 6 -- Starting Transaction
./acid_trans.sh $O_KEY1 $L_KEY1 $DELTA1 COMMIT
echo ISO Test 6 -- Transaction Completed
wait
echo ISO Test 6 -- All Completed
./acid_query.sh $O_KEY1
echo ISO Test 6 -- Test Completed at `date`
exit 0
```

acid_query.sh

```
#!/bin/bash
#
# TPC-H ACID Query
#
# Copyright 2007 ParAccel, Inc
#
O_KEY=$1

# Execute read-only query for isolation tests

echo "ACID Query -- Started at `date`"
O_TOTAL=`psql -q -t dev <<EOF13
     select round(o_totalprice,2)
     from ORDERS
      where O_ORDERKEY = $O_KEY;
     \q
EOF13`
echo "ACID Query -- o_orderkey = $O_KEY"
echo "ACID Query -- o_total = $O_TOTAL"
echo "ACID Query -- Completed at `date`"
exit 0
```

iso5_query.sh

```
#!/bin/bash
#
# TPC-H Isolation Query for ISO 5
#
# Copyright 2007 ParAccel, Inc
#
P_KEY=$1
S_KEY=$2

echo ISO Query -- Starting at `date`

PS_DATA=`psql -q -t dev <<EOF1
     select PS_AVAILQTY
       from PARTSUPP
      where PS_PARTKEY = $P_KEY
        and PS_SUPPKEY  = $S_KEY
     \q
EOF1`
echo ISO Query -- PS_AVAILQTY = $PS_DATA

PS_DATA=`psql -q -t dev <<EOF2
     select PS_SUPPLYCOST
       from PARTSUPP
      where PS_PARTKEY = $P_KEY
        and PS_SUPPKEY  = $S_KEY
     \q
EOF2`
echo ISO Query -- PS_SUPPLYCOST = $PS_DATA

PS_DATA=`psql -q -t dev <<EOF3
     select PS_COMMENT
       from PARTSUPP
      where PS_PARTKEY = $P_KEY
        and PS_SUPPKEY  = $S_KEY
     \q
EOF3`
echo ISO Query -- PS_COMMENT = $PS_DATA
```

```
echo ISO Query -- Completed at `date`
```

==========

iso6_query.sh

==========

```
#!/bin/bash
#
# TPC-H Isolation Query for ISO 6
#
# Copyright 2007 ParAccel, Inc
#
O_KEY=$1

echo ISO6 Query -- Starting at `date`

PS_DATA=`psql -q -t dev <<EOF1
select L_EXTENDEDPRICE, SLEEP(L_LINENUMBER*4)
  from LINEITEM
 where L_ORDERKEY = $O_KEY
   and L_LINENUMBER < 4
     \q
EOF1`
echo ISO6 Query -- L_EXTENDEDPRICE = $PS_DATA

echo ISO6 Query -- Completed at `date`
```

==========

durability test

==========

==========

acid_durability_main.sh

==========

```
#!/bin/bash
#
# TPC-H ACID Durability Main
#
# Copyright 2007 ParAccel, Inc
#
NUMOFKEYS=25
echo Durability Test -- Starts `date`
echo
./acid_setup.sh $NUMOFKEYS dur_orderkeys1.txt
./acid_setup.sh $NUMOFKEYS dur_orderkeys2.txt
./acid_setup.sh $NUMOFKEYS dur_orderkeys3.txt
./acid_setup.sh $NUMOFKEYS dur_orderkeys4.txt
./acid_setup.sh $NUMOFKEYS dur_orderkeys5.txt
./acid_setup.sh $NUMOFKEYS dur_orderkeys6.txt
./acid_setup.sh $NUMOFKEYS dur_orderkeys7.txt
./acid_setup.sh $NUMOFKEYS dur_orderkeys8.txt
./acid_setup.sh $NUMOFKEYS dur_orderkeys9.txt

if [ -f dur_keys.tbl ]
then
  rm dur_keys.tbl
fi
# Pre Verify Step
./acid_durability_verify.sh
# Start test
echo Durability Test - Start Transaction Loop
./acid_durability_loop.sh dur_orderkeys1.txt >
dur_log1 &
sleep 3
./acid_durability_loop.sh dur_orderkeys2.txt >
dur_log2 &
sleep 3
./acid_durability_loop.sh dur_orderkeys3.txt >
dur_log3 &
sleep 3
./acid_durability_loop.sh dur_orderkeys4.txt >
dur_log4 &
sleep 3
./acid_durability_loop.sh dur_orderkeys5.txt >
dur_log5 &
sleep 3
./acid_durability_loop.sh dur_orderkeys6.txt >
dur_log6 &
sleep 3
./acid_durability_loop.sh dur_orderkeys7.txt >
dur_log7 &
sleep 3
./acid_durability_loop.sh dur_orderkeys8.txt >
dur_log8 &
sleep 3
./acid_durability_loop.sh dur_orderkeys9.txt >
dur_log9 &
wait
echo Durability Test -- Transactions Completed
echo
# Get count from the history table
HIST_COUNT=`psql -q -t dev <<EOF10
    select count(*)
      from HISTORY;
\q
EOF10`

echo
echo Durability Test -- Complete `date`
```

==========

acid_durability_loop.sh

==========

```
#!/bin/bash
#
# TPC-H ACID Durability Transaction Loop
#
# Copyright 2007 ParAccel, Inc
#

echo Transaction Loop -- Starts `date`
echo
KEYFILE=$1
echo Transaction Loop -- Reading from $KEYFILE
# Loop through the orderkey and linenumber in
consistency_values.txt

while read O_KEY L_KEY DELTA
do
   ./acid_trans.sh $O_KEY $L_KEY $DELTA COMMIT
   if [ $? -eq 0 ]
      then
      echo $O_KEY "|" $L_KEY >> dur_keys.tbl
      sudo sync;sudo sync;sudo sync
   else
      exit $2
   fi
   sleep 1
done < $KEYFILE

echo
echo Durability Test -- First loop completed for `wc
-l $KEYFILE` transactions
echo
echo Durability Test --
-------------------------------------------------
echo

while read O_KEY L_KEY DELTA
do
   ./acid_trans.sh $O_KEY $L_KEY $DELTA COMMIT
   if [ $? -eq 0 ]
      then
      echo $O_KEY "|" $L_KEY >> dur_keys.tbl
```

```
      sudo sync;sudo sync;sudo sync
   else
      exit $2
   fi
   sleep 1
done < $KEYFILE

echo
echo Transaction Loop -- Complete `date`
```

==========

acid_durability_verify.sh

==========

```
#!/bin/bash
#
# TPC-H ACID Durability Main
#
# Copyright 2007 ParAccel, Inc
#
# Get count from the history table
HIST_COUNT=`psql -q -t dev <<EOF10
    select count(*)
      from HISTORY;
\q
EOF10`
if [ $? -ne 0 ]
   then
      echo
      echo Durability Test -- Database is DOWN
      echo
      exit $2
   fi

echo Durability Test -- History count $HIST_COUNT
echo
echo Durability Test -- Verify Starts `date`
echo

# Get sample number of keys to verify
tail -3 dur_orderkeys1.txt > dur_samplekeys.txt
tail -3 dur_orderkeys2.txt >> dur_samplekeys.txt
tail -3 dur_orderkeys3.txt >> dur_samplekeys.txt
tail -3 dur_orderkeys4.txt >> dur_samplekeys.txt
tail -3 dur_orderkeys5.txt >> dur_samplekeys.txt
tail -3 dur_orderkeys6.txt >> dur_samplekeys.txt
tail -3 dur_orderkeys7.txt >> dur_samplekeys.txt
tail -3 dur_orderkeys8.txt >> dur_samplekeys.txt
tail -3 dur_orderkeys9.txt >> dur_samplekeys.txt

# loop through smaple keys for verification
while read O_KEY LKEY DELTA
do
    psql -q -t dev <<EOF10
    select O_ORDERKEY,
           O_TOTALPRICE,
           sum(round(round(L_EXTENDEDPRICE*
           (1-L_DISCOUNT),2)*(1+L_TAX),2)),
           round(O_TOTALPRICE -
sum(round(round(L_EXTENDEDPRICE*
           (1-L_DISCOUNT),2)*(1+L_TAX),2)),1)
    from ORDERS join LINEITEM
      on O_ORDERKEY = L_ORDERKEY
     and O_ORDERKEY = $O_KEY
   group by 1, 2;
\q
EOF10

done < dur_samplekeys.txt

echo Durability Test -- Verify Complete `date`
echo
```

==========

Disk Configuration Details

==========

Each server had 2 internal disks configured from the BIOS as a RAID1 device using the on-board LSI RAID controller. This operation preceeds the installation of Red Hat Linux. Once Red Hat is installed, most of the RAID1 devive is used for a file system mounted on /home.

Appendix C. Query Text and Query Output

==========

qualification query 1

==========

```
-- using default substitutions
select 'Stream 0 Query 1 START - ',
date_part('epoch',LOCALTIMESTAMP(1));
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 <= cast(date '1998-12-01' -
interval '90 days' as date)
group by
       l_returnflag,
       l_linestatus
order by
       l_returnflag,
       l_linestatus;
select 'Stream 0  Query 1 STOP - ',
date_part('epoch',LOCALTIMESTAMP(1));


Fri Oct 26 12:20:40 PDT 2007
 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 |  53758256749.600 |  55909064213.178 |
25.52 |  38273.12 |     0.04 |     1478493
 N            | F            |   991417.00 |
1487504710.38 |   1413082157.986 |   1469649196.694 |
25.51 |  38284.46 |     0.05 |       38854
 N            | O            | 74429437.00 |
111631834353.84 | 106051845806.199 | 110297934442.245
|   25.50 |  38249.32 |     0.04 |     2918531
 R            | F            | 37719753.00 |
56568041380.90 |  53741292299.136 |  55889618108.977 |
25.50 |  38250.85 |     0.05 |     1478870
(4 rows)
```

==========

qualification query 2

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

-- using default substitutions
select 'Stream 0 Query 2 START - ',
date_part('epoch',LOCALTIMESTAMP(1));
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
limit 100;

select 'Stream 0 Query 2 STOP - ',
date_part('epoch',LOCALTIMESTAMP(1));


Fri Oct 26 12:20:42 PDT 2007
 s_acctbal |          s_name           |
n_name           | p_partkey |          p_mfgr
|                s_address                |
s_phone     |
s_comment
-----------+---------------------------
+--------------------------+-----------
+---------------------------
+-----------------------------------------
+-----------------
+-----------------------------------------------------
---------------------------------------------------
   9938.53 | Supplier#000005359        | UNITED
KINGDOM            |    185358 | Manufacturer#4
| QKuHYh,vZGiwu2FWEJoLDx04                 | 33-429-
790-6131 | uriously regular requests hag|
   9937.84 | Supplier#000005969        | ROMANIA
|    108438 | Manufacturer#1            |
ANDENSOSmk,miq23Xfb5RWt6dvUcvt6Qa        | 29-520-692-
3537 | efully express instructions. regular requests
against the slyly fin|
   9936.22 | Supplier#000005250        | UNITED
KINGDOM            |       249 | Manufacturer#4
| B3rqp0xbSEim4Mpy2RH J                    | 33-320-
228-2957 | etect about the furiously final accounts.
slyly ironic pinto beans sleep inside the furiously|
   9923.77 | Supplier#000002324        | GERMANY
|     29821 | Manufacturer#4            | y3OD9UywSTOk
| 17-779-299-1839 | ackages boost blithely. blithely
regular deposits c|
   9871.22 | Supplier#000006373        | GERMANY
|     43868 | Manufacturer#5            | J8fcXWsTqM
| 17-813-485-8637 | etect blithely bold asymptotes.
fluffily ironic platelets wake furiously; blit|
   9870.78 | Supplier#000001286        | GERMANY
|     81285 | Manufacturer#2            |
YKA,E2fjiVd7eUrzp2Ef8j1QxGo2DFnosaTEH    | 17-516-924-
4574 |  regular accounts. furiously unusual courts
above the fi|
   9870.78 | Supplier#000001286        | GERMANY
|    181285 | Manufacturer#4            |
YKA,E2fjiVd7eUrzp2Ef8j1QxGo2DFnosaTEH    | 17-516-924-
4574 |  regular accounts. furiously unusual courts
above the fi|
   9852.52 | Supplier#000008973        | RUSSIA
|     18972 | Manufacturer#2            |
t5L67YdBYYH6o,Vz24jpDyQ9                 | 32-188-594-
7038 | rns wake final foxes. carefully unusual
depende|
   9847.83 | Supplier#000008097        | RUSSIA
|    130557 | Manufacturer#2            |
xMe97bpE69NzdwLoX                        | 32-375-640-
3593 |  the special excuses. silent sentiments serve
carefully final ac|
   9847.57 | Supplier#000006345        | FRANCE
|     86344 | Manufacturer#1            |
VSt3rzk3qG698u6ld8HhOByvrTcSTSvQlDQDag   | 16-886-766-
7945 | ges. slyly regular requests are. ruthless,
express excuses cajole blithely across the unu|
   9847.57 | Supplier#000006345        | FRANCE
|    173827 | Manufacturer#2            |
VSt3rzk3qG698u6ld8HhOByvrTcSTSvQlDQDag   | 16-886-766-
7945 | ges. slyly regular requests are. ruthless,
express excuses cajole blithely across the unu|
   9836.93 | Supplier#000007342        | RUSSIA
|      4841 | Manufacturer#4            |
JOlK7C1,7xrEZSSOw                        | 32-399-414-
5385 | blithely carefully bold theodolites. fur|
   9817.10 | Supplier#000002352        | RUSSIA
|    124815 | Manufacturer#2            |
4LfoHUZjgjEbAKw TgdKcgOc4D4uCYw          | 32-551-831-
1437 | wake carefully alongside of the carefully final
ex|
   9817.10 | Supplier#000002352        | RUSSIA
|    152351 | Manufacturer#3            |
4LfoHUZjgjEbAKw TgdKcgOc4D4uCYw          | 32-551-831-
1437 | wake carefully alongside of the carefully final
ex|
   9739.86 | Supplier#000003384        | FRANCE
|    138357 | Manufacturer#2            |
o,Z3v4POifevE k9U1b 6J1ucX,I             | 16-494-913-
5925 | s after the furiously bold packages sleep
fluffily idly final requests: quickly final|
   9721.95 | Supplier#000008757        | UNITED
KINGDOM            |    156241 | Manufacturer#3
| Atg6GnM4dT2                              | 33-821-
407-2995 | eep furiously sauternes; quickl|
   9681.33 | Supplier#000008406        | RUSSIA
|     78405 | Manufacturer#1            | ,qUuXcftUl
| 32-139-873-8571 | haggle slyly regular excuses.
quic|
   9643.55 | Supplier#000005148        | ROMANIA
|    107617 | Manufacturer#1            |
kT4ciVFslx9z4s79p Js825                  | 29-252-617-
4850 | final excuses. final ideas boost quickly
furiously speci|
   9624.82 | Supplier#000001816        | FRANCE
|     34306 | Manufacturer#3            |
e7vab91vLJPWxxZnewmnDBpDmxYHrb           | 16-392-237-
```

6726 | e packages are around the special ideas. special, pending foxes us|
   9624.78 | Supplier#000009658 | ROMANIA |
189657 | Manufacturer#1 | oE9uBgEfSS4opIcepXyAYM,x | 29-748-876-2014 | ronic asymptotes wake bravely final|
   9612.94 | Supplier#000003228 | ROMANIA |
120715 | Manufacturer#2 | KDdpNKN3cWu7ZSrbdqp7AfSLxx,qWB | 29-325-784-8187 | warhorses. quickly even deposits sublate daringly ironic instructions. slyly blithe t|
   9612.94 | Supplier#000003228 | ROMANIA |
198189 | Manufacturer#4 | KDdpNKN3cWu7ZSrbdqp7AfSLxx,qWB | 29-325-784-8187 | warhorses. quickly even deposits sublate daringly ironic instructions. slyly blithe t|
   9571.83 | Supplier#000004305 | ROMANIA |
179270 | Manufacturer#2 | qNHZ7WmCzygwMPRDO9Ps | 29-973-481-1831 | kly carefully express asymptotes. furiou|
   9558.10 | Supplier#000003532 | UNITED KINGDOM | 88515 | Manufacturer#4 | EOeuiiOn21OVpTlGguufFDFsbN1p0lhpxHp | 33-152-301-2164 | foxes. quickly even excuses use. slyly special foxes nag bl|
   9492.79 | Supplier#000005975 | GERMANY |
25974 | Manufacturer#5 | S6mIiCTx82z7lV | 17-992-579-4839 | arefully pending accounts. blithely regular excuses boost carefully carefully ironic p|
   9461.05 | Supplier#000002536 | UNITED KINGDOM | 20033 | Manufacturer#1 | 8mmGbyzaU 7ZS2wJumTibypncu9pNkDc4FYA | 33-556-973-5522 | . slyly regular deposits wake slyly. furiously regular warthogs are.|
   9453.01 | Supplier#000000802 | ROMANIA |
175767 | Manufacturer#1 | ,6HYXb4uaHITmtMBj4Ak57Pd | 29-342-882-6463 | gular frets. permanently special multipliers believe blithely alongs|
   9408.65 | Supplier#000007772 | UNITED KINGDOM | 117771 | Manufacturer#4 | AiC5YAH,gdu0i7 | 33-152-491-1126 | nag against the final requests. furiously unusual packages cajole blit|
   9359.61 | Supplier#000004856 | ROMANIA |
62349 | Manufacturer#5 | HYogcF3Jb yh1 | 29-334-870-9731 | y ironic theodolites. blithely sile|
   9357.45 | Supplier#000006188 | UNITED KINGDOM | 138648 | Manufacturer#1 | g801,ssP8wpTk4Hm | 33-583-607-1633 | ously always regular packages. fluffily even accounts beneath the furiously final pack|
   9352.04 | Supplier#000003439 | GERMANY |
170921 | Manufacturer#4 | qYPDgoiBGhCYxjgC | 17-128-996-4650 | according to the carefully bold ideas|
   9312.97 | Supplier#000007807 | RUSSIA |
90279 | Manufacturer#5 | oGYMPCk9XHGB2PBfKRnHA | 32-673-872-5854 | ecial packages among the pending, even requests use regula|
   9312.97 | Supplier#000007807 | RUSSIA |
100276 | Manufacturer#5 | oGYMPCk9XHGB2PBfKRnHA | 32-673-872-5854 | ecial packages among the pending, even requests use regula|
   9280.27 | Supplier#000007194 | ROMANIA |
47193 | Manufacturer#3 | zhRUQkBSrFYxIAXTfInj vyGRQjeK | 29-318-454-2133 | o beans haggle after the furiously unusual deposits. carefully silent dolphins cajole carefully|
   9274.80 | Supplier#000008854 | RUSSIA |
76346 | Manufacturer#3 | 1xhLoOUM7I3mZ1mKnerw OSqdbb4QbGa | 32-524-148-5221 | y. courts do wake slyly. carefully ironic platelets haggle above the slyly regular the|
   9249.35 | Supplier#000003973 | FRANCE |
26466 | Manufacturer#1 | d18GiDsL6Wm2IsGXM,RZf1jCsgZAOjNYVThTRP4 | 16-722-866-1658 | uests are furiously. regular tithes through the regular, final accounts cajole furiously above the q|
   9249.35 | Supplier#000003973 | FRANCE |
33972 | Manufacturer#1 | d18GiDsL6Wm2IsGXM,RZf1jCsgZAOjNYVThTRP4 | 16-722-866-1658 | uests are furiously. regular tithes through the regular, final accounts cajole furiously above the q|
   9208.70 | Supplier#000007769 | ROMANIA |
40256 | Manufacturer#5 | rsimdze 5o9PHt7xS | 29-964-424-9649 | lites was quickly above the furiously ironic requests. slyly even foxes against the blithely bold |
   9201.47 | Supplier#000009690 | UNITED KINGDOM | 67183 | Manufacturer#5 | CB BnUTlmi5zdeEl7R7 | 33-121-267-9529 | e even, even foxes. blithely ironic packages cajole regular packages. slyly final ide|
   9192.10 | Supplier#000000115 | UNITED KINGDOM | 85098 | Manufacturer#3 | nJ 2t0f7Ve,wL1,6WzGBJLNBUCKlsV | 33-597-248-1220 | es across the carefully express accounts boost caref|
   9189.98 | Supplier#000001226 | GERMANY |
21225 | Manufacturer#4 | qsLCqSvLyZfuXIpjz | 17-725-903-1381 | deposits. blithely bold excuses about the slyly bold forges wake |
   9128.97 | Supplier#000004311 | RUSSIA |
146768 | Manufacturer#5 | I8IjnXd7NSJRs594RxsRR0 | 32-155-440-7120 | refully. blithely unusual asymptotes haggle |
   9104.83 | Supplier#000008520 | GERMANY |
150974 | Manufacturer#4 | RqRVDgD0ERJ9 b41vR2,3 | 17-728-804-1793 | ly about the blithely ironic depths. slyly final theodolites among the fluffily bold ideas print|
   9101.00 | Supplier#000005791 | ROMANIA |
128254 | Manufacturer#5 | zub2zCV,jhHPPQqi,P2INAjE1zI n66cOEoXFG | 29-549-251-5384 | ts. notornis detect blithely above the carefully bold requests. blithely even package|
   9094.57 | Supplier#000004582 | RUSSIA |
39575 | Manufacturer#1 | WB0XkCSG3r,mnQ n,h9VIxjjr9ARHFvKgMDf | 32-587-577-1351 | jole. regular accounts sleep blithely frets. final pinto beans play furiously past the |
   8996.87 | Supplier#000004702 | FRANCE |
102191 | Manufacturer#5 | 8XVcQK23akp | 16-811-269-8946 | ickly final packages along the express plat|
   8996.14 | Supplier#000009814 | ROMANIA |
139813 | Manufacturer#2 | af0O5pg83lPU4IDVmEylXZVqYZQzSDlYLAmR | 29-995-571-8781 | dependencies boost quickly across the furiously pending requests! unusual dolphins play sl|
   8968.42 | Supplier#000010000 | ROMANIA |
119999 | Manufacturer#5 | aTGLEusCiL4FPDBdv665XBJhPyCOB0i | 29-578-432-2146 | ly regular foxes boost slyly. quickly special waters boost carefully ironi|
   8936.82 | Supplier#000007043 | UNITED KINGDOM | 109512 | Manufacturer#1 | FVajceZInZdbJE6Z9XsRUxrUEpiwHDrOXi,1Rz | 33-784-177-8208 | efully regular courts. furiousl|
   8929.42 | Supplier#000008770 | FRANCE |
173735 | Manufacturer#4 | R7cG26TtXrHAP9 HckhfRi | 16-242-746-9248 | cajole furiously unusual requests. quickly stealthy requests are. |
   8920.59 | Supplier#000003967 | ROMANIA |
26460 | Manufacturer#1 | eHoAXe62SY9 | 29-194-731-3944 | aters. express, pending instructions sleep. brave, r|
   8920.59 | Supplier#000003967 | ROMANIA |
173966 | Manufacturer#2 | eHoAXe62SY9

| 29-194-731-3944 | aters. express, pending instructions sleep. brave, r|
   8913.96 | Supplier#000004603 | UNITED KINGDOM | 137063 | Manufacturer#2 | OUzlvMUr7n,utLxmPNeYKSf3T24OXskxB5 | 33-789-255-7342 | haggle slyly above the furiously regular pinto beans. even |
   8877.82 | Supplier#000007967 | FRANCE | 167966 | Manufacturer#5 | A3pi1BARM4nx6R,qrwFoRPU | 16-442-147-9345 | ously foxes. express, ironic requests im|
   8862.24 | Supplier#000003323 | ROMANIA | 73322 | Manufacturer#3 | W9 lYcsC9FwBqk3ItL | 29-736-951-3710 | ly pending ideas sleep about the furiously unu|
   8841.59 | Supplier#000005750 | ROMANIA | 100729 | Manufacturer#5 | Erx3lAgu0g62iaHF9x50uMH4EgeN9hEG | 29-344-502-5481 | gainst the pinto beans. fluffily unusual dependencies affix slyly even deposits.|
   8781.71 | Supplier#000003121 | ROMANIA | 13120 | Manufacturer#5 | wNqTogx238ZYCamFb,50v,bj 4IbNFW9Bvw1xP | 29-707-291-5144 | s wake quickly ironic ideas|
   8754.24 | Supplier#000009407 | UNITED KINGDOM | 179406 | Manufacturer#4 | CHRCbkaWcf5B | 33-903-970-9604 | e ironic requests. carefully even foxes above the furious|
   8691.06 | Supplier#000004429 | UNITED KINGDOM | 126892 | Manufacturer#2 | k,BQms5UhoAF1B2Asi,fLib | 33-964-337-5038 | efully express deposits kindle after the deposits. final |
   8655.99 | Supplier#000006330 | RUSSIA | 193810 | Manufacturer#2 | UozlaENr0ytKe2w6CeIEWFWn iO3S8Rae7Ou | 32-561-198-3705 | symptotes use about the express dolphins. requests use after the express platelets. final, ex|
   8638.36 | Supplier#000002920 | RUSSIA | 75398 | Manufacturer#1 | Je2a8bszf3L | 32-122-621-7549 | ly quickly ironic requests. even requests whithout t|
   8638.36 | Supplier#000002920 | RUSSIA | 170402 | Manufacturer#3 | Je2a8bszf3L | 32-122-621-7549 | ly quickly ironic requests. even requests whithout t|
   8607.69 | Supplier#000006003 | UNITED KINGDOM | 76002 | Manufacturer#2 | EH9wADcEiuenM0NR08zDwMidw,52Y2RyILEiA | 33-416-807-5206 | ar, pending accounts. pending depende|
   8569.52 | Supplier#000005936 | RUSSIA | 5935 | Manufacturer#5 | jXaNZ6vwnEWJ2ksLZJpjtgt0bY2a3AU | 32-644-251-7916 | . regular foxes nag carefully atop the regular, silent deposits. quickly regular packages |
   8564.12 | Supplier#000000033 | GERMANY | 110032 | Manufacturer#1 | gfeKpYw3400L0SDywXA6Ya1Qmq1w6YB9f3R | 17-138-897-9374 | n sauternes along the regular asymptotes are regularly along the |
   8553.82 | Supplier#000003979 | ROMANIA | 143978 | Manufacturer#4 | BfmVhCAnCMY3jzpjUMy4CNWs9 HzpdQR7INJU | 29-124-646-4897 | ic requests wake against the blithely unusual accounts. fluffily r|
   8517.23 | Supplier#000009529 | RUSSIA | 37025 | Manufacturer#5 | e44R8o7JAIS9iMcr | 32-565-297-8775 | ove the even courts. furiously special platelets |
   8517.23 | Supplier#000009529 | RUSSIA | 59528 | Manufacturer#2 | e44R8o7JAIS9iMcr | 32-565-297-8775 | ove the even courts. furiously special platelets |
   8503.70 | Supplier#000006830 | RUSSIA | 44325 | Manufacturer#4 | BC4WFCYRUZyaIgchU 4S | 32-147-878-5069 | pades cajole. furious packages among the carefully express excuses boost furiously across th|
   8457.09 | Supplier#000009456 | UNITED KINGDOM | 19455 | Manufacturer#1 | 7SBhZs8gP1cJjT0Qf433YBk | 33-858-440-4349 | cing requests along the furiously unusual deposits promise among the furiously unus|
   8441.40 | Supplier#000003817 | FRANCE | 141302 | Manufacturer#2 | hU3fz3xL78 | 16-339-356-5115 | ely even ideas. ideas wake slyly furiously unusual instructions. pinto beans sleep ag|
   8432.89 | Supplier#000003990 | RUSSIA | 191470 | Manufacturer#1 | wehBBp1RQbfxAYDASS75MsywmsKHRVdkrvNe6m | 32-839-509-9301 | ep furiously. packages should have to haggle slyly across the deposits. furiously regu|
   8431.40 | Supplier#000002675 | ROMANIA | 5174 | Manufacturer#1 | HJFStOu9R5NGPOegKhgbzBdyvrG2yh8w | 29-474-643-1443 | ithely express pinto beans. blithely even foxes haggle. furiously regular theodol|
   8407.04 | Supplier#000005406 | RUSSIA | 162889 | Manufacturer#4 | j7 gYF5RW8DC5UrjKC | 32-626-152-4621 | r the blithely regular packages. slyly ironic theodoli|
   8386.08 | Supplier#000008518 | FRANCE | 36014 | Manufacturer#3 | 2jqzqqAVe9crMVGP,n9nTsQXulNLTUYoJjEDcqWV | 16-618-780-7481 | blithely bold pains are carefully platelets. finally regular pinto beans sleep carefully special|
   8376.52 | Supplier#000005306 | UNITED KINGDOM | 190267 | Manufacturer#5 | 9t8Y8 QqSIsoADPt6NLdk,TP5zyRx41oBUlgoGc9 | 33-632-514-7931 | ly final accounts sleep special, regular requests. furiously regular|
   8348.74 | Supplier#000008851 | FRANCE | 66344 | Manufacturer#4 | nWxi7GwEbjhw1 | 16-796-240-2472 | boldly final deposits. regular, even instructions detect slyly. fluffily unusual pinto bea|
   8338.58 | Supplier#000007269 | FRANCE | 17268 | Manufacturer#4 | ZwhJSwABUoiB04,3 | 16-267-277-4365 | iously final accounts. even pinto beans cajole slyly regular|
   8328.46 | Supplier#000001744 | ROMANIA | 69237 | Manufacturer#5 | oLo3fV64q2,FKHa3p,qHnS7Yzv,ps8 | 29-330-728-5873 | ep carefully-- even, careful packages are slyly along t|
   8307.93 | Supplier#000003142 | GERMANY | 18139 | Manufacturer#1 | dqblvV8dCNAorGlJ | 17-595-447-6026 | olites wake furiously regular decoys. final requests nod |
   8231.61 | Supplier#000009558 | RUSSIA | 192000 | Manufacturer#2 | mcdgen,yT1iJDHDS5fV | 32-762-137-5858 | foxes according to the furi|
   8152.61 | Supplier#000002731 | ROMANIA | 15227 | Manufacturer#4 | nluXJCuY1tu | 29-805-463-2030 | special requests. even, regular warhorses affix among the final gr|
   8109.09 | Supplier#000009186 | FRANCE | 99185 | Manufacturer#1 | wgfosrVPexl9pEXWywaqlBMDYYf | 16-668-570-1402 | tions haggle slyly about the sil|
   8102.62 | Supplier#000003347 | UNITED KINGDOM | 18344 | Manufacturer#5 | m CtXS2S16i | 33-454-274-8532 | egrate with the slyly bold instructions. special foxes haggle silently among the|
   8046.07 | Supplier#000008780 | FRANCE | 191222 | Manufacturer#3 | AczzuE0UK9osj ,Lx0Jmh | 16-473-215-6395 | onic platelets cajole after the regular

```
instructions. permanently bold excuses|
   8042.09 | Supplier#000003245        | RUSSIA
|    135705 | Manufacturer#4            |
Dh8Ikg39onrbOL4DyTfGw8a9oKUX3d9Y         | 32-836-132-
8872 | osits. packages cajole slyly. furiously regular
deposits cajole slyly. q|
   8042.09 | Supplier#000003245        | RUSSIA
|    150729 | Manufacturer#1            |
Dh8Ikg39onrbOL4DyTfGw8a9oKUX3d9Y         | 32-836-132-
8872 | osits. packages cajole slyly. furiously regular
deposits cajole slyly. q|
   7992.40 | Supplier#000006108        | FRANCE
|    118574 | Manufacturer#1            |
8tBydnTDwUqfBfFV4l3                      | 16-974-998-
8937 |  ironic ideas? fluffily even instructions wake.
blithel|
   7980.65 | Supplier#000001288        | FRANCE
|     13784 | Manufacturer#4            | zE,7HgVPrCn
| 16-646-464-8247 | ully bold courts. escapades nag
slyly. furiously fluffy theodo|
   7950.37 | Supplier#000008101        | GERMANY
|     33094 | Manufacturer#5            |
kkYvL6IuvojJgTNG IKkaXQDYgx8ILohj        | 17-627-663-
8014 | arefully unusual requests x-ray above the
quickly final deposits. |
   7937.93 | Supplier#000009012        | ROMANIA
|     83995 | Manufacturer#2            |
iUiTziH,Ek3i4lwSgunXMgrcTzwdb            | 29-250-925-
9690 | to the blithely ironic deposits nag sly|
   7914.45 | Supplier#000001013        | RUSSIA
|    125988 | Manufacturer#2            |
riRcntps4KEDtYScjpMIWeYF6mNnR            | 32-194-698-
3365 |  busily bold packages are dolphi|
   7912.91 | Supplier#000004211        | GERMANY
|    159180 | Manufacturer#5            |
2wQRVovHrm3,v03IKzfTd,1PYsFXQFFOG        | 17-266-947-
7315 | ay furiously regular platelets. cou|
   7912.91 | Supplier#000004211        | GERMANY
|    184210 | Manufacturer#4            |
2wQRVovHrm3,v03IKzfTd,1PYsFXQFFOG        | 17-266-947-
7315 | ay furiously regular platelets. cou|
   7894.56 | Supplier#000007981        | GERMANY
|     85472 | Manufacturer#4            |
NSJ96vMROAbeXP                           | 17-963-404-
3760 | ic platelets affix after the furiously|
   7887.08 | Supplier#000009792        | GERMANY
|    164759 | Manufacturer#3            |
Y28ITVeYriT3kIGdV2K8fSZ V2UqT5H1Otz       | 17-988-938-
4296 | ckly around the carefully fluffy theodolites.
slyly ironic pack|
   7871.50 | Supplier#000007206        | RUSSIA
|    104695 | Manufacturer#1            | 3w
fNCnrVmvJjE95sgWZzvW                    | 32-432-452-
7731 | ironic requests. furiously final theodolites
cajole. final, express packages sleep. quickly reg|
   7852.45 | Supplier#000005864        | RUSSIA
|      8363 | Manufacturer#4            |
WCNfBPZeSXh3h,c                          | 32-454-883-
3821 | usly unusual pinto beans. brave ideas sleep
carefully quickly ironi|
   7850.66 | Supplier#000001518        | UNITED
KINGDOM            |     86501 | Manufacturer#1
| ONda3YJiHKJOC                             | 33-730-
383-3892 | ifts haggle fluffily pending pai|
   7843.52 | Supplier#000006683        | FRANCE
|     11680 | Manufacturer#4            |
2Z0JGkiv01Y00oCFwUGfviIbhzCdy            | 16-464-517-
8943 |  express, final pinto beans x-ray slyly
asymptotes. unusual, unusual|
(100 rows)
```

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qualification query 3

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```
-- using default substitutions
select 'Stream 0 Query 3 START - ',
date_part('epoch',LOCALTIMESTAMP(1));
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 < date '1995-03-15'
       and l_shipdate > date '1995-03-15'
group by
       l_orderkey,
       o_orderdate,
       o_shippriority
order by
       revenue desc,
       o_orderdate
limit 10;
select 'Stream 0 Query 3 STOP - ',
date_part('epoch',LOCALTIMESTAMP(1));


Fri Oct 26 12:20:49 PDT 2007
 l_orderkey |  revenue   | o_orderdate |
o_shippriority
------------+------------+-------------
+----------------
    2456423 | 406181.008 | 1995-03-05  |
0
    3459808 | 405838.697 | 1995-03-04  |
0
     492164 | 390324.058 | 1995-02-19  |
0
    1188320 | 384537.934 | 1995-03-09  |
0
    2435712 | 378673.054 | 1995-02-26  |
0
    4878020 | 378376.794 | 1995-03-12  |
0
    5521732 | 375153.920 | 1995-03-13  |
0
    2628192 | 373133.307 | 1995-02-22  |
0
     993600 | 371407.458 | 1995-03-05  |
0
    2300070 | 367371.144 | 1995-03-13  |
0
(10 rows)
```

==========

qualification query 4

==========

```
-- using default substitutions
select 'Stream 0 Query 4 START - ',
date_part('epoch',LOCALTIMESTAMP(1));
select
       o_orderpriority,
       count(*) as order_count
from
       orders
where
       o_orderdate >= date '1993-07-01'
       and o_orderdate < cast(date '1993-07-01' +
interval '3 months' as date)
       and exists (
              select
                     *
              from
                     lineitem
```

```
		where
			l_orderkey = o_orderkey
			and l_commitdate < l_receiptdate
	)
group by
	o_orderpriority
order by
	o_orderpriority;
select 'Stream 0 Query 4 STOP - ',
date_part('epoch',LOCALTIMESTAMP(1));


Fri Oct 26 12:20:53 PDT 2007
 o_orderpriority | order_count
-----------------+-------------
 1-URGENT        |       10594
 2-HIGH          |       10476
 3-MEDIUM        |       10410
 4-NOT SPECIFIED |       10556
 5-LOW           |       10487
(5 rows)
```

==========

qualification query 5

==========

```
-- using default substitutions
select 'Stream 0 Query 5 START - ',
date_part('epoch',LOCALTIMESTAMP(1));
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 >= date '1994-01-01'
	and o_orderdate < cast(date '1994-01-01' +
interval '1 year' as date)
group by
	n_name
order by
	revenue desc;
select 'Stream 0 Query 5 STOP - ',
date_part('epoch',LOCALTIMESTAMP(1));


Fri Oct 26 12:20:58 PDT 2007
          n_name           |   revenue
---------------------------+--------------
 INDONESIA                 | 55502040.783
 VIETNAM                   | 55295086.579
 CHINA                     | 53724493.874
 INDIA                     | 52035511.632
 JAPAN                     | 45410175.353
(5 rows)
```

==========

qualification query 6

==========

```
-- using default substitutions
select 'Stream 0 Query 6 START - ',
date_part('epoch',LOCALTIMESTAMP(1));
select
	sum(l_extendedprice * l_discount) as revenue
from
	lineitem
where
	l_shipdate >= date '1994-01-01'
	and l_shipdate < cast(date '1994-01-01' +
interval '1 year' as date)
	and l_discount between .06 - 0.01 and .06 +
0.01
	and l_quantity < 24;
select 'Stream 0 Query 6 STOP - ',
date_part('epoch',LOCALTIMESTAMP(1));


Fri Oct 26 12:21:01 PDT 2007
    revenue
---------------
 123141046.397
(1 row)
```

==========

qualification query 7

==========

```
-- using default substitutions
select 'Stream 0 Query 7 START - ',
date_part('epoch',LOCALTIMESTAMP(1));
select
	supp_nation,
	cust_nation,
	l_year,
	sum(volume) as revenue
from
	(
		select
			n1.n_name as supp_nation,
			n2.n_name as cust_nation,
			datepart(year, l_shipdate) 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 date
'1995-01-01' and date '1996-12-31'
	) as shipping
group by
	supp_nation,
	cust_nation,
	l_year
order by
	supp_nation,
	cust_nation,
	l_year;
select 'Stream 0 Query 7 STOP - ',
date_part('epoch',LOCALTIMESTAMP(1));


Fri Oct 26 12:21:02 PDT 2007
	 supp_nation	|	cust_nation
```

```
| one_year |   revenue
-------------------------
+--------------------------+----------+-------------
 FRANCE                     | GERMANY
|     1995 | 54639732.326
 FRANCE                     | GERMANY
|     1996 | 54633082.905
 GERMANY                    | FRANCE
|     1995 | 52531746.305
 GERMANY                    | FRANCE
|     1996 | 52520548.643
(4 rows)
```

qualification query 8

```
-- using default substitutions
select 'Stream 0 Query 8 START - ',
date_part('epoch',LOCALTIMESTAMP(1));
select
       o_year,
       sum(case
              when nation = 'BRAZIL' then volume
              else 0
       end) / sum(volume) as mkt_share
from
       (
              select
                     datepart(year,o_orderdate) 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 date
'1995-01-01' and date '1996-12-31'
                     and p_type = 'ECONOMY ANODIZED
STEEL'
       ) as all_nations
group by
       o_year
order by
       o_year;
select 'Stream 0 Query 8 STOP - ',
date_part('epoch',LOCALTIMESTAMP(1));
```

```
Fri Oct 26 12:21:06 PDT 2007
 o_year | mkt_share
--------+-----------
   1995 |     0.034
   1996 |     0.041
(2 rows)
```

qualification query 9

```
-- using default substitutions
select 'Stream 0 Query 9 START - ',
date_part('epoch',LOCALTIMESTAMP(1));
select
       nation,
       o_year,
       sum(amount) as sum_profit
from
       (
              select
                     n_name as nation,
                     datepart(year,o_orderdate) 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%'
       ) as profit
group by
       nation,
       o_year
order by
       nation,
       o_year desc;
select 'Stream 0 Query 9 STOP - ',
date_part('epoch',LOCALTIMESTAMP(1));
```

```
Fri Oct 26 12:21:10 PDT 2007
          nation           | o_year |  sum_profit
---------------------------+--------+--------------
 ALGERIA                   |   1998 | 31342866.889
 ALGERIA                   |   1997 | 57138192.394
 ALGERIA                   |   1996 | 56140139.529
 ALGERIA                   |   1995 | 53051469.075
 ALGERIA                   |   1994 | 53867581.552
 ALGERIA                   |   1993 | 54942717.541
 ALGERIA                   |   1992 | 54628034.118
 ARGENTINA                 |   1998 | 30211185.393
 ARGENTINA                 |   1997 | 50805741.197
 ARGENTINA                 |   1996 | 51923745.958
 ARGENTINA                 |   1995 | 49298625.208
 ARGENTINA                 |   1994 | 50835609.558
 ARGENTINA                 |   1993 | 51646078.639
 ARGENTINA                 |   1992 | 50410314.437
 BRAZIL                    |   1998 | 27217924.097
 BRAZIL                    |   1997 | 48378668.692
 BRAZIL                    |   1996 | 50482869.810
 BRAZIL                    |   1995 | 47623383.090
 BRAZIL                    |   1994 | 47840165.201
 BRAZIL                    |   1993 | 49054693.496
 BRAZIL                    |   1992 | 48667638.538
 CANADA                    |   1998 | 30379833.429
 CANADA                    |   1997 | 50465051.759
 CANADA                    |   1996 | 52560500.816
 CANADA                    |   1995 | 52375332.217
 CANADA                    |   1994 | 52600364.071
 CANADA                    |   1993 | 52644503.504
 CANADA                    |   1992 | 53932871.108
 CHINA                     |   1998 | 31075465.835
 CHINA                     |   1997 | 50551873.863
 CHINA                     |   1996 | 51039293.301
 CHINA                     |   1995 | 49287534.089
 CHINA                     |   1994 | 50851089.509
 CHINA                     |   1993 | 54229629.248
```

```
CHINA                     |   1992 | 52400528.817
EGYPT                     |   1998 | 29054433.066
EGYPT                     |   1997 | 50627610.886
EGYPT                     |   1996 | 49542212.297
EGYPT                     |   1995 | 48311549.804
EGYPT                     |   1994 | 49790644.183
EGYPT                     |   1993 | 48904292.455
EGYPT                     |   1992 | 49434932.102
ETHIOPIA                  |   1998 | 28040716.967
ETHIOPIA                  |   1997 | 47455009.312
ETHIOPIA                  |   1996 | 46491097.047
ETHIOPIA                  |   1995 | 46804448.799
ETHIOPIA                  |   1994 | 48516143.387
ETHIOPIA                  |   1993 | 46551891.053
ETHIOPIA                  |   1992 | 44934648.149
FRANCE                    |   1998 | 32226407.492
FRANCE                    |   1997 | 47121485.329
FRANCE                    |   1996 | 47263134.945
FRANCE                    |   1995 | 47275997.042
FRANCE                    |   1994 | 47067208.801
FRANCE                    |   1993 | 51163369.541
FRANCE                    |   1992 | 47846234.804
GERMANY                   |   1998 | 28624942.322
GERMANY                   |   1997 | 49309074.315
GERMANY                   |   1996 | 49918682.592
GERMANY                   |   1995 | 52650718.170
GERMANY                   |   1994 | 50346899.880
GERMANY                   |   1993 | 50991895.248
GERMANY                   |   1992 | 48274125.547
INDIA                     |   1998 | 29943144.024
INDIA                     |   1997 | 50665452.666
INDIA                     |   1996 | 50283091.725
INDIA                     |   1995 | 50006774.082
INDIA                     |   1994 | 48995190.183
INDIA                     |   1993 | 50286902.317
INDIA                     |   1992 | 50850328.817
INDONESIA                 |   1998 | 27672339.686
INDONESIA                 |   1997 | 50512145.161
INDONESIA                 |   1996 | 51653059.532
INDONESIA                 |   1995 | 51508779.076
INDONESIA                 |   1994 | 52817949.774
INDONESIA                 |   1993 | 47959994.412
INDONESIA                 |   1992 | 51776604.479
IRAN                      |   1998 | 29065735.920
IRAN                      |   1997 | 50042062.499
IRAN                      |   1996 | 50926652.629
IRAN                      |   1995 | 51249667.084
IRAN                      |   1994 | 50337085.302
IRAN                      |   1993 | 51730762.912
IRAN                      |   1992 | 49955856.006
IRAQ                      |   1998 | 31624550.653
IRAQ                      |   1997 | 55121748.421
IRAQ                      |   1996 | 55897663.192
IRAQ                      |   1995 | 54815471.949
IRAQ                      |   1994 | 54408515.530
IRAQ                      |   1993 | 53633167.365
IRAQ                      |   1992 | 55891938.725
JAPAN                     |   1998 | 27934179.368
JAPAN                     |   1997 | 44517162.072
JAPAN                     |   1996 | 42545605.606
JAPAN                     |   1995 | 43749355.885
JAPAN                     |   1994 | 44840242.553
JAPAN                     |   1993 | 44660015.010
JAPAN                     |   1992 | 45410248.603
JORDAN                    |   1998 | 26901488.310
JORDAN                    |   1997 | 45471877.874
JORDAN                    |   1996 | 46794325.296
JORDAN                    |   1995 | 45178828.074
JORDAN                    |   1994 | 45333636.002
JORDAN                    |   1993 | 47971495.572
JORDAN                    |   1992 | 44717238.686
KENYA                     |   1998 | 28597614.034
KENYA                     |   1997 | 47949733.212
KENYA                     |   1996 | 46886924.097
KENYA                     |   1995 | 46072338.223
KENYA                     |   1994 | 45772060.694
KENYA                     |   1993 | 46308727.733
KENYA                     |   1992 | 47257780.303
MOROCCO                   |   1998 | 26732115.291
MOROCCO                   |   1997 | 45637303.728
MOROCCO                   |   1996 | 45558221.225
MOROCCO                   |   1995 | 47851318.369
MOROCCO                   |   1994 | 46272172.435
MOROCCO                   |   1993 | 46764325.682
MOROCCO                   |   1992 | 48122783.054
MOZAMBIQUE                |   1998 | 30712391.666
MOZAMBIQUE                |   1997 | 50316528.195
MOZAMBIQUE                |   1996 | 51640319.703
MOZAMBIQUE                |   1995 | 50693773.954
MOZAMBIQUE                |   1994 | 49253277.074
MOZAMBIQUE                |   1993 | 49153015.990
MOZAMBIQUE                |   1992 | 48247551.307
PERU                      |   1998 | 29326101.993
PERU                      |   1997 | 49753779.886
PERU                      |   1996 | 50935169.755
PERU                      |   1995 | 53309882.825
PERU                      |   1994 | 50643531.261
PERU                      |   1993 | 51584621.444
PERU                      |   1992 | 47523898.551
ROMANIA                   |   1998 | 30368667.103
ROMANIA                   |   1997 | 50365683.299
ROMANIA                   |   1996 | 49598998.485
ROMANIA                   |   1995 | 47537642.362
ROMANIA                   |   1994 | 51455282.460
ROMANIA                   |   1993 | 50407136.362
ROMANIA                   |   1992 | 48185384.595
RUSSIA                    |   1998 | 28322383.695
RUSSIA                    |   1997 | 50106684.652
RUSSIA                    |   1996 | 51753341.874
RUSSIA                    |   1995 | 49215819.824
RUSSIA                    |   1994 | 52205665.908
RUSSIA                    |   1993 | 51860229.474
RUSSIA                    |   1992 | 53251676.597
SAUDI ARABIA              |   1998 | 31541259.465
SAUDI ARABIA              |   1997 | 52438750.237
SAUDI ARABIA              |   1996 | 52543737.226
SAUDI ARABIA              |   1995 | 52938695.945
SAUDI ARABIA              |   1994 | 51389601.398
SAUDI ARABIA              |   1993 | 52937508.286
SAUDI ARABIA              |   1992 | 54843459.052
UNITED KINGDOM            |   1998 | 28494873.700
UNITED KINGDOM            |   1997 | 49381810.388
UNITED KINGDOM            |   1996 | 51386853.452
UNITED KINGDOM            |   1995 | 51509586.290
UNITED KINGDOM            |   1994 | 48086499.223
UNITED KINGDOM            |   1993 | 49166826.669
UNITED KINGDOM            |   1992 | 49349121.564
UNITED STATES             |   1998 | 25126238.670
UNITED STATES             |   1997 | 50077305.890
UNITED STATES             |   1996 | 48048648.965
UNITED STATES             |   1995 | 48809031.903
UNITED STATES             |   1994 | 49296746.647
UNITED STATES             |   1993 | 48029946.281
UNITED STATES             |   1992 | 48671943.965
VIETNAM                   |   1998 | 30442735.719
VIETNAM                   |   1997 | 50309179.241
VIETNAM                   |   1996 | 50488160.843
VIETNAM                   |   1995 | 49658284.077
VIETNAM                   |   1994 | 50596056.729
VIETNAM                   |   1993 | 50953918.602
VIETNAM                   |   1992 | 49613837.757
(175 rows)
```

==========

qualification query 10

==========

```
-- using default substitutions
select 'Stream 0 Query 10 START - ',
date_part('epoch',LOCALTIMESTAMP(1));
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 >= date '1993-10-01'
       and o_orderdate < cast(date '1993-10-01' +
interval '3 months' as date)
       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
limit 20;
select 'Stream 0 Query 10 STOP - ',
date_part('epoch',LOCALTIMESTAMP(1));


Fri Oct 26 12:21:14 PDT 2007
 c_custkey |       c_name       |  revenue   |
c_acctbal |          n_name           |
c_address                |     c_phone     |
c_comment
-----------+--------------------+------------
+-----------+--------------------------
+----------------------------------------
+-----------------
+-------------------------------------------------
-------------------------------------------------
--------
     57040 | Customer#000057040 | 734235.242 |
632.87 | JAPAN                     | Eioyzjf4pp
| 22-895-641-3466 | sits. slyly regular requests sleep
alongside of the regular inst|
    143347 | Customer#000143347 | 721002.690 |
2557.47 | EGYPT                     | 1aReFYv,Kw4
| 14-742-935-3718 | ggle carefully enticing requests.
final deposits use bold, bold pinto beans. ironic,
idle re|
     60838 | Customer#000060838 | 679127.302 |
2454.77 | BRAZIL                    |
64EaJ5vMAHWJlBOxJklpNc2RJiWE              | 12-913-494-
9813 |  need to boost against the slyly regular
account|
    101998 | Customer#000101998 | 637029.565 |
3790.89 | UNITED KINGDOM            |
01c9CILnNtfOQYmZj                         | 33-593-865-
6378 | ress foxes wake slyly after the bold excuses.
ironic platelets are furiously carefully bold
theodolites|
    125341 | Customer#000125341 | 633508.083 |
4983.51 | GERMANY                   |
S29ODD6bceU8QSuuEJznkNaK                  | 17-582-695-
5962 | arefully even depths. blithely even excuses
sleep furiously. foxes use except the dependencies.
ca|
     25501 | Customer#000025501 | 620269.784 |
7725.04 | ETHIOPIA                  |
W556MXuoiaYCCZamJI,Rn0B4ACUGdkQ8DZ     | 15-874-808-
6793 | he pending instructions wake carefully at the
pinto beans. regular, final instructions along the
slyly fina|
    115831 | Customer#000115831 | 596423.863 |
5098.10 | FRANCE                    | rFeBbEEyk dl
ne7zV5fDrmiq1oK09wV7pxqCgIc | 16-715-386-3788 | l
somas sleep. furiously final deposits wake blithely
regular pinto b|
     84223 | Customer#000084223 | 594998.019 |
528.65 | UNITED KINGDOM            | nAVZCs6BaWap
rrM27N 2qBnzc5WBauxbA       | 33-442-824-8191 |  slyly
final deposits haggle regular, pending dependencies.
pending escapades wake |
     54289 | Customer#000054289 | 585603.388 |
5583.02 | IRAN                      | vXCxoCsU0Bad5JQI
,oobkZ                  | 20-834-292-4707 | ely
special foxes are quickly finally ironic p|
     39922 | Customer#000039922 | 584878.111 |
7321.11 | GERMANY                   |
Zgy4s50l2GKN4pLDPBU8m342gIw6R             | 17-147-757-
8036 | y final requests. furiously final foxes cajole
blithely special platelets. f|
      6226 | Customer#000006226 | 576783.758 |
2230.09 | UNITED KINGDOM            |
8gPu8,NPGkfyQQ0hcIYUGPIBWc,ybP5g,         | 33-657-701-
3391 | ending platelets along the express deposits
cajole carefully final |
       922 | Customer#000000922 | 576767.529 |
3869.25 | GERMANY                   |
Az9RFaut7NkPnc5zSD2PwHgVwr4jRzq           | 17-945-916-
9648 | luffily fluffy deposits. packages c|
    147946 | Customer#000147946 | 576455.128 |
2030.13 | ALGERIA                   |
iANyZHjqhyy7Ajah0pTrYyhJ                  | 10-886-956-
3143 | ithely ironic deposits haggle blithely ironic
requests. quickly regu|
    115640 | Customer#000115640 | 569341.190 |
6436.10 | ARGENTINA                 | Vtgfia9qI
7EpHgecU1X                       | 11-411-543-4901 | ost
slyly along the patterns; pinto be|
     73606 | Customer#000073606 | 568656.856 |
1785.67 | JAPAN                     |
xuR0Tro5yChDfOCrjkd2ol                    | 22-437-653-
6966 | he furiously regular ideas. slowly|
    110246 | Customer#000110246 | 566842.978 |
7763.35 | VIETNAM                   | 7KzflgX
MDOq7sOkI                        | 31-943-426-9837 |
egular deposits serve blithely above the fl|
    142549 | Customer#000142549 | 563537.233 |
5085.99 | INDONESIA                 |
ChqEoK43OysjdHbtKCp6dKqjNyvvi9            | 19-955-562-
2398 | sleep pending courts. ironic deposits against
the carefully unusual platelets cajole carefully
express accounts.|
    146149 | Customer#000146149 | 557254.984 |
1791.55 | ROMANIA                   | s87fvzFQpU
| 29-744-164-6487 |  of the slyly silent accounts.
quickly final accounts across the |
     52528 | Customer#000052528 | 556397.348 |
551.79 | ARGENTINA                 | NFztyTOR10UOJ
| 11-208-192-3205 |  deposits hinder. blithely pending
asymptotes breach slyly regular re|
     23431 | Customer#000023431 | 554269.533 |
3381.86 | ROMANIA                   |
HgiV0phqhaIa9aydNoIlb                     | 29-915-458-
2654 | nusual, even instructions: furiously stealthy
n|
(20 rows)
```

==========

qualification query 11

==========

```
-- using default substitutions
select 'Stream 0 Query 11 START - ',
date_part('epoch',LOCALTIMESTAMP(1));
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;
select 'Stream 0 Query 11 STOP - ',
date_part('epoch',LOCALTIMESTAMP(1));



Fri Oct 26 12:21:17 PDT 2007
 ps_partkey |    value
------------+-------------
     129760 | 17538456.86
     166726 | 16503353.92
     191287 | 16474801.97
     161758 | 16101755.54
      34452 | 15983844.72
     139035 | 15907078.34
       9403 | 15451755.62
     154358 | 15212937.88
      38823 | 15064802.86
      85606 | 15053957.15
      33354 | 14408297.40




lines deleted




     113808 |  7893353.88
      27901 |  7892952.00
     128820 |  7892882.72
      25891 |  7890511.20
     122819 |  7888881.02
     154731 |  7888301.33
     101674 |  7879324.60
      51968 |  7879102.21
      72073 |  7877736.11
       5182 |  7874521.73
(1048 rows)
```

==========

qualification query 12

==========

```
-- using default substitutions
select 'Stream 0 Query 12 START - ',
date_part('epoch',LOCALTIMESTAMP(1));
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 >= date '1994-01-01'
        and l_receiptdate < cast(date '1994-01-01' +
interval '1 year' as date)
group by
        l_shipmode
order by
        l_shipmode;
select 'Stream 0 Query 12 STOP - ',
date_part('epoch',LOCALTIMESTAMP(1));


Fri Oct 26 12:21:20 PDT 2007
 l_shipmode | high_line_count | low_line_count
------------+-----------------+----------------
 MAIL       |            6202 |           9324
 SHIP       |            6200 |           9262
(2 rows)
```

==========

qualification query 13

==========

```
-- using default substitutions
select 'Stream 0 Query 13 START - ',
date_part('epoch',LOCALTIMESTAMP(1));
select
        c_count,
        count(*) as custdist
from
        (
                select
                        c_custkey,
                        count(o_orderkey)
                from
                        customer left outer join orders
on
                                c_custkey = o_custkey
                                and o_comment not like
'%special%requests%'
                group by
                        c_custkey
        ) as c_orders (c_custkey, c_count)
group by
        c_count
order by
        custdist desc,
        c_count desc;
select 'Stream 0 Query 13 STOP - ',
date_part('epoch',LOCALTIMESTAMP(1));



Fri Oct 26 12:21:22 PDT 2007
 c_count | custdist
---------+----------
       0 |    50005
       9 |     6641
      10 |     6532
      11 |     6014
       8 |     5937
```

```
      12 |     5639
      13 |     5024
      19 |     4793
       7 |     4687
      17 |     4587
      18 |     4529
      20 |     4516
      15 |     4505
      14 |     4446
      16 |     4273
      21 |     4190
      22 |     3623
       6 |     3265
      23 |     3225
      24 |     2742
      25 |     2086
       5 |     1948
      26 |     1612
      27 |     1179
       4 |     1007
      28 |      893
      29 |      593
       3 |      415
      30 |      376
      31 |      226
      32 |      148
       2 |      134
      33 |       75
      34 |       50
      35 |       37
       1 |       17
      36 |       14
      38 |        5
      37 |        5
      40 |        4
      41 |        2
      39 |        1
(42 rows)
```

==========

qualification query 14

==========

```
-- using default substitutions
select 'Stream 0 Query 14 START - ',
date_part('epoch',LOCALTIMESTAMP(1));
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 < cast(date '1995-09-01' +
interval '1 month' as date);
select 'Stream 0 Query 14 STOP - ',
date_part('epoch',LOCALTIMESTAMP(1));


Fri Oct 26 12:21:25 PDT 2007
 promo_revenue
---------------
        16.380
(1 row)
```

==========

qualification query 15

==========

```
-- using default substitutions
select 'Stream 0 Query 15 START - ',
date_part('epoch',LOCALTIMESTAMP(1));
create view revenue0 (supplier_no, total_revenue) as
       select
              l_suppkey,
              sum(l_extendedprice * (1 - l_discount))
       from
              lineitem
       where
              l_shipdate >= date '1996-01-01'
              and l_shipdate < cast(date '1996-01-01'
+ interval '3 months' as date)
       group by
              l_suppkey;

select
       s_suppkey,
       s_name,
       s_address,
       s_phone,
       total_revenue
from
       supplier,
       revenue0
where
       s_suppkey = supplier_no
       and total_revenue = (
              select
                     max(total_revenue)
              from
                     revenue0
       )
order by
       s_suppkey;
drop view revenue0;
select 'Stream 0 Query 15 STOP - ',
date_part('epoch',LOCALTIMESTAMP(1));


Fri Oct 26 12:21:26 PDT 2007
CREATE VIEW
 s_suppkey |          s_name           |     s_address
|     s_phone     | total_revenue
-----------+---------------------------
+-------------------+-----------------+---------------
      8449 | Supplier#000008449        |
Wp34zim9qYFbVctdW | 20-469-856-8873 |   1772627.202
(1 row)

DROP VIEW
```

==========

qualification query 16

==========

```
-- using default substitutions
select 'Stream 0 Query 16 START - ',
date_part('epoch',LOCALTIMESTAMP(1));
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;
select 'Stream 0 Query 16 STOP - ',
date_part('epoch',LOCALTIMESTAMP(1));


Fri Oct 26 12:21:30 PDT 2007
  p_brand   |          p_type           | p_size |
supplier_cnt
------------+---------------------------+--------
+--------------
 Brand#41   | MEDIUM BRUSHED TIN        |      3 |
28
 Brand#54   | STANDARD BRUSHED COPPER   |     14 |
27
 Brand#11   | STANDARD BRUSHED TIN      |     23 |
24
 Brand#11   | STANDARD BURNISHED BRASS  |     36 |
24
 Brand#15   | MEDIUM ANODIZED NICKEL    |      3 |
24
 Brand#15   | SMALL ANODIZED BRASS      |     45 |
24
 Brand#15   | SMALL BURNISHED NICKEL    |     19 |
24
 Brand#21   | MEDIUM ANODIZED COPPER    |      3 |
24
 Brand#22   | SMALL BRUSHED NICKEL      |      3 |
24
 Brand#22   | SMALL BURNISHED BRASS     |     19 |
24

lines deleted


 Brand#33   | SMALL ANODIZED BRASS      |      9 |
3
 Brand#35   | MEDIUM ANODIZED TIN       |     19 |
3
 Brand#51   | SMALL PLATED BRASS        |     23 |
3
 Brand#52   | MEDIUM BRUSHED BRASS      |     45 |
3
 Brand#53   | MEDIUM BRUSHED TIN        |     45 |
3
 Brand#54   | ECONOMY POLISHED BRASS    |      9 |
3
 Brand#55   | PROMO PLATED BRASS        |     19 |
3
 Brand#55   | STANDARD PLATED TIN       |     49 |
3
(18314 rows)
```

==========

qualification query 17

==========

```
-- using default substitutions
select 'Stream 0 Query 17 START - ',
date_part('epoch',LOCALTIMESTAMP(1));
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
        );
select 'Stream 0 Query 17 STOP - ',
date_part('epoch',LOCALTIMESTAMP(1));


Fri Oct 26 12:21:36 PDT 2007
 avg_yearly
------------
 348406.054
(1 row)
```

==========

qualification query 18

==========

```
-- using default substitutions
select 'Stream 0 Query 18 START - ',
date_part('epoch',LOCALTIMESTAMP(1));
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
limit 100;
select 'Stream 0 Query 18 STOP - ',
date_part('epoch',LOCALTIMESTAMP(1));


Fri Oct 26 12:21:41 PDT 2007
       c_name       | c_custkey | o_orderkey |
o_orderdate | o_totalprice |  sum
--------------------+-----------+------------
+-------------+--------------+--------
 Customer#000128120 |    128120 |    4722021 | 1994-
04-07  |    544089.09 | 323.00
 Customer#000144617 |    144617 |    3043270 | 1997-
02-12  |    530604.44 | 317.00
 Customer#000013940 |     13940 |    2232932 | 1997-
04-13  |    522720.61 | 304.00
 Customer#000066790 |     66790 |    2199712 | 1996-
09-30  |    515531.82 | 327.00
```

```
 Customer#000046435 |     46435 |    4745607 | 1997-
07-03  |    508047.99 | 309.00
 Customer#000015272 |     15272 |    3883783 | 1993-
07-28  |    500241.33 | 302.00
 Customer#000146608 |    146608 |    3342468 | 1994-
06-12  |    499794.58 | 303.00
 Customer#000096103 |     96103 |    5984582 | 1992-
03-16  |    494398.79 | 312.00
 Customer#000024341 |     24341 |    1474818 | 1992-
11-15  |    491348.26 | 302.00
 Customer#000137446 |    137446 |    5489475 | 1997-
05-23  |    487763.25 | 311.00
 Customer#000107590 |    107590 |    4267751 | 1994-
11-04  |    485141.38 | 301.00
 Customer#000050008 |     50008 |    2366755 | 1996-
12-09  |    483891.26 | 302.00
 Customer#000015619 |     15619 |    3767271 | 1996-
08-07  |    480083.96 | 318.00
 Customer#000077260 |     77260 |    1436544 | 1992-
09-12  |    479499.43 | 307.00
 Customer#000109379 |    109379 |    5746311 | 1996-
10-10  |    478064.11 | 302.00
 Customer#000054602 |     54602 |    5832321 | 1997-
02-09  |    471220.08 | 307.00
 Customer#000105995 |    105995 |    2096705 | 1994-
07-03  |    469692.58 | 307.00
 Customer#000148885 |    148885 |    2942469 | 1992-
05-31  |    469630.44 | 313.00
 Customer#000114586 |    114586 |     551136 | 1993-
05-19  |    469605.59 | 308.00
 Customer#000105260 |    105260 |    5296167 | 1996-
09-06  |    469360.57 | 303.00
 Customer#000147197 |    147197 |    1263015 | 1997-
02-02  |    467149.67 | 320.00
 Customer#000064483 |     64483 |    2745894 | 1996-
07-04  |    466991.35 | 304.00
 Customer#000136573 |    136573 |    2761378 | 1996-
05-31  |    461282.73 | 301.00
 Customer#000016384 |     16384 |     502886 | 1994-
04-12  |    458378.92 | 312.00
 Customer#000117919 |    117919 |    2869152 | 1996-
06-20  |    456815.92 | 317.00
 Customer#000012251 |     12251 |     735366 | 1993-
11-24  |    455107.26 | 309.00
 Customer#000120098 |    120098 |    1971680 | 1995-
06-14  |    453451.23 | 308.00
 Customer#000066098 |     66098 |    5007490 | 1992-
08-07  |    453436.16 | 304.00
 Customer#000117076 |    117076 |    4290656 | 1997-
02-05  |    449545.85 | 301.00
 Customer#000129379 |    129379 |    4720454 | 1997-
06-07  |    448665.79 | 303.00
 Customer#000126865 |    126865 |    4702759 | 1994-
11-07  |    447606.65 | 320.00
 Customer#000088876 |     88876 |     983201 | 1993-
12-30  |    446717.46 | 304.00
 Customer#000036619 |     36619 |    4806726 | 1995-
01-17  |    446704.09 | 328.00
 Customer#000141823 |    141823 |    2806245 | 1996-
12-29  |    446269.12 | 310.00
 Customer#000053029 |     53029 |    2662214 | 1993-
08-13  |    446144.49 | 302.00
 Customer#000018188 |     18188 |    3037414 | 1995-
01-25  |    443807.22 | 308.00
 Customer#000066533 |     66533 |      29158 | 1995-
10-21  |    443576.50 | 305.00
 Customer#000037729 |     37729 |    4134341 | 1995-
06-29  |    441082.97 | 309.00
 Customer#000003566 |      3566 |    2329187 | 1998-
01-04  |    439803.36 | 304.00
 Customer#000045538 |     45538 |    4527553 | 1994-
05-22  |    436275.31 | 305.00
 Customer#000081581 |     81581 |    4739650 | 1995-
11-04  |    435405.90 | 305.00
 Customer#000119989 |    119989 |    1544643 | 1997-
09-20  |    434568.25 | 320.00
 Customer#000003680 |      3680 |    3861123 | 1998-
07-03  |    433525.97 | 301.00
 Customer#000113131 |    113131 |     967334 | 1995-
12-15  |    432957.75 | 301.00
 Customer#000141098 |    141098 |     565574 | 1995-
09-24  |    430986.69 | 301.00
 Customer#000093392 |     93392 |    5200102 | 1997-
01-22  |    425487.51 | 304.00
 Customer#000015631 |     15631 |    1845057 | 1994-
05-12  |    419879.59 | 302.00
 Customer#000112987 |    112987 |    4439686 | 1996-
09-17  |    418161.49 | 305.00
 Customer#000012599 |     12599 |    4259524 | 1998-
02-12  |    415200.61 | 304.00
 Customer#000105410 |    105410 |    4478371 | 1996-
03-05  |    412754.51 | 302.00
 Customer#000149842 |    149842 |    5156581 | 1994-
05-30  |    411329.35 | 302.00
 Customer#000010129 |     10129 |    5849444 | 1994-
03-21  |    409129.85 | 309.00
 Customer#000069904 |     69904 |    1742403 | 1996-
10-19  |    408513.00 | 305.00
 Customer#000017746 |     17746 |       6882 | 1997-
04-09  |    408446.93 | 303.00
 Customer#000013072 |     13072 |    1481925 | 1998-
03-15  |    399195.47 | 301.00
 Customer#000082441 |     82441 |     857959 | 1994-
02-07  |    382579.74 | 305.00
 Customer#000088703 |     88703 |    2995076 | 1994-
01-30  |    363812.12 | 302.00
(57 rows)

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

qualification query 19

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

-- using default substitutions
select 'Stream 0  Query 19 START - ',
date_part('epoch',LOCALTIMESTAMP(1));
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'
        );
select 'Stream 0 Query 19 STOP - ',
date_part('epoch',LOCALTIMESTAMP(1));


Fri Oct 26 12:21:44 PDT 2007
   revenue
-------------
 3083843.026
(1 row)
```

==========

qualification query 20

==========

```
-- using default substitutions
select 'Sream 0 Query 20 START - ',
date_part('epoch',LOCALTIMESTAMP(1));
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 >=
date '1994-01-01'
                                        and l_shipdate <
cast(date '1994-01-01' + interval '1 year' as date)
                        )
        )
        and s_nationkey = n_nationkey
        and n_name = 'CANADA'
order by
        s_name;
select 'Sream 0 Query 20 STOP - ',
date_part('epoch',LOCALTIMESTAMP(1));


Fri Oct 26 12:21:45 PDT 2007
         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



lines deleted



 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)
```

==========

qualification query 21

==========

```
-- using default substitutions
select 'Stream 0 Query 21 START - ',
date_part('epoch',LOCALTIMESTAMP(1));
select
        s_name,
        count(*) as numwait
from
        supplier,
        lineitem l1,
        orders,
        nation
where
        s_suppkey = l1.l_suppkey
        and o_orderkey = l1.l_orderkey
        and o_orderstatus = 'F'
        and l1.l_receiptdate > l1.l_commitdate
        and exists (
                select
                        *
                from
                        lineitem l2
                where
                        l2.l_orderkey = l1.l_orderkey
                        and l2.l_suppkey <> l1.l_suppkey
        )
        and not exists (
                select
                        *
```

```
                from
                        lineitem l3
                where
                        l3.l_orderkey = l1.l_orderkey
                        and l3.l_suppkey <> l1.l_suppkey
                        and l3.l_receiptdate >
l3.l_commitdate
        )
        and s_nationkey = n_nationkey
        and n_name = 'SAUDI ARABIA'
group by
        s_name
order by
        numwait desc,
        s_name
limit 100;
select 'Stream 0 Query 21 STOP - ',
date_part('epoch',LOCALTIMESTAMP(1));


Fri Oct 26 12:21:51 PDT 2007
          s_name           | numwait
---------------------------+---------
 Supplier#000002829        |      20
 Supplier#000005808        |      18
 Supplier#000000262        |      17
 Supplier#000000496        |      17
 Supplier#000002160        |      17
 Supplier#000002301        |      17
 Supplier#000002540        |      17
 Supplier#000003063        |      17
 Supplier#000005178        |      17
 Supplier#000008331        |      17
 Supplier#000002005        |      16
 Supplier#000002095        |      16
 Supplier#000005799        |      16
 Supplier#000005842        |      16
 Supplier#000006450        |      16
 Supplier#000006939        |      16
 Supplier#000009200        |      16
 Supplier#000009727        |      16
 Supplier#000000486        |      15
 Supplier#000000565        |      15
 Supplier#000001046        |      15
 Supplier#000001047        |      15
 Supplier#000001161        |      15
 Supplier#000001336        |      15
 Supplier#000001435        |      15
 Supplier#000003075        |      15
 Supplier#000003335        |      15
 Supplier#000005649        |      15
 Supplier#000006027        |      15
 Supplier#000006795        |      15
 Supplier#000006800        |      15
 Supplier#000006824        |      15
 Supplier#000007131        |      15
 Supplier#000007382        |      15
 Supplier#000008913        |      15
 Supplier#000009787        |      15
 Supplier#000000633        |      14
 Supplier#000001960        |      14
 Supplier#000002323        |      14
 Supplier#000002490        |      14
 Supplier#000002993        |      14
 Supplier#000003101        |      14
 Supplier#000004489        |      14
 Supplier#000005435        |      14
 Supplier#000005583        |      14
 Supplier#000005774        |      14
 Supplier#000007579        |      14
 Supplier#000008180        |      14
 Supplier#000008695        |      14
 Supplier#000009224        |      14
 Supplier#000000357        |      13
 Supplier#000000436        |      13
 Supplier#000000610        |      13
 Supplier#000000788        |      13
 Supplier#000000889        |      13
 Supplier#000001062        |      13
 Supplier#000001498        |      13
 Supplier#000002056        |      13
 Supplier#000002312        |      13
 Supplier#000002344        |      13
 Supplier#000002596        |      13
 Supplier#000002615        |      13
 Supplier#000002978        |      13
 Supplier#000003048        |      13
 Supplier#000003234        |      13
 Supplier#000003727        |      13
 Supplier#000003806        |      13
 Supplier#000004472        |      13
 Supplier#000005236        |      13
 Supplier#000005906        |      13
 Supplier#000006241        |      13
 Supplier#000006326        |      13
 Supplier#000006384        |      13
 Supplier#000006394        |      13
 Supplier#000006624        |      13
 Supplier#000006629        |      13
 Supplier#000006682        |      13
 Supplier#000006737        |      13
 Supplier#000006825        |      13
 Supplier#000007021        |      13
 Supplier#000007417        |      13
 Supplier#000007497        |      13
 Supplier#000007602        |      13
 Supplier#000008134        |      13
 Supplier#000008234        |      13
 Supplier#000009435        |      13
 Supplier#000009436        |      13
 Supplier#000009564        |      13
 Supplier#000009896        |      13
 Supplier#000000379        |      12
 Supplier#000000673        |      12
 Supplier#000000762        |      12
 Supplier#000000811        |      12
 Supplier#000000821        |      12
 Supplier#000001337        |      12
 Supplier#000001916        |      12
 Supplier#000001925        |      12
 Supplier#000002039        |      12
 Supplier#000002357        |      12
 Supplier#000002483        |      12
(100 rows)
```

==========

qualification query 22

==========

```
-- using default substitutions
select 'Stream 0 Query 22 START - ',
date_part('epoch',LOCALTIMESTAMP(1));
select
        cntrycode,
        count(*) as numcust,
        sum(c_acctbal) as totacctbal
from
        (
                select
                        substring(c_phone from 1 for 2)
as cntrycode,
                        c_acctbal
                from
                        customer
                where
                        substring(c_phone from 1 for 2)
in
                                ('13', '31', '23', '29',
'30', '18', '17')
                        and c_acctbal > (
                                select
                                        avg(c_acctbal)
                                from
                                customer
```

```
                        where
                                c_acctbal > 0.00
                                and
substring(c_phone from 1 for 2) in
                                        ('13',
'31', '23', '29', '30', '18', '17')
                        )
                        and not exists (
                                select
                                        *
                                from
                                        orders
                                where
                                        o_custkey =
c_custkey
                        )
        ) as custsale
group by
        cntrycode
order by
        cntrycode;
select 'Stream 0 Query 22 STOP - ',
date_part('epoch',LOCALTIMESTAMP(1));



Fri Oct 26 12:21:57 PDT 2007
 cntrycode | numcust | totacctbal
-----------+---------+------------
 13        |     888 | 6737713.99
 17        |     861 | 6460573.72
 18        |     964 | 7236687.40
 23        |     892 | 6701457.95
 29        |     948 | 7158866.63
 30        |     909 | 6808436.13
 31        |     922 | 6806670.18
(7 rows)
```

Appendix D. Seed and Query Substitution Parameters

This Appendix contains Seed values and substitution parameters for each stream

Seed Values

```
stream0 1023151756
stream1 1023151757
stream2 1023151758
stream3 1023151759
stream4 1023151760
stream5 1023151761
```

Query Parameters

```
==================================================
stream0: 1023151756
==================================================
14      1996-01-01
2       13      TIN     ASIA
9       saddle
20      smoke   1996-01-01      INDONESIA
6       1996-01-01      0.03    24
17      Brand#42        JUMBO JAR
18      313
8       IRAQ    MIDDLE EAST     ECONOMY BRUSHED TIN
21      MOROCCO
13      unusual         deposits
3       MACHINERY       1995-03-16
22      19      30      32      20      21      18      24
16      Brand#54        MEDIUM ANODIZED         35      5
        8       7       41      45      20      29
4       1995-06-01
11      EGYPT   0.0000010000
15      1997-01-01
1       116
10      1993-02-01
19      Brand#45        Brand#42        Brand#35        1
        15      26
5       MIDDLE EAST     1996-01-01
7       CANADA IRAQ
12      REG AIR         MAIL    1996-01-01

==================================================
stream1: 1023151757
==================================================
21      GERMANY
3       BUILDING        1995-03-01
18      314
5       AMERICA         1996-01-01
11      PERU    0.0000010000
7       SAUDI ARABIA    CANADA
6       1996-01-01      0.08    24
20      firebrick       1994-01-01      UNITED STATES
17      Brand#44        JUMBO CAN
12      SHIP    MAIL    1997-01-01
16      Brand#34        ECONOMY BURNISHED       38      8
        16      49      18      37      31      47
15      1995-01-01
13      unusual         deposits
10      1993-11-01
2       1       STEEL   AFRICA
8       CANADA AMERICA          ECONOMY PLATED TIN
14      1997-01-01
19      Brand#42        Brand#25        Brand#24        7
        16      22
9       puff
22      34      18      28      11      23      12      26
1       63
4       1993-03-01

==================================================
stream2: 1023151758
==================================================
6       1996-01-01      0.06    25
17      Brand#41        WRAP BOX
14      1997-01-01
16      Brand#14        STANDARD POLISHED       42      36
        12      28      22      30      17      33
19      Brand#54        Brand#53        Brand#23        2
        17      29
10      1994-08-01
9       papaya
2       38      BRASS   ASIA
15      1993-01-01
8       SAUDI ARABIA    MIDDLE EAST     ECONOMY ANODIZED
TIN
5       ASIA    1996-01-01
22      23      18      28      12      26      20      21
12      MAIL    SHIP    1993-01-01
7       JAPAN   SAUDI ARABIA
13      unusual         deposits
18      312
1       71
4       1995-10-01
20      plum    1997-01-01      JORDAN
3       HOUSEHOLD       1995-03-18
11      ETHIOPIA        0.0000010000
21      UNITED STATES
```

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

stream3: 1023151759

```
==================================================
8       JAPAN   ASIA    LARGE POLISHED TIN
5       EUROPE 1997-01-01
4       1993-07-01
6       1997-01-01      0.03    25
17      Brand#43        WRAP JAR
7       EGYPT   JAPAN
1       79
18      313
22      19      15      17      12      28      23      10
14      1997-01-01
9       navajo
10      1993-05-01
15      1995-01-01
11      CHINA   0.0000010000
20      burlywood       1996-01-01      CANADA
2       26      NICKEL  AFRICA
21      PERU
19      Brand#51        Brand#41        Brand#23        7
        18      25
13      unusual         deposits
16      Brand#54        MEDIUM BRUSHED 13       7       35
        34      11      5       14      1
12      TRUCK   MAIL    1997-01-01
3       BUILDING        1995-03-03
```

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

stream4: 1023151760

```
==================================================
5       MIDDLE EAST     1997-01-01
21      INDONESIA
14      1998-01-01
19      Brand#53        Brand#24        Brand#12        2
        19      21
15      1993-01-01
17      Brand#45        WRAP CAN
12      RAIL    FOB     1997-01-01
6       1997-01-01      0.08    24
4       1996-02-01
9       medium
8       EGYPT   MIDDLE EAST     LARGE BURNISHED NICKEL
16      Brand#34        PROMO BURNISHED         23      28
        19      27      21      14      7       15
11      FRANCE  0.0000010000
2       14      TIN     EUROPE
10      1994-03-01
18      315
1       87
13      unusual         deposits
7       VIETNAM         EGYPT
22      28      17      16      23      24      26      14
3       HOUSEHOLD       1995-03-20
20      medium  1994-01-01      CHINA
```

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

stream5: 1023151761

```
==================================================
21      ARGENTINA
15      1996-01-01
4       1993-11-01
6       1997-01-01      0.06    25
7       JORDAN  VIETNAM
16      Brand#24        SMALL PLATED    2       48      3
        5       11      7       8       47
19      Brand#15        Brand#12        Brand#11        8
        20      29
18      313
14      1993-01-01
22      18      11      32      34      33      31      23
11      ROMANIA         0.0000010000
13      express         packages
3       AUTOMOBILE      1995-03-06
1       95
2       2       COPPER  AFRICA
5       AFRICA  1997-01-01
8       VIETNAM         ASIA    MEDIUM BRUSHED NICKEL
20      violet  1993-01-01      INDIA
12      AIR     FOB     1993-01-01
17      Brand#42        SM BOX
10      1994-12-01
9       lemon
```

Appendix E. Implementation-Specific Layer/Driver Code

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

ntest

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

#!/bin/bash

source /home/paraccel/.bashrc

# Set env var's needed for ntest
export xenv="xen-TPCH9-1"
nq=22

test_timestamp=`date "+%m_%d_%H_%M_%S"`

cur_dir=$(pwd)
if [[ $cur_dir != $HOME/run/scripts ]]
then
      echo
      echo ERROR: do_test must be run from
$HOME/run/scripts
      echo
      echo "       the current dir is $cur_dir "
      echo
      exit
fi


export
audit_file_dir="$HOME/run/paraccel_stage/results/"

if (( $# < 1 ))
then
   echo
   echo "usage: $0    scope   (plus additional args
depending upon scope)                                   "
   echo
   echo "      scope values:
"
   echo
   echo "      - load          create and load a tpch
database from scratch                           "
   echo "      - qi            do query i
(i=1,2,...,22)
"
   echo "      - stream0       do all 22 queries
without any refreshes                                   "
   echo "      - refresh1      do refresh 1
"
   echo "      - refresh2      do refresh 2"
   echo "      - thrustreams   do a single thrurefresh
run without any refreshes               "
   echo "      - thrurefresh   do all the throughput
refreshes without query streams"
   echo "      - all           do full audit run: load
+ 2 power-thrurefresh cycles:"
   echo "      run1 <onerefresh 1 + stream0 +
onerefresh 2 + thrustreans + thrurefresh> + run2<>"
   echo
   exit
```

```
fi

scope=$1

case $scope in
          load)  if (( $# < 3  || $# > 3 ))
                 then
                       echo
                       echo "usage: $0    load
scale_factor    num_query_streams"
                       echo
                       exit
                 fi
                seed=1
                sf=$2
                nqs=$3;;


            q*)  if (( $# < 2 || $# > 2 ))
                 then
                       echo
                       echo "usage: $0    qi
scale_factor                              "
                       echo
                       echo "     note: database must
be running; if not restart it first"
                       echo
                       exit
                 fi

                 query_num=${scope:1}
                 case $query_num in
                    [1-9])   ;;  # q1  to q9
                   1[0-9])   ;;  # q10 to q19
                   2[0-2])   ;;  # q20 to q22
                        *)  echo
                            echo "ERROR: query number
($query_num) must be between 1 and 22"
                            echo
                            exit
                 esac

                 sf=$2  ;;

       stream0)  if (( $# < 3 || $# > 3 ))
                 then
                       echo
                       echo "usage: $0    stream0
scale_factor  input_seed"
                       echo
                       exit
                 fi

                 sf=$2
                 let input_seed=$3   ;;

       refresh1)  if (( $# < 2 || $# > 2 ))
                 then
                       echo
                       echo "usage: $0    refresh1
scale_factor  "
                       echo
                       exit
                 fi

                 sf=$2 ;;

       refresh2)  if (( $# < 2 || $# > 2 ))
                 then
                       echo
                       echo "usage: $0    refresh2
scale_factor  "
                       echo
                       exit
                 fi

                 sf=$2 ;;

    thrustreams)  if (( $# < 4 || $# > 4 ))
                 then
                       echo
                       echo "usage: $0    thrustreams
scale_factor  "
                       echo "
num_query_streams  input_seed "
                       echo
                       exit
                 fi

                 sf=$2
                 nqs=$3
                 let input_seed=$4   ;;

    thrurefresh)  if (( $# < 4 || $# > 4 ))
                 then
                       echo
                       echo "usage: $0    thrurefresh
scale_factor  "
                       echo "
num_query_streams  input_seed "
                       echo
                       exit
                 fi

                 sf=$2
                 nqs=$3
                 let input_seed=$4   ;;



          all)  if (( $# < 6 || $# > 6 ))
                 then
                       echo
                       echo "usage: $0    all
scale_factor  "
                       echo "
num_query_streams                         "
                       echo "
num_disks  disk_size(in GB)  system_cost    "
                       echo
                       exit
                       echo
                 fi

                 sf=$2
                 nqs=$3
                 let nd=$4
                 let ds=$5
                 let sc=$6
                 input_seed=$(grep "as a seed"
stream0.sql | cut -d 'g' -f2 | cut -d 'a' -f1) ;;
               *)  echo
                 echo "ERROR: scope (=$scope) must be
one of:                          "
                 echo
                 echo "
load,q1,q2,...,q22,stream0,refresh1,refresh2,"
                 echo "
thrustreams,thrurefresh,lthrurefresh,all     "
                 echo
                 echo
                 exit
esac

# we impose the minimum stream requirement only in the
"all" case
# for all other scopes the min number of query streams
is 1
# aminqs is thus the "allowed minimum" for the current
run

aminqs=1
if [[ ($scope = all ) && -z $real_scope && -z
$real_scope2 ]]
then
```

```
   case $sf in
         .1)  aminqs=1
              ;;
          1)  aminqs=2
              ;;
         10)  aminqs=3
              ;;
         30)  aminqs=4
              ;;
        100)  aminqs=5
              ;;
        300)  aminqs=6
              ;;
       1000)  aminqs=7
              ;;
       3000)  aminqs=8
              ;;
      10000)  aminqs=9
              ;;
         * )
              echo
              echo "ERROR:  scale factor (=$sf) must
be one of (.1,1,10,30,100,300,1000,3000,10000)"
              echo
              exit
              echo;;
   esac
fi

# These are the minimum number of streams for a
compliant run
case $sf in
        1)  cmin=2
            ;;
       10)  cmin=3
            ;;
       30)  cmin=4
            ;;
      100)  cmin=5
            ;;
      300)  cmin=6
            ;;
     1000)  cmin=7
            ;;
     3000)  cmin=8
            ;;
    10000)  cmin=9
            ;;
        *)  cmin=1
            ;;
esac


PLATFORM=`uname -m`

# make sure input_seed value is legal (i.e. >= 0 ) for
the scopes where it is been
# supplied as a commandline arg ("lrun1" and
"lthrurefresh" are covered by "all"

if [[ $scope = stream0    || $scope = power || $scope
= thrustreams ||  \
      $scope = thrurefresh || $scope = run1  || $scope
= all           ]]
then
      if [[ $input_seed -lt 0 ]]
      then
           echo
           echo "ERROR: input_seed($input_seed) must
be >= 0"
           echo
           exit
      fi
fi


# check that the scale factor is legal where it has
been supplied as
# a command line arg

      if [[ $sf != .1 && $sf != 1 && $sf != 10 &&
$sf != 30 && \
            $sf != 100 && $sf != 300 && $sf != 1000 &&
$sf != 3000 && $sf != 10000 ]]
      then
            echo
            echo "ERROR: scale factor (=$sf) must be
one of [.1,1,10,30,100,300,1000,3000,10000]"
            echo
            exit
      fi

if [[ $scope = thrurefresh || $scope = all     ]]
then
         # generate update_throughputX.sql
         i=2
         run=1
         ((max_streams=nqs + 1))
         while((run<=2))
         do
            echo "MAX = $max_streams"
            upd_tput_fname="update_throughput_run_${ru
n}_${nqs}.sql"
            cat update_throughput_header >
$upd_tput_fname
            stream_number=1
            while ((i<=max_streams))
            do
               echo "select 'Stream ${stream_number}
RF1 START - ', date_part('epoch',LOCALTIMESTAMP(3)),
localtimestamp;" >> $upd_tput_fname
               echo "exec rf1 ${i};" >>
$upd_tput_fname
               echo "select 'Stream ${stream_number}
RF1 STOP - ', date_part('epoch',LOCALTIMESTAMP(3)),
localtimestamp;" >> $upd_tput_fname
               echo "select 'Stream ${stream_number}
RF2 START - ', date_part('epoch',LOCALTIMESTAMP(3)),
localtimestamp;" >> $upd_tput_fname
               echo "exec rf2 ${i};" >>
$upd_tput_fname
               echo "select 'Stream ${stream_number}
RF2 STOP - ', date_part('epoch',LOCALTIMESTAMP(3)),
localtimestamp;" >> $upd_tput_fname
               ((i=i+1))
               ((stream_number=stream_number+1))
            done
            cat update_throughput_footer >>
$upd_tput_fname
            ((i=nqs + 2))
            ((max_streams=max_streams + nqs))
            ((run=run + 1))
         done
fi

if [[ $scope = thrurefresh || $scope = run1 || $scope
= all || $scope = mall ]]
then
            run=1
            while((run<=2))
            do
               if [[ -f
update_throughput_run_${run}_${nqs}.sql ]]
               then
                 echo
               else
                 echo
                 echo "ERROR:
update_throughput_run_${run}_${nqs}.sql must exist for
a run of $nqs streams"
                 echo
                 exit
            fi
            ((run=run + 1))
      done
fi
```

```
# make sure that the number of query streams >=
minimum allowed num streams
# aminqs has been previously set to 1 except when
$scope is "all" in which
# case aminqs is the complient minimun

if [[ $scope = all ]]
then
      if ((nqs < aminqs))    # nqs: requested number
of query streams
      then
            echo
            echo "ERROR: requested query streams
(=$nqs) must be >= $aminqs for sf=$sf & scope=$scope"
            echo
            exit
      fi
fi

if ((sf >= 1000))
then
   big=big     #  make l_orderkey and o_orderkey
bigint
else
   big=        #  otherwise int
fi

# we have checked the commandline args for
reasonableness, now
# describe the scope of the run and its configuration

echo " "
case $scope in
           q* )
                 echo "DOING QUERY $query_num  with: "
;;
          all )
                 if [[ $real_scope = lrun1 ]]
                 then
                       echo "DOING LOAD, FOLLOWED BY
POWER, FOLLOWED BY THROUGHPUT with:"
                 else
                       echo "DOING FULL AUDIT TEST
(load, plus 2 full runs) with: "
                 fi ;;
         load )
                 echo "ONLY DOING LOAD (and create
database) with: " ;;
      refresh1 )
                 echo "ONLY DOING ONE REFRESH 1 with:
" ;;
      refresh2 )
                 echo "ONLY DOING ONE REFRESH 2 with:
" ;;
   thrustreams )
                 echo "ONLY DOING ONE THROUGHPUT TEST
WITHOUT REFRESHES with:" ;;
   thrurefresh )
                 echo "ONLY DOING ONE THROUGHPUT TEST
with:" ;;
      stream0 )
                 echo "ONLY DOING 22 SINGLE-USER
QUERIES (NO REFRESHES):" ;;
            * )
                 echo "ERROR:  scope (=$scope) must be
one of"
                 echo "
(all,load,power,refresh,stream0,thrurefresh,run1)"
                 echo
                 exit ;;
esac

echo " "
      echo "      scale factor = $sf "

if [[ $scope = all || $scope = thrurefresh || $scope =
thrustreams ]]
then
   echo "      num thrurefresh streams = $nqs
(compliant minimum for this scale factor: $cmin)"
fi


if [[ $scope = load || $scope = all ]]
then
      if [[ $big = big ]]
      then
         echo "      using orderkeys of type unsigned
bigint"
      else
         echo "      using orderkeys of type unsigned
int "
      fi

      echo

fi


if [[ $scope != load && $scope != refresh1 && $scope !
= refresh2 ]]
then
   if [[ $input_seed == 1 ]]
   then
         seed=$input_seed
         echo "      using newly gererated seed"
   elif  [[ $input_seed == 0 ]]
   then
         if [[ -f stream0.sql ]]
         then
               existing_seed=$(grep "as a seed"
stream0.sql | cut -d 'g' -f2 | cut -d 'a' -f1)
               seed=$existing_seed
               echo  "      using existing seed =
$seed"
         else
               echo "ERROR: Cannot use existing seed
when stream0.sql does not exist"
               exit
         fi
   else
      echo "      using $input_seed as seed"
      seed=$input_seed
   fi
fi


echo "      Using the following nodes"
echo "      ---------------------------"
cqi show | grep -i node  #replace this with cqi -s
when sysmgr is ready

echo -e "Are these OK? (type y or n) \c"
read ans


if [[ $ans = n || $ans = no ]]
then
     echo
     echo change one or more of
     echo "  options.sql, tpch.cfg,
create_database.sql, create_tables_${big}int or
/etc/system"
     echo and try again
     echo
     exit
fi

# -------------  start real execution
-----------------------------------
if [[ $scope = all ]]
```

```
then
   rm -f ${audit_file_dir}* 2&>/dev/null
fi

power=0           # used in run1 to determine if
Composite should be calculated
throughput=0      # this might not be necessary

if [[ $scope = q* ]]
then
     # assumes database is running
     do_one_query $query_num $sf
     echo
     exit
fi

echo
echo

if [[ $scope = load  ]]
then

     echo " "
     echo " "
     echo " "

     if [[ -e cud.ooo ]]
     then
        rm cud.ooo
     fi

     echo "    Creating tpch database: `date`"
     echo "  "
     createdb.sh > cud.ooo
     echo "  "
     #This installs the stored procedures for refresh
1 and 2
     echo "Installing stored procs for RF1 and RF2."
     echo "  "
     psql -d tpch -f create_rf1.sql -o create_rf1.out
     psql -d tpch -f create_rf2.sql -o create_rf2.out
     if [[ -s cud.ooo ]]   # cud.ooo exists and non-
empty
     then
           echo "    tpch database created: `date`"
     else
           echo
           echo ERROR: create_database.sh  failed
           echo
     exit
     fi
     echo "  "
     echo "  "
fi

# create db_spaces  and create the 2 stored procs
which control the refresh operations
if [[ $scope = load  ]]
then

     psql -d tpch -f time_wait.sql -o tpchw.ooo
     if [[ -s tpchw.ooo ]]
     then
           echo "         executed tpch_wait.sql"
     else
           echo
           echo ERROR: tpch_wait.sql failed
           echo
           exit
     fi

     echo "  "
fi

if [[ $scope = load ]]
then
     sleep 5

     if [[ -e ct.ooo ]]
     then
       rm ct.ooo
     fi

     psql -d tpch -f create_tables_${big}int.sql -o
ct.ooo
     if [[ -s ct.ooo ]]
     then
           echo "    executed
create_tables_${big}int.sql"
     else
           echo
           echo ERROR: create_tables_${big}int.sql
failed
           echo
           exit
     fi

     sleep 5

     #
     # Load the database
     #
     echo "  "

     starttime=`date "+%Y-%m-%d %H:%M:%S"`
     echo "   Load started  $starttime "  | tee
start_load.out
     psql -d tpch -a -f load_lineitem.sql >
load_lineitem.out &
     loadlpid=$!
     echo " "
     echo "          - lineitem load started: `date` "
     echo " "
     psql -d tpch -a -f load_region.sql >
load_region.out
     echo "          - region load completed: `date` "
     psql -d tpch -a -f load_nation.sql >
load_nation.out
     echo "          - nation load completed: `date` "
     psql -d tpch -a -f load_customer.sql >
load_customer.out
     echo "          - customer load completed: `date`
"
     psql -d tpch -a -f load_part.sql > load_part.out
     echo "          - part load completed: `date` "
     psql -d tpch -a -f load_supplier.sql >
load_supplier.out
     echo "          - supplier load completed: `date`
"
     psql -d tpch -a -f load_partsupp.sql >
load_partsupp.out
     echo "          - partsupp load completed: `date`
"
     psql -d tpch -a -f load_orders.sql >
load_orders.out
     echo "          - orders load completed: `date` "
     wait $loadlpid
     echo "          - lineitem load completed: `date`
"
     echo
     echo "     Building statistics.."
     echo
     echo ANALYZE START at `date` > analyze.out
     psql -d tpch -a -c 'analyze' >> analyze.out
     echo ANALYZE STOP at `date` >> analyze.out
     echo
     echo "    Done building statistics `date` "
     echo
     endyear=`date '+%Y'`
     enddate=`date '+%m%d'`
     endtime=`date '+%H%M%S'`
     endstamp=`date "+%Y-%m-%d %H:%M:%S"`
     echo "    Load Finished  $endstamp" | tee
end_load.out
     echo "    Seed time is:
$endyeaar$enddate$endtime"
```

```
     echo
     show_asiq_cpu  end_load  > end_load_cpu.out
     slt=`tr -s ' ' <start_load.out | cut -d' ' -f 4,5
`
     elt=`tr -s ' ' <end_load.out | cut -d' ' -f 4,5 `
     echo "CALLING CALCULATE_LOAD.. FROM NTEST"
     lt=`calculate_load_time.bash "$elt" "$slt" `  #
calls secs_from_epoch.pl
     echo "   Database Load Time:  $lt"
     echo " "
     if ((seed==1))
     then
           echo "Generating $((nqs+1)) Query Streams "
           echo "Using the appropriate timestamp seed
= $enddate$endtime"
           gen_streams $enddate $endtime $sf $nqs
     else
        if [[ $input_seed == 0 ]]
        then
           echo  "Using existing seed = $seed
####################"
        else
           echo  "Using provided seed = $seed
####################"
           rm -f stream*.sql
           gen_streams 0 $seed $sf $nqs
        fi
     fi
     echo
     if [[ $scope = load ]]
     then
          echo exiting $0
          echo
          exit
     fi
fi

#Load completed

if [[ $scope = all ]]
then
     echo "Starting Audit Verification Scripts
`date` "
     echo

     # After the load Completes run the Audit SQL

     psql -d tpch -f dbtables-xen.sql >
rdbtablest_start.out

     echo
     echo "Finished Audit Start Verification Scripts
`date` "
     echo
fi

echo "Performing Pre-Test clean-up."
echo


if rm stream*.out 2>/tmp/junk
then
echo "Clean-up: Removed stream*.out"
else
echo "Clean-up No stream files to remove"
fi
echo
if rm update_power.out 2>/tmp/junk
then
echo "Clean-up: Removed update_power.out"
else
echo "Clean-up: No update_power.out file to remove"
fi
echo
if rm update_throughput.out 2>/tmp/junk
then
echo "Clean-up: Removed update_throughput.out"
else
echo "Clean-up: No update_throughput.out file to
remove"
fi
echo
echo


if [[ ( $scope = refresh1 || $scope = refresh2 ||
$scope = stream0 || $scope = all ) ]]
then
     if [[  $scope = all ]]
     then
          echo
          echo "Start Run 1 Power Test   `date` "
          echo "----------------------          "
     elif [[ $scope = stream0 ]]
     then
          echo
          echo "Start Stream0   `date` "
          echo "-------------           "
     else
          echo
          echo "Start Refresh   `date` "
          echo "-------------           "
     fi


     if [[ $scope = refresh1 || $scope = all ]]
     then
          echo
          echo "     Start refresh 1   `date`  "
          psql -d tpch -f refresh1.sql > rf1.out
          echo
          echo "     End refresh 1   `date`  "
         #create the refresh file
         cat rf1.out  > update_power.out
     fi


     if [[ $scope = stream0  || $scope = all ]]
     then
           echo
           echo "     Start Query Stream 0   `date` "
           psql -d tpch -f stream0.sql > stream0.out
           cat s0q01-1.out s0q01-4.out s0q02-1.out
s0q02-4.out s0q03-1.out s0q03-4.out s0q04-1.out s0q04-
4.out s0q05-1.out s0q05-4.out s0q06-1.out s0q06-4.out
s0q07-1.out s0q07-4.out s0q08-1.out s0q08-4.out s0q09-
1.out s0q09-4.out s0q10-1.out s0q10-4.out s0q11-1.out
s0q11-4.out s0q12-1.out s0q12-4.out s0q13-1.out s0q13-
4.out s0q14-1.out s0q14-4.out s0q15-1.out s0q15-4.out
s0q16-1.out s0q16-4.out s0q17-1.out s0q17-4.out s0q18-
1.out s0q18-4.out s0q19-1.out s0q19-4.out s0q20-1.out
s0q20-4.out s0q21-1.out s0q21-4.out s0q22-1.out s0q22-
4.out >> stream0.out
           echo
           echo "     Finish Query Stream 0  `date` "
     fi


     if [[ $scope = refresh2 || $scope = all ]]  # do
refresh2
     then
           echo
           echo "     Start refresh 2   `date` "
          psql -d tpch -f refresh2.sql > rf2.out
           echo
           echo "     End refresh 2    `date`  "
           # append the refresh file
           cat rf2.out >> update_power.out
     else
           echo
           echo "End Stream0   `date`"
           echo "-----------         "
           echo will now make report
           echo
     fi
```

```
     if [[ $scope = refresh2 ]]
     then
           echo
           echo "     End Refresh 2  `date`    "
           echo "--------------------------"
           echo
           tpch_stats.pl power $sf $nqs none
           echo
           if [[ $scope = refresh2 ]]
           then
               exit   # on refresh
           fi
     else
           echo
           echo "End Run 1 Power Test        `date` "
           echo "---------------------           "
           echo "   Computing response times.."
           echo " "
           echo " "
           tpch_stats.pl power $sf "1" "none"
           power=$(tpch_stats.pl stream0 $sf 1 power)
           echo " "
           echo " "
           echo "   Done computing response times"
           echo " "
           echo "     Power = $power"
           echo
           echo
           ps -eaf | grep asiq| grep -v grep | tr -s '
' | cut -d ' ' -f8,9
           echo
     fi
fi

if [[ ($scope = thrurefresh || $scope = all || $scope
= thrustreams) ]]
then
     echo
     echo "Start Run 1 Throughput `date`  "
     echo "----------------------         "
     echo "  "
     echo "     Start Query Streams  `date` "
     echo "  "

     ((i=1))
     while ((i<=nqs))  # run all query streams
concurrently
     do
        echo "        Starting stream ${i}"
        psql -d tpch -f stream${i}.sql >
stream${i}.out &
       echo "        Stream ${i} started    `date`"
        ((i=i+1))
     done
     wait   # for everything

     ((i=1))
     while ((i<=nqs))
     do
       cat s${i}q01-1.out s${i}q01-4.out s${i}q02-
1.out s${i}q02-4.out s${i}q03-1.out s${i}q03-4.out
s${i}q04-1.out s${i}q04-4.out s${i}q05-1.out s${i}q05-
4.out s${i}q06-1.out s${i}q06-4.out s${i}q07-1.out
s${i}q07-4.out s${i}q08-1.out s${i}q08-4.out s${i}q09-
1.out s${i}q09-4.out s${i}q10-1.out s${i}q10-4.out
s${i}q11-1.out s${i}q11-4.out s${i}q12-1.out s${i}q12-
4.out s${i}q13-1.out s${i}q13-4.out s${i}q14-1.out
s${i}q14-4.out s${i}q15-1.out s${i}q15-4.out s${i}q16-
1.out s${i}q16-4.out s${i}q17-1.out s${i}q17-4.out
s${i}q18-1.out s${i}q18-4.out s${i}q19-1.out s${i}q19-
4.out s${i}q20-1.out s${i}q20-4.out s${i}q21-1.out
s${i}q21-4.out s${i}q22-1.out s${i}q22-4.out >>
stream${i}.out
        ((i=i+1))
     done

     echo " "
     echo "     All Query Streams have completed
`date` "
     echo " "

     if [[ $scope != thrustreams ]]  # thrustreams
does a thrurefresh without refreshes
     then
          echo "     Start Refresh Stream for set $nqs
`date` "

     psql -d tpch -f
update_throughput_run_1_${nqs}.sql >>
update_throughput.out


          echo
          echo "     Refresh stream has completed
`date`   "
     fi
     throughput_interval=$(tpch_throughput_interval.ba
sh  $nqs)
     tpch_throughput_interval.bash $nqs >
throughput_interval.out
     throughput=$(tpch_stats.pl "thrurefresh"  $sf
$nqs "throughput")
     echo
     echo "     Throughput Interval =
$throughput_interval secs "
     echo
     echo "     Throughput = $throughput"
     echo
     if [[ $power != 0 ]]
     then
          composite=$(my_calc.pl
"sqrt($power*$throughput)")
          echo "     Composite = $composite"
          echo
     fi
     echo
     #ps -eaf | grep asiq | grep -v grep | tr -s ' ' |
cut -d ' ' -f8,9
     echo
fi

if [[ $scope = stream0 || $scope = power || $scope =
thrustreams ||
      $scope = thrurefresh || $scope = all  ]]
then
     dayHr=`date '+%m%d%H'`
     echo
     echo
     if [[ -z $real_scope2 ]]     # non_null means
lthrurefresh
     then
        if [[ -z $real_scope ]]   # non_null means
lrun1
        then
           if [[ $scope = stream0 ]]
           then
              composite=0
           fi
           if [[ $scope = power ]]
           then
              composite=$power
           fi
           if [[ $scope = thrurefresh || $scope =
all ]]
           then
              composite=$throughput
           fi
           rpt_file_name="run1_"$test_timestamp

#rpt_file_name="mrun1_${scope}_${sf}g_${nqs}s_${dayHr}
_${xenv}_1n_$(round_to_tenths.pl ${composite}).r"
           echo "Producing ${rpt_file_name}"
           echo "Running tpch_report
##############################################"
           tpch_report.new $scope $sf
```

```
\
                           run1_${scope}_${sf}g_${nqs
}s_${dayHr}_${xenv}_1n.r \
                           $seed $nqs $nd $ds $sc
\
                        > ${rpt_file_name}
          mv ${rpt_file_name} $audit_file_dir
       else
       echo" "
       fi
     else
       # lthrurefresh
       composite=$throughput
       rpt_file_name="run1_"$test_timestamp
       echo "Producing ${rpt_file_name}"
       tpch_report.new $scope $sf
\
                          run1_${scope}_${sf}g_${nqs}s_
${dayHr}_${xenv}_1n.r \
                           $seed $nqs $nd $ds $sc
\
                        > ${rpt_file_name}
          mv ${rpt_file_name} $audit_file_dir
     fi
     echo
fi


if [[ $scope = all ]]
then
     echo
     ((i=0))
     while ((i<=nqs))  # move the streamX.out files to
audit naming standard
     do
        ((q=1))
        while ((q<=22))
        do
           if [ $q -lt 10 ]
           then
              qn="0$q"
           else
              qn="$q"
           fi
           cat s${i}q${qn}-?.out >
${audit_file_dir}m1s${i}q${qn}.out
           lc=`wc -l < s${i}q${qn}-3.out`
           if [ $lc -gt 200 ]
           then
              head -102 s${i}q${qn}-3.out >
s${i}q${qn}-3.trunc
              echo
"*******************************************" >>
s${i}q${qn}-3.trunc
              tail -102 s${i}q${qn}-3.out >>
s${i}q${qn}-3.trunc
              cat s${i}q${qn}-1.out  s${i}q${qn}-2.out
s${i}q${qn}-3.trunc s${i}q${qn}-4.out >
${audit_file_dir}m1s${i}q${qn}.trunc.out
           fi
        ((q=q+1))
        done
        ((i=i+1))
     done

     mv update_power.out $audit_file_dir"m1s00rf.out"
#change to move
     mv update_throughput.out
$audit_file_dir"m1s01rf.out" #change to move
     mv load_*.out $audit_file_dir
     mv analyze.out $audit_file_dir

     echo "Moved  *.out files to audit naming standard
in ../paraccel_stage/results"
     echo
     echo
     echo "FINISHED Run1      `date`"
     echo
fi

####################
# Run 2
####################
if [[ ( $scope = refresh1 || $scope = refresh2 ||
$scope = stream0 || $scope = all ) ]]
then
     if [[  $scope = all ]]
     then
          echo
          echo "Start Run 2 Power Test   `date` "
          echo "----------------------          "
     elif [[ $scope = stream0 ]]
     then
          echo
          echo "Start Stream0   `date` "
          echo "-------------          "
     else
          echo
          echo "Start Refresh   `date` "
          echo "-------------          "
     fi


     if [[ $scope = refresh1 || $scope = all ]]
     then
          echo
          echo "     Start refresh 1   `date`  "
          psql -d tpch -f refresh1.sql > rf1.out
          echo
          echo "     End refresh 1   `date`  "
         #create the refresh file
         cat rf1.out  > update_power.out
     fi


     if [[ $scope = stream0  || $scope = all ]]
     then
           echo
           echo "     Start Query Stream 0   `date` "
           psql -d tpch -f stream0.sql > stream0.out
           cat s0q01-1.out s0q01-4.out s0q02-1.out
s0q02-4.out s0q03-1.out s0q03-4.out s0q04-1.out s0q04-
4.out s0q05-1.out s0q05-4.out s0q06-1.out s0q06-4.out
s0q07-1.out s0q07-4.out s0q08-1.out s0q08-4.out s0q09-
1.out s0q09-4.out s0q10-1.out s0q10-4.out s0q11-1.out
s0q11-4.out s0q12-1.out s0q12-4.out s0q13-1.out s0q13-
4.out s0q14-1.out s0q14-4.out s0q15-1.out s0q15-4.out
s0q16-1.out s0q16-4.out s0q17-1.out s0q17-4.out s0q18-
1.out s0q18-4.out s0q19-1.out s0q19-4.out s0q20-1.out
s0q20-4.out s0q21-1.out s0q21-4.out s0q22-1.out s0q22-
4.out >> stream0.out
           echo
           echo "     Finish Query Stream 0  `date` "
     fi


     if [[ $scope = refresh2 || $scope = all ]]  # do
refresh2
     then
           echo
           echo "     Start refresh 2   `date` "
          psql -d tpch -f refresh2.sql > rf2.out
           echo
           echo "     End refresh 2    `date`  "
           # append the refresh file
           cat rf2.out >> update_power.out
     else
           echo
           echo "End Stream0   `date`"
           echo "-----------      "
           echo will now make report
           echo
     fi


     if [[ $scope = refresh2 ]]
```

```
     then
           echo
           echo "     End Refresh 2  `date`    "
           echo "----------------------------"
           echo
           tpch_stats.pl power $sf $nqs none
           echo
           if [[ $scope = refresh2 ]]
           then
               exit   # on refresh
           fi
     else
           echo
           echo "End Run 2 Power Test       `date` "
           echo "---------------------           "
           echo "   Computing response times.."
           echo " "
           echo " "
           tpch_stats.pl power $sf "1" "none"
           power=$(tpch_stats.pl stream0 $sf 1 power)
           echo " "
           echo " "
           echo "   Done computing response times"
           echo " "
           echo "     Power = $power"
           echo
           echo
           ps -eaf | grep asiq| grep -v grep | tr -s '
' | cut -d ' ' -f8,9
           echo
     fi
fi

if [[ ($scope = thrurefresh || $scope = all || $scope
= thrustreams) ]]
then
     echo
     echo "Start Run 2 Throughput `date`  "
     echo "----------------------         "
     echo "  "
     echo "     Start Query Streams  `date` "
     echo "  "

     ((i=1))
     while ((i<=nqs))  # run all query streams
concurrently
     do
        echo "        Starting stream ${i}"
        psql -d tpch -f stream${i}.sql >
stream${i}.out &
        echo "        Stream ${i} started    `date`"
        ((i=i+1))
     done

     wait   # for everything

     ((i=1))
     while ((i<=nqs))  # get timings for each stream
     do
       cat s${i}q01-1.out s${i}q01-4.out s${i}q02-
1.out s${i}q02-4.out s${i}q03-1.out s${i}q03-4.out
s${i}q04-1.out s${i}q04-4.out s${i}q05-1.out s${i}q05-
4.out s${i}q06-1.out s${i}q06-4.out s${i}q07-1.out
s${i}q07-4.out s${i}q08-1.out s${i}q08-4.out s${i}q09-
1.out s${i}q09-4.out s${i}q10-1.out s${i}q10-4.out
s${i}q11-1.out s${i}q11-4.out s${i}q12-1.out s${i}q12-
4.out s${i}q13-1.out s${i}q13-4.out s${i}q14-1.out
s${i}q14-4.out s${i}q15-1.out s${i}q15-4.out s${i}q16-
1.out s${i}q16-4.out s${i}q17-1.out s${i}q17-4.out
s${i}q18-1.out s${i}q18-4.out s${i}q19-1.out s${i}q19-
4.out s${i}q20-1.out s${i}q20-4.out s${i}q21-1.out
s${i}q21-4.out s${i}q22-1.out s${i}q22-4.out >>
stream${i}.out
        ((i=i+1))
     done

     echo " "
     echo "     All Query Streams have completed
`date` "
     echo " "

     if [[ $scope != thrustreams ]]  # thrustreams
does a thrurefresh without refreshes
     then
          echo "     Start Refresh Stream for set $nqs
`date` "

          psql -d tpch -f update_throughput${nqs}.sql
>> update_throughput.out

          echo
          echo "     Refresh stream has completed
`date`   "
     fi
     throughput_interval=$(tpch_throughput_interval.ba
sh  $nqs)
     tpch_throughput_interval.bash $nqs >
throughput_interval.out
     throughput=$(tpch_stats.pl "thrurefresh"  $sf
$nqs "throughput")
     echo
     echo "     Throughput Interval =
$throughput_interval secs "
     echo
     echo "     Throughput = $throughput"
     echo
     if [[ $power != 0 ]]
     then
          composite=$(my_calc.pl
"sqrt($power*$throughput)")
          echo "     Composite = $composite"
          echo
     fi
     echo
     #ps -eaf | grep asiq | grep -v grep | tr -s ' ' |
cut -d ' ' -f8,9
     echo
fi

if [[ $scope = stream0 || $scope = power || $scope =
thrustreams ||
      $scope = thrurefresh || $scope = all  ]]
then
     dayHr=`date '+%m%d%H'`
     echo
     echo
     if [[ -z $real_scope2 ]]     # non_null means
lthrurefresh
     then
        if [[ -z $real_scope ]]   # non_null means
lrun1
        then
          if [[ $scope = stream0 ]]
          then
             composite=0
          fi
          if [[ $scope = power ]]
          then
             composite=$power
          fi
          if [[ $scope = thrurefresh || $scope =
all ]]
          then
             composite=$throughput
          fi
          rpt_file_name="run2_"$test_timestamp
          echo "Producing ${rpt_file_name}"
          echo "Running tpch_report
##############################################"
          tpch_report.new $scope $sf
\
                              run1_${scope}_${sf}g_${nqs
}s_${dayHr}_${xenv}_1n.r \
                              $seed $nqs $nd $ds $sc
\
                        > ${rpt_file_name}
```

```
           mv ${rpt_file_name} $audit_file_dir
        else
          echo" "
        fi
     else
        # lthrurefresh
        composite=$throughput
        rpt_file_name="run2_"$test_timestamp
        echo "Producing ${rpt_file_name}"
        tpch_report.new $scope $sf
\
                          run1_${scope}_${sf}g_${nqs}s_
${dayHr}_${xenv}_1n.r \
                          $seed $nqs $nd $ds $sc
\
                         > ${rpt_file_name}
           mv ${rpt_file_name} $audit_file_dir
     fi
     echo
fi


if [[ $scope = all ]]
then
     echo
     ((i=0))
     while ((i<=nqs))  # move the streamX.out files to
audit naming standard
     do
        ((q=1))
        while ((q<=22))
        do
           if [ $q -lt 10 ]
           then
              qn="0$q"
           else
              qn="$q"
           fi
           cat s${i}q${qn}-?.out >
${audit_file_dir}m2s${i}q${qn}.out
           lc=`wc -l < s${i}q${qn}-3.out`
           if [ $lc -gt 200 ]
           then
              head -102 s${i}q${qn}-3.out >
s${i}q${qn}-3.trunc
              echo
"*****************************************" >>
s${i}q${qn}-3.trunc
              tail -102 s${i}q${qn}-3.out >>
s${i}q${qn}-3.trunc
              cat s${i}q${qn}-1.out  s${i}q${qn}-2.out
s${i}q${qn}-3.trunc s${i}q${qn}-4.out >
${audit_file_dir}m2s${i}q${qn}.trunc.out
           fi
        ((q=q+1))
        done
        ((i=i+1))
        echo create query output files here - dude
     done

     mv update_power.out $audit_file_dir"m2s00rf.out"
#change to move
     mv update_throughput.out
$audit_file_dir"m2s01rf.out" #change to move

     echo "Moved *.out files to audit naming standard
in ../paraccel_stage/results"
     echo
     echo "FINISHED Run2      `date`"
     echo
fi
exit


================================================
tpch_stats.pl
================================================
```

```
#!/usr/bin/perl -w

use strict;

my @time_array;
my @scratch;
my $query;
my $start_time;
my $end_time;
my $file;
my $throughput;
my $throughput_interval;

# Validate input arguments

if (!$ARGV[3])
{
  print "\n";
  print "Usage: tpch_throughput.pl [Scope (power or
throughput)] [Scale Factor] [Number of Streams]
[Return Value]\n";
  print "\n";
  exit;
}

# Specifying "none" for a return value will allow
verbose printouts (Not returning a value to a caller)

# Set variables based on input arguments

my $scope = $ARGV[0];
my $scale_factor = $ARGV[1];
my $num_streams = $ARGV[2];
my $return_value = $ARGV[3];

# Power tests only run one stream. Don't rely on
command line input for this.
if ($scope eq "power")
{
  $num_streams = 1;
}


# This method calculates the geometric mean
 sub GeometricMean()
 {
   my $sum = $_[0];
   # Create a string that returns the geometric sum
[Note: input is already Log(q1) + Log(q2)..]
   my $line = "10**($sum/(($num_streams*22)+2))";
   #my $line = "$sum/(($num_streams*22)+2)";
   # Calculate the geometric mean
   my $geometric_mean =`my_calc.pl "$line"`;
   # Return the geometric mean, rounded to tenths of a
second
   $geometric_mean = sprintf("%.1f",$geometric_mean);
   return $geometric_mean
 }

# This method calculates the arithmetic mean
 sub ArithmeticMean()
 {
   my $sum = $_[0];
   # Calculate the arithmetic mean
   my $line = "$sum/(($num_streams*22)+2)";
   my $arithmetic_mean = `my_calc.pl "$line"`;
   # Return the arithmetic mean, rounded to tenths of
a second
   $arithmetic_mean =
sprintf("%.1f",$arithmetic_mean);
   return $arithmetic_mean;
 }

# This method calculates TPC-H Power
 sub TPCHPower()
 {
```

```
   my $sum = $_[0];
   # Calculate the arithmetic mean
   my $line = "3600*$scale_factor**(-($sum)/24)";
   # my $line = "3600*$scale_factor**(-
($sum)/($num_streams * 24))";
   my $power = `my_calc.pl "$line"`;
   # Return the tpc-h power, rounded to tenths of a
second
   $power = sprintf("%.1f",$power);
   return $power;
 }

# This method calculates throughput
 sub TPCHThroughput()
 {
   my $throughput_interval = $_[0];
   # create a string whose value is the throughput
metric
   my $line =
"$num_streams*22*3600*$scale_factor/$throughput_interv
al";
   #evaluate the throughput metric
   my $th=`my_calc.pl "$line"`;
   # $throughput=`round_to_tenths.pl $th`;
   $throughput = sprintf("%.1f",$th);
   return $throughput;
 }

# This is a print delegate that allows for
conditionals
# If this script is returning a value, printing is
silenced
 sub MyPrint
 {
    my $message = $_[0];
    if ($return_value eq "none")
    {
       print $message;
    }
 }
 #This method sorts a two dimensional array and prints
the results
 sub SortPrintArray()
 {
   #my $list1_title = $_[0];
   #my $list2_title = $_[2];
   #my $list3_title = $_[4];
  my @biglist = $_[0];
  print $biglist[0] [5];
  my @a;
  my @b;
  my @sorted = map  { $_->[0] }
               sort { $a->[0] cmp $b->[0] }
               map  { [ $_, $_->[1] ] } @biglist;
  print "---  Sorted  -------\n";
  print $sorted[0] [0];
  print "\n";
  print "--------------------\n";
 }
 # Create log string for 22 queries, n streams
 sub ParseFile
 {
    #Input args:
    my $file = $_[0];
    my $stream_num = $_[1];
    my $success = 0; #later this bool answers: Did the
file open?

    my $offset = 1;
    my $raw_sum = 0;
    my $log_sum = 0;
    my $line = "";
    my $rows = 0;
    my $exectime;
    my $rounded_exectime;

    # array used to sort output
    my @queries;
    my @exec_times;
    my @perf_results;

    #Adjust parse offset, if necessary
    open(FILE,$file) || exit;
    while(<FILE>)
    {
       chomp($_);
       my @scratch = split(/\s+/,$_);
       if ( $_ =~ /START/)
       {
         #Read the stream number from the file if this
is a throughput update
        if ($file =~ /update_throughput/)
        {
          $stream_num = $scratch[2];
          $offset = 0;
        }
        $query = $scratch[3 + $offset];
        $start_time = $scratch[7 + $offset];
       }
       if ( $_ =~ /STOP/)
       {
         $end_time = $scratch[7 + $offset];
         $exectime = $end_time - $start_time;
         $raw_sum = $raw_sum + $exectime;
         if ($rows == 0)
         {
           $line = "Log($exectime)";
         }
         else
         {
            $line = "$line+Log($exectime)";
         }
         # round to first decimal place
         $rounded_exectime =
sprintf("%.1f",$exectime);
         if ($scope eq "throughput" || $scope eq
"tpworf" || $scope eq "trefresh")
         {
           MyPrint(" Stream $stream_num: Query $query
        $exectime      seconds\n");
         }
         if ($scope eq "power" || $scope eq "stream0"
|| $scope eq "prefresh" || $scope eq "refresh")
         {
           MyPrint(" Query $query     $exectime
seconds \n");
         }
         push (@queries, $query);
         push (@exec_times, $exectime);
         $rows++;
       }
    }
    my $element;
    my @output = ([@queries],[@exec_times]);
    #&SortPrintArray(@output);
    my $line_length = length($line);
    my @return;
    if ($line_length > 0)
    {
      # Calculate query sum
      $log_sum = $log_sum + `my_calc.pl  "$line"`;
      @return = ($raw_sum, $log_sum);
    }
    else
    {
      @return = (-1,-1);
    }
    return @return;
  }

  sub Refreshes()
  {
     my $file_name = $_[0];
     my $offset = $_[1];
     # Run refreshes
     my @result = ParseFile($file_name, $offset);
```

```
    my $raw_sum = $result[0];
    my $log_sum = $result[1];
    return @result;
  }

  sub Power()
  {
    my $raw_sum = 0;
    my $log_sum = 0;
    my @result;
    # Set the number of streams to one (power test)
    #$num_streams = 1;
    MyPrint("TPCH Power Test Response Times\n");
    MyPrint("----------------------------------------
------------------\n");
    # Run power test
    my $file = "stream0.out";
    @result = ParseFile($file, 0);
    if ($result[0] == -1)
    {
       print "File: $file failed to open\n";
       exit;
    }
    $raw_sum = $raw_sum + $result[0];
    $log_sum = $log_sum + $result[1];
    MyPrint("----------------------------------------
-----------------\n");
    MyPrint("Power -- Total Time Elapsed:
$raw_sum\n");
    MyPrint("----------------------------------------
-----------------\n");
    if ($scope eq "power")
      {
        MyPrint("Refresh Streams (Scope:
$scope)\n");
        MyPrint("----------------------------------
----------------------\n");
        @result = &Refreshes("update_power.out", 1);
        $raw_sum = $raw_sum + $result[0];
        $log_sum = $log_sum + $result[1];
        my $refresh_sum = $result[0];
        MyPrint ("Total (RF1 and RF2):
$refresh_sum   seconds\n");
        MyPrint("----------------------------------
----------------------\n");
        MyPrint("Power + Refreshes:       Total Time
Elapsed:       $raw_sum\n");
        MyPrint("----------------------------------
----------------------\n");
      }
    # Print the geometric mean, rounded to tenths of
a second
    my $geometric_mean = &GeometricMean($log_sum);
    MyPrint("Power Test Geometric Mean:
$geometric_mean\n");
    #Print the arithmetic mean, rounded to tenths of
a second
    my $arithmetic_mean = &ArithmeticMean($raw_sum);
    MyPrint("Power Test Arithmetic Mean:
$arithmetic_mean\n");
    MyPrint("----------------------------------------
-----------------\n");
    my $power = &TPCHPower($log_sum);
    my @return = ($power, $arithmetic_mean,
$geometric_mean);
    return @return;
  }

  sub Throughput()
  {
    my $raw_sum = 0;
    my $log_sum = 0;
    my $stream_num;
    my @result;
    MyPrint("\n");
    MyPrint("TPCH Throughput Test Response Times\n");
    MyPrint("----------------------------------------
-----------------\n");
    # Run throughput test
    for (my $count = 0; $count<$num_streams;
$count++)
    {
      $stream_num = $count + 1;
      $file = "stream".($stream_num).".out";
      @result = ParseFile($file,$stream_num,1);
      $raw_sum = $raw_sum + $result[0];
      $log_sum = $log_sum + $result[1];
      if ($result[0] == -1)
      {
          print "File: $file failed to open\n";
          exit;
      }
      MyPrint("----------------------------------
------------------\n");
      MyPrint("Throughput -- Time Elapsed: Stream
$stream_num:   $result[0]\n");
      MyPrint("----------------------------------
------------------\n");
    }
    my $ti_file = "throughput_interval.out";
    #The ntest script generated an output file
containing the throughput interval.
    #Open and read that file.
    open(INTERVAL,"throughput_interval.out") || die
"Can't open file ".$ti_file."\n" ;
    $throughput_interval = <INTERVAL>;
    MyPrint("----------------------------------------
----------------\n");
    MyPrint("Throughput -- Total Time Elapsed:
$num_streams Streams: $throughput_interval");
    MyPrint("----------------------------------------
----------------\n");
    $throughput =
&TPCHThroughput($throughput_interval);

       if ($scope eq "thrurefresh")
       {
         MyPrint("Refresh Streams (Scope:
$scope)\n");
         MyPrint("----------------------------------
----------------------\n");
        # Run refreshes
         @result =
&Refreshes("update_throughput.out", 0);
         $raw_sum = $raw_sum + $result[0];
         $log_sum = $log_sum + $result[1];
         my $refresh_sum = $result[0];
         MyPrint (" Refresh Total:
$refresh_sum    seconds\n");
         MyPrint("----------------------------------
----------------------\n");
         chomp($refresh_sum);
         my $test_total = $throughput_interval +
$refresh_sum;
         MyPrint (" Total Elapsed Time (Thr. + Ref.):
$test_total    seconds\n");
         MyPrint("----------------------------------
----------------------\n");
       }
    # Print the geometric mean, rounded to tenths of
a second
    my $geometric_mean = &GeometricMean($log_sum);
    MyPrint("Throughput Test Geometric Mean:
      $geometric_mean\n");
    #Print the arithmetic mean, rounded to tenths of
a second
    my $arithmetic_mean = &ArithmeticMean($raw_sum);
    MyPrint("Throughput Test Arithmetic Mean:
      $arithmetic_mean\n");
    my $power = &TPCHPower($log_sum);
    my @return = ($power, $arithmetic_mean,
$geometric_mean);
    return @return;
  }

   # Control report output based on scope
```

```
   my @return;
   if ($scope eq "power" || $scope eq "stream0")
   {
      @return = &Power;
   }
   elsif ($scope eq "thrurefresh" || $scope eq
"thrustreams")
   {
       @return = &Throughput;
   }
   elsif ($scope eq "refresh1" || $scope eq "refresh2"
)
   {
      my $refresh_sum = 0;
      MyPrint("Refresh Streams (Scope: $scope)\n");
      MyPrint("-------------------------------------
------------------\n");
      for (my $i = 1;$i < 3;$i++)
      {
          @return = &Refreshes("rf$i.out");
          $refresh_sum = $refresh_sum + $return[0];
#add the raw sums of the two refreshes together
      }
     print "Total (RF1 and RF2):     $refresh_sum
seconds\n";
     MyPrint("-------------------------------------
------------------\n");
   }
   elsif ($scope eq "thrurefresh")
   {
       @return = &Refreshes("update_throughput.out");
   }
   elsif ($scope eq "refresh1" || $scope eq "refresh2"
)
   {
       @return = &Refreshes("update_power.out");
   }
   elsif ($scope eq "checkfiles")
   {
      if ($num_streams == 1)
      {
         if(-e "update_power.out")
         {
           $scope = "power";
         }
         else
         {
            $scope = "stream0";
         }
         @return = &power;
      }
      my $stream_count = 0;
      for (my $s_counter=0; $s_counter<$num_streams+1;
$s_counter++)
      {
        if (-e "stream$s_counter.out")
         {
           $stream_count++;
        }
      }
      if ($stream_count > 0)
      {
        if ($stream_count < $num_streams)
         {
           MyPrint("Stream Count: {$stream_count} is
less than the specified number of streams:
{$num_streams}\n");
           MyPrint("Will attempt to generate stats for
the existing streams\n");
         }
         if(-e "update_throughput.out")
         {
            $scope = "throughput";
            &Throughput;
         }
         else
         {
            $scope = "tworf";
            &Throughput;
         }
      }
   }
   else { print("Invalid Scope name: $scope \n");
exit; }
   #If the caller requested a return value, deliver it
and exit
   use Switch;
   switch ($return_value)
   {
      case["power"]{print"$return[0]";}
      case["arith_mean"]{print"$return[1]";}
      case["geo_mean"]{print"$return[2]";}
      case["throughput"]{print"$throughput";}
      case["throughput_interval"]{print"$throughput_in
terval";}
      else {}
      exit;
   }


================================================
calculate_load_time.bash
================================================

#!/bin/bash

# calculates load time from the start and end times in
the files
#   start_load.out
#   end_load.out

# called from tpch_report.bash

# final version


if (( $# < 2 ))
then
  echo "usage:  $0  end_load_time  start_load_time"
  echo ""
  echo "           - returns load_time"
  echo "             calls;"
  echo "                sec_from_epoch.bash"
  echo "                my_calc.pl"
  exit
fi


elt=$1     # of the form: yyyy-mm-dd hh:mm:ss
# echo "end_load_time=$elt   [debug
calculate_load_time.bash]"

end_secs_from_epoch=`secs_from_epoch.pl "$elt"`
# echo "end_secs_from_epoch=$end_secs_from_epoch
[debug   calculate_load_time.bash]"

slt=$2     # of the form: yyyy-mm-dd hh:mm:ss
# echo "start_load_time=$slt   [debug
calculate_load_time.bash]"

start_secs_from_epoch=`secs_from_epoch.pl "$slt"`
# echo "start_secs_from_epoch=$start_secs_from_epoch
[debug   tpch_throughput_interval.bash]"

((lt=end_secs_from_epoch-start_secs_from_epoch))

lt_dhms=`s2dhms.bash $lt`

echo $lt_dhms


================================================
secs_from_epoch.pl
================================================
```

```
#!/usr/bin/perl -w

# computes the number of seconds from epoch for a
given timestamp in the form
#    yyyy-mm-dd hh:mm:ss
#
# the ParAccel TPC-H kit uses this timestamp format

use Time::Local;

our $ARGC = @ARGV ;

if ( $ARGC < 1 )
  {
    print "\nusage:  $0  time_stamp \n";
    print " \n";
    print "           time_stamp is in the form:
yyyy-mm-dd hh:mm:ss  \n";
    print "               put time_stamp in single or
double quotes  \n\n";
    exit;
  }

# $ARGV[0] is the first actual argument, not the
script name as in C or the shell
$_=$ARGV[0];

my $arg_length = length($_);
if ($arg_length == 0)
{
   print "Input invalid\n";
   exit;
}

#print "$_     [debug  secs_from_epoch.pl]\n";
s/-/:/g;
s/ /:/;
# print "$_     [debug  secs_from_epoch.pl]\n";

@fields=split(/:/,$_);   # separates $_ using : as
delimiter

my $yr   = $fields[0]-1900;    # epoch begins at 1900
my $mon  = $fields[1]-1;       # months go from 0-11
my $day  = $fields[2];         # days go from 1-31
my $hr   = $fields[3];         # hours go from 0-23
my $min  = $fields[4];         # mins  go from 0-59
my $sec  = $fields[5];         # mins  go from 0-59

# print "$yr,$mon,$day,$hr,$min,$sec   [debug
secs_from_epoch.pl\n";
$time = timelocal($sec,$min,$hr,$day,$mon,$yr);
print "$time\n";



==================================================
my_calc.pl
==================================================

#!/usr/bin/perl

# -w removed from above to surpress runtime warnings
on garbadge expressions i.e.
#                       function keys, escape
sequence, etc. as well a certain
#                       string expressions eval
doesn't understand

# final version:  dec 21 2002

# evaluates all kinds of expressions, except as noted
below
#
#   we can do everything except exp! when exp contains
parentheses
#   but  factorial(exp) works for arbitrary exp
#
#    todo: maybe lift this restriction


our $ARGC = @ARGV ;

my $show_commas;      # initially turned off
my $show_trace;       # initially turned off

if ( $ARGC >= 1 )   # these are the batch cases
  {
    if ($ARGC == 2)
      {
        $show_commas = $ARGV[1];
      }
    else
      {
        $show_commas = '';
      }

    if ($ARGV[0] eq "help")
      {
         print "\nusage:  $0 \n";
         print "              interactive case \n";
         print "   or\n\n";
         print "usage:  $0  help\n";
         print "              displays usage info
(i.e. this output)\n";
         print "   or\n\n";
         print "usage:  $0  expression  [any 2nd arg
means commify]\n";
         print "              - displays evaluated
expression and exits\n";
         print "              - place expression in
quotes if it contains spaces\n\n";
         exit;
       }

    # $ARGV[0] is the first actual argument, not the
script name as in C or the shell

    my $result = evaluate_perl($ARGV[0]);

    # print $ARGV[0], " = ", $result, "\n";
    # just show the result in the batch case, so it
can be used in a pipeline

    print  $result, "\n";

    exit;
  }

# interactive case
#    need to commify this

my $input;

my $mode = 'perl';

for (;;)
  {
    print "enter arithmetic or string expression
(q=exit): ";
    $input = <STDIN>;
    chomp ($input);
    if ( $input =~ /quit|exit|^q$|^e$/i )
      {
        exit;
      }
    elsif ($input eq 'help')
      {
        print_help();
      }
    else  # evaluate expression
      {
        if ( $input =~ /commas\s*$|c\s*$/i )  # turn
show_commas on
```

```
          {
            $show_commas = 'yes';
            $input =~ s/\s*commas\s*$|\s*c\s*$//i;  #
erase "c" or "commas" and
                                                    #
surrounding whitespace
          }

        if ($input eq '')  # do next iteration if the
rest of $input is empty
          {
            next;
          }

        my $result = evaluate_perl($input);
        print $input, " = ", $result, "\n";
      }
  }



sub evaluate_perl
{
   $_ = shift;  # $_ is a string, or arithmetic
expression

#print "----- $_ -----\n";

   # note: n! is not understood by Perl. We use
regular expressions to
   #       translate many cases of exp! to
factorial(exp).
   #       We can thus handle n!, (n-r)! and  ( (n+r)!
+ m! ), but not ((n)!)!
   #       or ((n+m)!)!

   # replace n! with factorial(n);
   s/
      (\d+)!            # match and capture integer!
   /factorial($1)/gx;

   # replace (exp)! with factorial(exp),  where exp is
like "num1 arith_op num2"
   s/
      (\([\d\+\-\*\/\s]+\))!   # match and capture
(integer arith_operator integer)!
   /factorial($1)/x;           # replace $1 with
factorial($1)

   s/ln/log/g;      # allow the use ln for the natural
log

# questions: why does eval return NULL on "(2 *
(3+2))!" instead of returning
#            itself as a string?

#print "----- $_ -----\n";

   my $result = eval;

   if ($show_commas and length($result) > 4)   # put
commas in $result
     {
        $result = commify($result);
     }

   $show_commas = '';   # turn off commas

   return $result;  # note: $result is local to this
sunroutine
}


sub factorial
{
#print "in factorial\n";
   my $n = shift;
   if ($n <= 0)
     {
        return 1;
     }
   my $ans = 1;
   for (my $i = 1; $i <= $n; $i++)
     {
       $ans = $ans*$i;
     }
   return $ans;
}


#binomial coefficient   c(n,r)
sub c
{
#print "in c\n";
   my $n = shift;
   my $r = shift;
   if ($r > $n or $r < 0)
     {
       return undefined;
     }
   else
     {
       return factorial($n) / ( factorial($r) *
factorial($n-$r) );
     }
}


# base 2 log
sub lg
{
my $n = shift;
return log($n)/log(2);   #  log = base e log
}

# base 10 log
sub Log
{
my $n = shift;
return log($n)/log(10);   #  log = base e log
}

sub commify
{
my $input = shift;

$input = reverse $input;
$input =~ s/(\d\d\d)(?=\d)(?!\d*\.)/$1,/g;
$input = reverse $input;
return $input;
}


sub print_help
{
print <<DONE

------------------------------------------------------
----------------------------
interactively evaluate perl expressions

   quit, exit, q or e will all exit

arithemetic expressions can contain
   perl's usual arithmetic operators:   +  -  *  /  %
and  **
   perl's builtin arithmetic functions:  exp()  sin()
cos()  log()  abs()  and  sqrt()
   as well as the following 9 functions:
      the factorial functions:  !, factorial
      the log functions:  lg (base 2), Log (base 10)
and ln (base e -- synonym for log)
      the binomial cooefficient function:  c(n,i)

notes:
  1. We don't completely parse expressions, so that
```

```
some expressions cannot be
     corectly evaluated: e.g.

         (exp)!, when exp is an expression that
contains parenthesis,
         however factorial(exp) works for all
arithmetic expressions.

  2. Both arithmetic and numeric string results are
displayed with separating commas,
     when either "c" or "commas" is appended to any
input expression (with or without
     separating whitespace).
     "c" or "commas" should not be appended to string
expressions as meaningless output
     may be produced.

  3. Given any arithmetic or string function f(), this
script will evaluate expressions
     containing f whenever a subroutine, returning the
value of f() is included in the
     script. This is the way factorial(n) and c(n,m)
are implemented.
-------------------------------------------------------
---------------------------

DONE
}


================================================
round_to_tenths.pl
================================================

#!/usr/bin/perl -w

# used for tpch; spec requires most numbers to be
rounded to the nearest tenth

our $ARGC = @ARGV ;

if ( $ARGC < 1)
  {
     print "\nusage:  $0  number  \n\n";
     print "               displays number rounded to
the nearest tenth \n\n";
     exit
  }

$_=$ARGV[0];
printf "%.1f\n", $_;

================================================
gen_streams
================================================

#!/bin/bash
echo " Gen_Streams got called"

if (( $# < 2 ))
then
     echo "usage:  $0   seed1 seed2  scale_factor
num_streams"
     exit
fi

DSS_QUERY=/home/paraccel/run/dbgen
SCRIPTS_DIR=/home/paraccel/run/scripts

seed1=$1
seed2=$2
sf=$3
ns=$4

i=0

cd $DSS_QUERY

while ((i<=ns))
do
   qgen -a -p $i -r $seed1$seed2 -i
$DSS_QUERY/begin.sql -t $DSS_QUERY/end.sql -s $sf \
   1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
21 22 > $SCRIPTS_DIR/stream${i}.sql
((seed2=seed2+1))
if (($i == 0))
then
      echo "Stream $i (for power test) created."
fi
if (($i > 0))
then
      echo "Stream $i created."
fi
((i=i+1))
done

((seed2=seed2-1))
echo $seed1$seed2
```

Appendix F. Misc database scripts

The dbtables-syb.sql script was run to validate the correctness of the database after the database load. Three other scripts were used to extract basic information about tables and indexes from the database dew_cat1.sql, dew_cat2.sql, dew_cat3.sql.

Auditor Scripts

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

dbtables.sql

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

--
=========================================================
============+
--  FILENAME
--       DBTABLES.SQL
--  DESCRIPTION
--       CHECK ROW COUNT AND ROW STRUCTURE/CONTENT FOR
EACH TABLE
--       IN THE TPC-H DATABASE.
--
--
=========================================================
============
--
-- GET TIMESTAMP
SELECT 'START TIME', LOCALTIMESTAMP;
--
=========================================================
============
--           TABLE: LINEITEM
--
=========================================================
============
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;
--
=========================================================
============
--           TABLE: ORDERS
--
=========================================================
============
-- GET TIMESTAMP
```

```
SELECT 'TIME', LOCALTIMESTAMP;
SELECT COUNT(*) FROM ORDERS;
SELECT * FROM ORDERS
WHERE O_ORDERKEY IN ( 7, 44065, 287590, 411111,
483876, 599942 )
ORDER BY O_ORDERKEY;
--
=====================================================
============
--           TABLE: PART
--
=====================================================
============
-- GET TIMESTAMP
SELECT 'TIME', LOCALTIMESTAMP;
SELECT COUNT(*) FROM PART;
SELECT * FROM PART
WHERE P_PARTKEY IN (1,984,8743,9028,13876,17899,20000)
ORDER BY P_PARTKEY;
--
=====================================================
============
--           TABLE: PARTSUPP
--
=====================================================
============
-- GET TIMESTAMP
SELECT 'TIME', LOCALTIMESTAMP;
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);
--
=====================================================
============
--           TABLE: SUPPLIER
--
=====================================================
============
-- GET TIMESTAMP
SELECT 'TIME', LOCALTIMESTAMP;
SELECT COUNT(*) FROM SUPPLIER;
SELECT * FROM SUPPLIER
WHERE  S_SUPPKEY IN (83,265,492,784,901,1000)
ORDER BY S_SUPPKEY;
--
=====================================================
============
--           TABLE: CUSTOMER
--
=====================================================
============
-- GET TIMESTAMP
SELECT 'TIME', LOCALTIMESTAMP;
SELECT COUNT(*) FROM CUSTOMER;
SELECT * FROM CUSTOMER
WHERE  C_CUSTKEY IN (832,2653,4924,7845,92016,108070)
ORDER BY C_CUSTKEY;
--
=====================================================
============
--           TABLE: NATION & REGION
--
=====================================================
============
-- GET TIMESTAMP
SELECT 'TIME', LOCALTIMESTAMP;
SELECT * FROM REGION;
SELECT COUNT(*) FROM NATION;
SELECT * FROM NATION
WHERE N_NATIONKEY IN (3,10,14,20)
ORDER BY N_NATIONKEY;
--
=====================================================
============
--           CHECK KEY VALUES
--
=====================================================
============
-- GET TIMESTAMP
SELECT 'TIME', LOCALTIMESTAMP;
  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 'ORDERS',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;
  DROP table MINMAX;
SELECT 'END TIME', LOCALTIMESTAMP;
```

dbinsert.sql

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

--
=====================================================
============+
--  FILENAME
--       DBINSERT.SQL
--  DESCRIPTION
--       INSERTS DUPLICATE ROWS WITH NEW KEY VALUES
AND
--       INSERTS ROWS WITH VALUES BEYOND THE TPC-H
RANGES.
--
--
=====================================================
```

```
============
--
--
--
=====================================================
============
-- DUPLICATES
--
=====================================================
============

-- GET TIMESTAMP
SELECT LOCALTIMESTAMP;

-- DROP temporary tables. Ignore error messages
DROP table TEMP_PART;
DROP table TEMP_SUPPLIER;
DROP table TEMP_PARTSUPP;
DROP table TEMP_CUSTOMER;
DROP table TEMP_ORDERS;
DROP table TEMP_LINEITEM;
DROP table TEMP_NATION;
DROP table TEMP_REGION;

-- CREATE temporary tables
create table temp_part (
  p_partkey int4 not null encode delta,
  p_name varchar(55) not null,
  p_mfgr char(25) not null encode bytedict,
  p_brand char(10) not null encode bytedict,
  p_type varchar(25) not null,
  p_size int4 not null encode bytedict,
  p_container char(10) not null encode bytedict,
  p_retailprice numeric(12,2) not null encode
delta32k,
  p_comment varchar(23) not null encode text255,
  PRIMARY KEY (p_partkey)
);

create table temp_region (
  r_regionkey int4 not null encode always8,
  r_name char(25) not null encode bytedict,
  r_comment varchar(152) not null,
  PRIMARY KEY (r_regionkey)
);

create table temp_nation (
  n_nationkey int4 not null encode always8,
  n_name char(25) not null encode bytedict,
  n_regionkey int4 not null encode always8,
  n_comment varchar(152) not null,
  PRIMARY KEY (n_nationkey),
  FOREIGN KEY (n_regionkey) REFERENCES region
(r_regionkey)
);

create table temp_supplier (
  s_suppkey int4 not null,
  s_name char(25) not null,
  s_address varchar(40) not null,
  s_nationkey int4 not null encode always8,
  s_phone char(15) not null,
  s_acctbal numeric(12,2) not null,
  s_comment varchar(101) not null encode text255,
  PRIMARY KEY (s_suppkey),
  FOREIGN KEY (s_nationkey) REFERENCES nation
(n_nationkey)
);

create table temp_partsupp (
  ps_partkey int4 not null encode delta,
  ps_suppkey int4 not null encode delta32k,
  ps_availqty int4 not null encode delta32k,
  ps_supplycost numeric(12,2) not null encode zeros,
  ps_comment varchar(199) not null encode text255,
  PRIMARY KEY (ps_partkey, ps_suppkey),
  FOREIGN KEY (ps_partkey) REFERENCES part
(p_partkey),
  FOREIGN KEY (ps_suppkey) REFERENCES supplier
(s_suppkey)
);

create table temp_customer (
  c_custkey int4 not null encode delta,
  c_name varchar(25) not null,
  c_address varchar(40) not null,
  c_nationkey int4 not null encode bytedict,
  c_phone char(15) not null,
  c_acctbal numeric(12,2) not null encode zeros,
  c_mktsegment char(10) not null encode bytedict,
  c_comment varchar(117) not null encode text255,
  PRIMARY KEY (c_custkey),
  FOREIGN KEY (c_nationkey) REFERENCES nation
(n_nationkey)
);

create table temp_orders (
  o_orderkey int4 not null encode delta,
  o_custkey int4 not null,
  o_orderstatus char(1) not null,
  o_totalprice numeric(12,2) not null encode always32,
  o_orderdate date not null encode delta32k,
  o_orderpriority char(15) not null encode bytedict,
  o_clerk char(15) not null,
  o_shippriority int4 not null encode runlength,
  o_comment varchar(79) not null encode text255,
  PRIMARY KEY (o_orderkey),
  FOREIGN KEY (o_custkey) REFERENCES customer
(c_custkey)
);

create table temp_lineitem (
  l_orderkey int4 not null encode delta,
  l_partkey int4 not null,
  l_suppkey int4 not null,
  l_linenumber int4 not null encode always8,
  l_quantity numeric(12,2) not null encode bytedict,
  l_extendedprice numeric(12,2) not null encode
always32,
  l_discount numeric(12,2) not null encode bytedict,
  l_tax numeric(12,2) not null encode bytedict,
  l_returnflag char(1) not null,
  l_linestatus char(1) not null,
  l_shipdate date not null encode delta,
  l_commitdate date not null encode delta,
  l_receiptdate date not null encode delta,
  l_shipinstruct char(25) not null encode bytedict,
  l_shipmode char(10) not null encode bytedict,
  l_comment varchar(44) not null encode text255,
  FOREIGN KEY (l_orderkey) REFERENCES orders
(o_orderkey),
  FOREIGN KEY (l_partkey,l_suppkey) REFERENCES
partsupp (ps_partkey,ps_suppkey)
);


BEGIN TRANSACTION;
INSERT INTO TEMP_PART
SELECT * FROM PART
       WHERE P_PARTKEY = 1;

UPDATE TEMP_PART
       SET P_PARTKEY = 2147483647;

INSERT INTO PART
       SELECT * FROM TEMP_PART;

SELECT * FROM PART
       WHERE P_PARTKEY = 2147483647
       OR P_PARTKEY = 1;

DELETE FROM PART
       WHERE P_PARTKEY = 2147483647;

COMMIT;
```

```
BEGIN TRANSACTION;
INSERT INTO TEMP_SUPPLIER
SELECT * FROM SUPPLIER
       WHERE S_SUPPKEY = 1;

UPDATE TEMP_SUPPLIER
       SET S_SUPPKEY = 2147483647;

INSERT INTO SUPPLIER
       SELECT * FROM TEMP_SUPPLIER;

SELECT * FROM SUPPLIER
       WHERE S_SUPPKEY = 2147483647
       OR S_SUPPKEY = 1;

DELETE FROM SUPPLIER
       WHERE S_SUPPKEY = 2147483647;

COMMIT;

BEGIN TRANSACTION;
INSERT INTO TEMP_PARTSUPP
SELECT * FROM PARTSUPP
       WHERE PS_PARTKEY = 1
       AND PS_SUPPKEY = 2;

UPDATE TEMP_PARTSUPP
       SET PS_PARTKEY = 2147483647,
           PS_SUPPKEY = 2147483647;

INSERT INTO PARTSUPP
       SELECT * FROM TEMP_PARTSUPP;

SELECT * FROM PARTSUPP
       WHERE (PS_PARTKEY = 2147483647
       AND    PS_SUPPKEY = 2147483647)
       OR    (PS_PARTKEY = 1
       AND    PS_SUPPKEY = 2);

DELETE FROM PARTSUPP
       WHERE PS_PARTKEY = 2147483647
       AND   PS_SUPPKEY = 2147483647;

COMMIT;

BEGIN TRANSACTION;
INSERT INTO TEMP_CUSTOMER
SELECT * FROM CUSTOMER
       WHERE C_CUSTKEY = 1;

UPDATE TEMP_CUSTOMER
       SET C_CUSTKEY = 2147483647;

INSERT INTO CUSTOMER
       SELECT * FROM TEMP_CUSTOMER;

SELECT * FROM CUSTOMER
       WHERE C_CUSTKEY = 2147483647
       OR C_CUSTKEY = 1;

DELETE FROM CUSTOMER
       WHERE C_CUSTKEY = 2147483647;

COMMIT;

BEGIN TRANSACTION;
INSERT INTO TEMP_ORDERS
SELECT * FROM ORDERS
       WHERE O_ORDERKEY = (SELECT MIN(O_ORDERKEY)
FROM ORDERS);

UPDATE TEMP_ORDERS
       SET O_ORDERKEY = 2147483647;

INSERT INTO ORDERS
       SELECT * FROM TEMP_ORDERS;

SELECT * FROM ORDERS
       WHERE O_ORDERKEY = 2147483647
       OR O_ORDERKEY = (SELECT MIN(O_ORDERKEY) FROM
ORDERS);

DELETE FROM ORDERS
       WHERE O_ORDERKEY = 2147483647;

COMMIT;

BEGIN TRANSACTION;
INSERT INTO TEMP_LINEITEM
SELECT * FROM LINEITEM
       WHERE L_ORDERKEY = (SELECT MIN(O_ORDERKEY)
FROM ORDERS)
       AND   L_LINENUMBER = 1;

UPDATE TEMP_LINEITEM
       SET L_ORDERKEY = 2147483647,
           L_PARTKEY  = 2147483647,
           L_SUPPKEY  = 2147483647,
           L_LINENUMBER = -2147483646;

INSERT INTO LINEITEM
       SELECT * FROM TEMP_LINEITEM;

SELECT * FROM LINEITEM
       WHERE (L_ORDERKEY = 2147483647
       AND    L_PARTKEY  = 2147483647
       AND    L_SUPPKEY  = 2147483647
       AND    L_LINENUMBER = -2147483646)
       OR     (L_ORDERKEY = (SELECT MIN(O_ORDERKEY)
FROM ORDERS)
       AND    L_LINENUMBER = 1);

DELETE FROM LINEITEM
       WHERE L_ORDERKEY = 2147483647
       AND   L_PARTKEY  = 2147483647
       AND   L_SUPPKEY  = 2147483647
       AND   L_LINENUMBER = -2147483646;

COMMIT;

BEGIN TRANSACTION;
INSERT INTO TEMP_NATION
SELECT * FROM NATION
       WHERE N_NATIONKEY = 1;

UPDATE TEMP_NATION
       SET N_NATIONKEY = 2147483647;

INSERT INTO NATION
       SELECT * FROM TEMP_NATION;

SELECT * FROM NATION
       WHERE N_NATIONKEY = 2147483647
       OR N_NATIONKEY = 1;

DELETE FROM NATION
       WHERE N_NATIONKEY = 2147483647;

COMMIT;

BEGIN TRANSACTION;
INSERT INTO TEMP_REGION
SELECT * FROM REGION
       WHERE R_REGIONKEY = 1;

UPDATE TEMP_REGION
       SET R_REGIONKEY = 2147483647;

INSERT INTO REGION
       SELECT * FROM TEMP_REGION;

SELECT * FROM REGION
       WHERE R_REGIONKEY = 2147483647
       OR R_REGIONKEY = 1;

DELETE FROM REGION
```

```
       WHERE R_REGIONKEY = 2147483647;

COMMIT;

--
================================================
============
-- DUPLICATES FINISHED STARTING INSERTS FOR DOMAIN
RANGE
--
================================================
============

-- GET TIMESTAMP
SELECT LOCALTIMESTAMP;

INSERT INTO SUPPLIER
       (S_SUPPKEY, S_NAME, S_ADDRESS, S_NATIONKEY,
S_PHONE,
       S_ACCTBAL, S_COMMENT)
       VALUES
       (2147483647, 'NAME TEXT .............25E',
       'ADDRESS VARCHAR .............30.......40E',
       2147483647,'THIS IS PHONE E', 1234567890.12,
       'SUPPLIER COMMENT FIELD IS 101 LONG NO E');

SELECT * FROM SUPPLIER
       WHERE S_SUPPKEY = 2147483647;

DELETE FROM SUPPLIER
       WHERE S_SUPPKEY = 2147483647;

--
================================================
============
INSERT INTO PART
       (P_PARTKEY, P_NAME, P_MFGR, P_BRAND, P_TYPE,
       P_SIZE, P_CONTAINER, P_RETAILPRICE, P_COMMENT)
       VALUES
       (2147483647, 'PNAME TEXT
.......2.........3.........4....5E',
       'PMFGR TEXT.........2....5E','PBRAND 10E',
       'PTYPE VARCHAR.....2....5E', -2147483646,
       'PCONTAINRE', 1234567890.12,
       'PART COMMENT FIELD  23E');

SELECT * FROM PART
       WHERE P_PARTKEY = 2147483647;

DELETE FROM PART
       WHERE P_PARTKEY = 2147483647;

--
================================================
============
INSERT INTO PARTSUPP
       (PS_PARTKEY, PS_SUPPKEY, PS_AVAILQTY,
PS_SUPPLYCOST,
       PS_COMMENT)
       VALUES
       (2147483647, 2147483647, -2147483646,
1234567890.12,
       'PS COMMENT FIELD IS 199 LONG NO E');

SELECT * FROM PARTSUPP
       WHERE PS_PARTKEY = 2147483647
       AND   PS_SUPPKEY = 2147483647;

DELETE FROM PARTSUPP
       WHERE PS_PARTKEY = 2147483647
       AND   PS_SUPPKEY = 2147483647;

--
================================================
============
INSERT INTO CUSTOMER
       (C_CUSTKEY, C_NAME, C_ADDRESS, C_NATIONKEY,
       C_PHONE, C_ACCTBAL, C_MKTSEGMENT, C_COMMENT)
       VALUES
       (2147483647, 'CUSTOMER NAME GOES TO 25E',
       'CUSTOMER ADDRESS GOES HERE..3.........4E',
       2147483647, 'THIS IS PHONE E', 1234567890.12,
       'MARKT SEGE', 'CUSTOMER COMMENTS FIELS IS 117
LONG NO E');

SELECT * FROM CUSTOMER
       WHERE C_CUSTKEY = 2147483647;

DELETE FROM CUSTOMER
       WHERE C_CUSTKEY = 2147483647;

--
================================================
============
INSERT INTO ORDERS
       (O_ORDERKEY, O_CUSTKEY, O_ORDERSTATUS,
O_TOTALPRICE,
       O_ORDERDATE, O_ORDERPRIORITY, O_CLERK,
O_SHIPPRIORITY,
       O_COMMENT)
       VALUES
       (2147483647, 2147483647, 'X', 1234567890.12,
getdate(),
       'ORDER PRIORTY5E', 'FIXED TEXT  15E',
-2147483646,
       'ORDER COMMENTS FIELD IS 79 NO E');

SELECT * FROM ORDERS
       WHERE O_ORDERKEY = 2147483647
       AND  O_CUSTKEY = 2147483647;

DELETE FROM ORDERS
       WHERE O_ORDERKEY = 2147483647
       AND  O_CUSTKEY = 2147483647;

--
================================================
============
INSERT INTO LINEITEM
       (L_ORDERKEY, L_PARTKEY, L_SUPPKEY,
L_LINENUMBER,
       L_QUANTITY, L_EXTENDEDPRICE, L_DISCOUNT, L_TAX,
       L_RETURNFLAG, L_LINESTATUS, L_SHIPDATE,
L_COMMITDATE,
       L_RECEIPTDATE, L_SHIPINSTRUCT, L_SHIPMODE,
L_COMMENT)
       VALUES
       (2147483647,
       2147483647,
       2147483647,
       -2147483646,
       -1234567890.12,
       -1234567890.12,
       -1234567890.12,
       -1234567890.12,
       'Q',
       'R',
       getdate(),
       getdate(),
       getdate(),
       'SHIP BY CAMEL .........5E',
       'SHIP ASAPE',
       'IS THIS REALLY WHAT YOU WANTED? 44
LONG....E');

SELECT * FROM LINEITEM
       WHERE L_ORDERKEY = 2147483647
       AND L_PARTKEY = 2147483647
       AND L_SUPPKEY = 2147483647
       AND L_LINENUMBER = -2147483646;

DELETE FROM LINEITEM
       WHERE L_ORDERKEY = 2147483647
       AND L_PARTKEY = 2147483647
       AND L_SUPPKEY = 2147483647
       AND L_LINENUMBER = -2147483646;
```

```
--
=====================================================
============
INSERT INTO NATION
       (N_NATIONKEY, N_NAME, N_REGIONKEY, N_COMMENT)
       VALUES
       (2147483647,
       'ZE REPUBLIC D MAKEBELIEVE',
       2147483647,
       'A NATION COMMENT FOR FIELD SIZE 152 NO E');

SELECT * FROM NATION
       WHERE N_NATIONKEY = 2147483647
       AND N_REGIONKEY = 2147483647;

DELETE FROM NATION
       WHERE N_NATIONKEY = 2147483647
       AND N_REGIONKEY = 2147483647;

--
=====================================================
============
INSERT INTO REGION
       (R_REGIONKEY, R_NAME, R_COMMENT)
       VALUES
       (2147483647,
       'ZE ENDS OF THE EARTH....E',
       'A REASONABLE COMMENT WOULD GO HERE');

SELECT * FROM REGION
       WHERE R_REGIONKEY = 2147483647;

DELETE FROM REGION
       WHERE R_REGIONKEY = 2147483647;

-- GET TIMESTAMP
SELECT LOCALTIMESTAMP;

--
=====================================================
============
-- DROP TEMP TABLES
--
=====================================================
============
DROP table TEMP_PART;
DROP table TEMP_SUPPLIER;
DROP table TEMP_PARTSUPP;
DROP table TEMP_CUSTOMER;
DROP table TEMP_ORDERS;
DROP table TEMP_LINEITEM;
DROP table TEMP_NATION;
DROP table TEMP_REGION;

-- GET TIMESTAMP
SELECT LOCALTIMESTAMP;
--
=====================================================
============
-- DONE
--
=====================================================
============
```

Appendix G. Pricing information

Price quotes from ParAccel, Inc and Continental Resources, Inc are included below.

Sales Quote: ParAccel Inc.

Company Sun Microsystems
Contact Guido Ficco
Phone 781-442-0069
Fax
Address 1 Network Drive
Burlington MA 01803

ParAccel Sales Rep: MikeAzevedo
Phone: 858-309-4733
Fax: 866-903-0335

	Part Number	Description	List Price	Quantity	Discount Discount	Extended Price	Extended Support Fees 3 YEARS
1	PAR-ADB	ParAccel Analytic Database Per GB	1,000	1000	5.00%	$950,000	
2	PAR-SUPP-B	3 yr 24/7 ParAccel Support Per GB	30	1000	5.00%		$28,500.00
3							
4		5% Discount					
5							
6							
7							
8							
9							
10							
11							
12							

Quote Date: ***10/29/07***
Valid thru:

Total $978,500
License + 3 year support

Payment terms : Net 30 Days

Sales Contact
Adam Apps
(732) 563-0900 Main
(732) 748-3627 Direct
(781) 687-6423 Fax
aapps@conres.com E-mail

QUOTATION

Paraccel

Quote #:	20067020
Page #:	1
Customer #:	32719
Quote Date:	10/24/2007
Cust P.O. #:	n/a

Quote valid for 30 Days
Payment Terms: Net 30
F.O.B.: Hudson, N.H.

LINE #	MANUFACTURER	MFG MODEL #	QTY	DESCRIPTION	LIST PRICE	EXT. LIST	SALE PRICE	EXTEND PRICE
1	SUN	A86-FPZ2BH8GKBA	15	Sun Fire X4100 M2 X64 Server, 2x AMD Opteron Model 2220, (2.8 GHz) processor, 4 x 2GB DDR	$6,590.00	$98,850.00	$5,667.40	$85,011.00
2	SUN	4226A-Z	30	4 GB Memory Kit DDR2-667 DIMMs (2x2GB) for Sun Fire X4100 M2	$750.00	$22,500.00	$645.00	$19,350.00
3	SUN	WD9-A87-24-3H	15	Sun Fire X4100 M2 Server upgrade to 3 yrs. 7x24 hardware only support with 4 hour response	$792.00	$11,880.00	$712.80	$10,692.00
4	SUN	X311L	15	NORTH AMERICAN/ASIAN POWER CORD	$0.00	$0.00	$0.00	$0.00
5	CISCO	WS-C3750-24TS-E	2	Cisco Catalyst 3750-24TS 24 port switch	$5,990.00	$11,980.00	$3,750.53	$7,501.05
6	CISCO	CON-OSP-375024TE	6	Cisco Catalyst 3750-24TS 24 port switch 1 year Onsite 24x7x4 service	$1,006.00	$6,036.00	$894.22	$5,365.33
7	BELKIN	A3L791-05-GRN	30	Belkin Cat5e Patch Cable	$5.99	$179.70	$4.86	$145.89
8	REDHAT	MCT0798-C	15	RHEL ES PREMIUM 3YR	$3,702.00	$55,530.00	$2,234.00	$33,510.00

TOTAL $161,575.28

**Applicable tax, freight and insurance charges will be included on your invoice.*

GE Commercial Finance
Vendor Financial Services

Call Me for a formal GE Finance Lease Proposal (732) 748-3627
Estimated Lease Rate:

Lease the items on this quote for $5170 / month

/month based on the items listed on this quotation and a 36 month fair market value lease payment at the current rate of interest. Actual rate may vary.

Terms: Subject to Credit Approval; and subject to credit review.
Above Sales Quotation is subjected to CRI's general terms and conditions outlined at www.conres.com
Pricing subject to change. Delivery is conveyed F.O.B. shipping point. Title on Sales passes upon payment in full. Title on all rental or leased equipment remains with Continental Resources, Inc., and or Continental Leasing Co., Inc. Risk of loss is FOB shipping point. Payment of Freight Insurance modifies Risk of Loss to FOB destination. Taxes, Freight and Insurance be included in above quote. Return rights are restricted to vendor or manufacturers policy in existence at time of return. Third party leases must be identified before shipment and Lessor must be judged credit worthy by CRI. All payments are in United States International Terms and Conditions.

License and Maintenance Agreements: If customer agrees to purchase any items that carry a license or maintenance agreement and if invoice(s) for these product(s) is (are) not paid within approved credit terms, Continental Resources, Inc. reserves the right to, and customer grants permission to, revoke the agreement(s). All payment terms are in United States Dollars. All international credit granted is governed by The United Nations Convention on Contra International Sale of Goods (CISG) and all letters of credit are governed by the Uniform Customs and Practice for Documentary Credits (1 Revision International Chamber of Commerce Publication No. 500).
For our unabridged terms and conditions please visit. http://conres.com/corporate/leasing/terms_96.html
Note: IF you are receiving this quote via email attachment, and do not have Adobe Reader, you can download it from our Web site at: http://www.conres.com/corporate/News.html