HP Integrity Superdome - Itanium/1.6 GHz/18MB iL3 - 32p/64c
using
HP-UX 11i v3 64-bit
and
Oracle Database 11g Enterprise Edition with Partitioning and Oracle Automatic Storage Management

TPC Benchmark™ H
Full Disclosure Report

First Edition

April 29, 2009

First Edition - April 29, 2009

Hewlett-Packard Company, the sponsor of this benchmark test, believes that the information in this document is accurate as of the publication date. The information in this document is subject to change without notice. The sponsors assume no responsibility for any errors that may appear in this document. The pricing information in this document is believed to accurately reflect the current prices as of the publication date. However, the sponsors provide no warranty of the pricing information in this document.

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

All performance data contained in this report was obtained in a rigorously controlled environment. Results obtained in other operating environments may vary significantly. No warranty of system performance or price/performance is expressed or implied in this report.

Printed in U.S.A., April 29, 2009.

Overview

This report documents the methodology and results of the TPC Benchmark™ H test conducted on the HP Integrity Superdome - Itanium/1.6 GHz/18MB iL3 - 32p/64c, in conformance with the requirements of the TPC Benchmark™ H Standard Specification, Revision 2.8.0. The operating system used for the benchmark was HP-UX 11i v3 64-bit; the DBMS was Oracle Database 11g Enterprise Edition with Partitioning and Oracle Automatic Storage Management.

Standard and Executive Summary Statements

The pages following this preface contain the Executive Summary and Numerical Quantities Summary of the benchmark results.

Auditor

The benchmark configuration, environment and methodology used to produce and validate the test results and the pricing model used to calculate the cost per QphH was audited by Francois Raab, InfoSizing, to verify compliance with the relevant TPC specifications.

TPC Benchmark H Overview

The TPC Benchmark ™ H (TPC-H) is a decision support benchmark. It consists of a suite of business oriented ad-hoc queries and concurrent data 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(e.g., via a point and click GUI interface);

Are far more complex than most OLTP transactions;

Include a rich breadth of operators and selectivity constraints;

Generate intensive activity on the part of the database server component of the system under test;

Are executed against a database complying to specific population and scaling requirements;

Are implemented with constraints derived from staying closely synchronized with an on-line production database.

The TPC-H operations are modeled as follows:

The database is continuously available 24 hours a day, 7 days a week, for ad-hoc queries from multiple end users and updates against all tables, except possibly during infrequent (e.g., once a month) maintenance sessions;

The TPC-H database tracks, possibly with some delay, the state of the OLTP database through on-going updates which batch together a number of modifications impacting some part of the decision support database;

Due to the world-wide nature of the business data stored in the TPC-H database, the queries and the updates may be executed against the database at any time, especially in relation to each other. In addition, this mix of queries and updates is subject to specific ACIDity requirements, since queries and updates may execute concurrently;

To achieve the optimal compromise between performance and operational requirements the database administrator can set, once and for all, the locking levels and the concurrent scheduling rules for queries and updates.

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

The performance metrics reported by TPC-H measure multiple aspects of the capability of the system to process queries. The TPC-H metric at the selected size (QphH@Size) is the performance metric. To be compliant with the TPC-H standard, all references to TPC-H results for a given configuration must include all required reporting components (see Clause 5.4.7). The TPC believes that comparisons of TPC-H results measured against different database sizes are misleading and discourages such comparisons.

The TPC-H database must be implemented using a commercially available database management system (DBMS), and the queries executed via an interface using dynamic SQL. The specification provides for variants of SQL, as implementers are not required to have implemented a specific SQL standard in full. TPC-D uses terminology and metrics that are similar to other benchmarks, originated by the TPC and others. Such similarity in terminology does not in any way imply that TPC-H results are comparable to other benchmarks. The only benchmark results comparable to TPC-H are other TPC-H results compliant with the same revision.

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

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

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

General Implementation Guidelines

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

Are generally available to users;

Are relevant to the market segment that the individual TPC benchmark models or represents (e.g. TPC-H models and represents complex, high data volume, decision support environments);

Would plausibly be implemented by a significant number of users in the market segment the benchmark models or represents.

Hewlett-Packard Company does not warrant or represent that a user can or will achieve performance similar to the benchmark results contained in this report. No warranty of system performance or price/performance is expressed or implied by this report

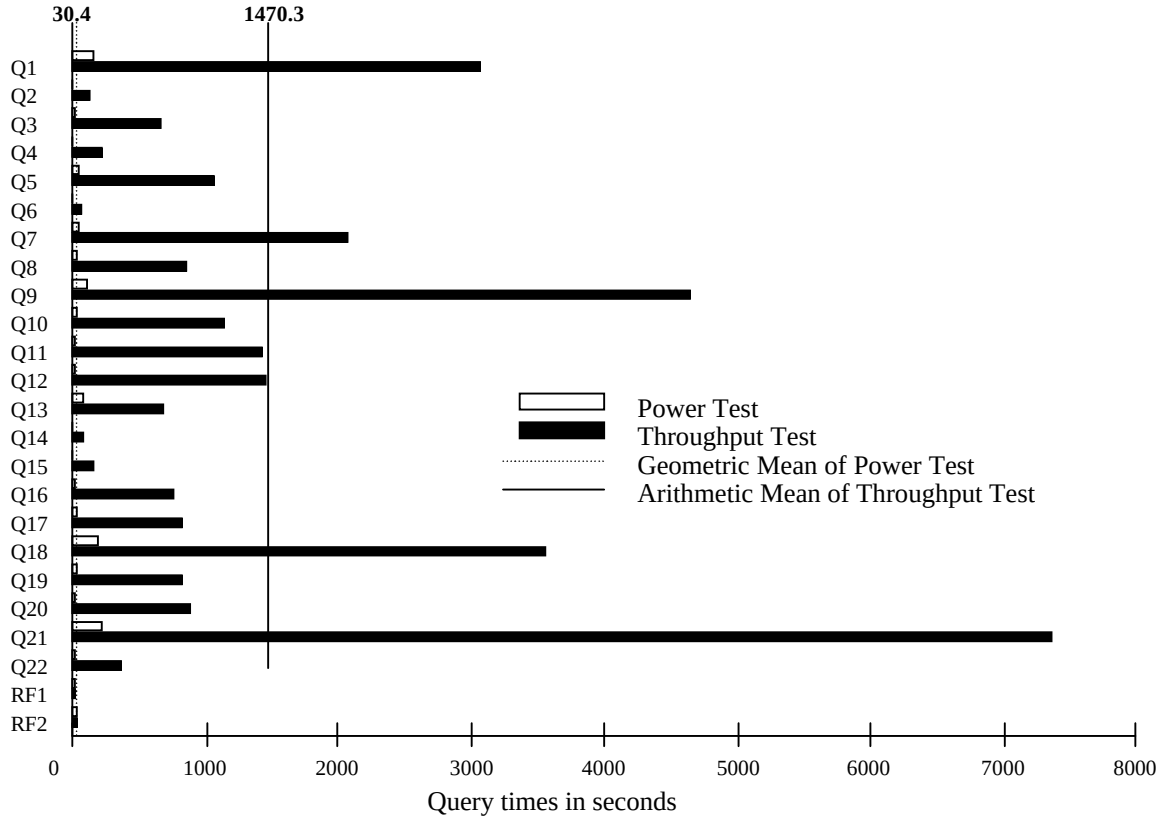
HP Integrity Superdome - Itanium/1.6 GHz/18MB iL3 - 32p/64c

TPC-H Rev 2.8.0

Report Date: April 29, 2009

Total System Cost	Composite Query per Hour Metric	Price/Performance
$2,532,527 USD	**123,323.1 QphH@1000GB**	**$20.54 USD Price/QphH@1000GB**

Database Size	Database Manager	Operating System	Other Software	Availability Date
1000 GB*	**Oracle Database 11g Enterprise Edition with Partitioning and Oracle Automatic Storage Management**	**HP-UX 11i v3 64-bit**	**None**	**Now**



Database Load Time = 01:07:12	Load Includes Backup: N	Total Data Storage/Database Size = 112.42
RAID (Base Tables Only): N	RAID (Base Tables and Auxiliary Data Structures): N	RAID (All): Y

System Configuration

Number of Nodes:	1
Processors/Cores/Threads/Type:	32/64/64/Intel Itanium 9140 1.6GHz, 9MB iL3 cache per core
Memory:	384 GB
Disk Drives:	1 High Availability Storage Systems with 4 18GB disks and 32 EVA 4400 (with total of 768 146GB 15K RPM disks)
Total Disk Storage	112416GB (In this number one GB is defined as 1024*1024*1024 bytes)
Lan Controllers	1 PCI 1000BT Lan Adapter

*Database Size includes only raw data (e.g. no temp, index, redundant storage space, etc.)

HP Integrity Superdome - Itanium/1.6 GHz/18MB iL3 - 32p/64c

TPC-H Rev 2.8.0

Report Date: April 29, 2009

Description	Part Number	Source	Reference Price	Qty	Extended Price	3 yr Maint Price
Server Hardware						
Superdome left chassis	A9834A, Opt 429	1	235,950	1	235,950	
Superdome sx2000 Cell Board	A9837A	1	19,250	8	154,000	
24x7x4hr - 3 Year Svc & Support Price (Hardware and Software)						702,536
Superdome 256GB Memory Bundle (128x2GB dimms)	A9856A	1	519,888	1	519,888	
Superdome 16GB Memory Group (8x2GB dimms)	A9846A	1	35,611	8	284,888	
12-Slot PCI-X I/O Chassis	A9836A	1	16,950	8	135,600	
Dual-Core Intel Itanium 9140N/1.6GHz/18MB L3	AD371A	1	23,000	32	736,000	
PCI-X 2 port 1000Base-SX Gigabit Adapter	A7011A	1	1,995	1	1,995	
PCI-X 4GB Fibre Channel Adapter (dual port)	AB379B	1	3,495	64	223,680	
PCI Dual Channel Ultra320 SCSI Adapter	A7173A	1	795	1	795	
HPDisk System 2120	A7382A	1	995	1	995	
HP INT no S/W 73G 15K 80U4 HDD	A7529A	1	1,495	4	5,980	
HP Universal Rack 10642 G2 Pallet Rack	AF001A	1	1,249	1	1,249	
HP 24A High Voltage US/JP Modular PDU	252663-D72	1	299	1	299	
HP Tape Array 5300	C7508B	1	729	1	729	
HP DVD + RW Array Field Module	Q1592B	1	649	1	649	
HP rx2660 Server (inc mem/disk/monitor/keyboard/mouse)	AB419A	1	8,557	1	8,557	
I/O Chassis Enclsoure for 12-Slot PCI-X Chassis	A9852A	1	25,750	2	51,500	
Graphite I/O expansion power subsystem	A5861D	1	34,860	1	34,860	
				Subtotal	**2,397,614**	**702,536**
Server Software						
Oracle Database 11g Enterprise Edition, Named User Plus for 3 years		2	11,875	32	380,000	
Partitioning, Named User Plus for 3 years		2	2,875	32	92,000	
Oracle Database Server Support Package for 3 years		2	6,900	1		6,900
HP-UX 11i v3 Integrity 16+ Skt PCL LTU	BA927AC, Opt 055	1	2,370	64	151,680	
HP-UX 11i v3 Integrity BOE Media	BA927AA, Opt AJR	1	565	1	565	
				Subtotal	**624,245**	**6,900**
Storage						
5m Fibre Channel Cables	221692-B22	1	95	128	12,160	
EVA4400 146GB HDD Starter Kit (8 HDD) (32+4 spare)**	AJ693B	1	15,000	36	540,000	
3 Yr Support Price for EVA4400 and disks						Included
M6412 Fibre Channel Drive Enclosure (32+4 spare)	AG638B	1	4,325	36	155,700	
146GB 15K FC EVA M6412 Enc HDD (512+52 spare)**	AG556B	1	1,190	564	671,160	
ProCurve Switch 2510 Series 48 port	J9020A	1	759	1	759	
Universal Rack 10642 G2 Pallet Rack	AF001A	1	1,249	6	7,494	
24A High Voltage US/JP Modular PDU	252663-D72	1	299	12	3,588	
				Subtotal	**1,390,861**	**0**
				Total	**4,412,720**	**709,436**
Oracle Mandatory E-Business Discount on (Licenses and Support)					(95,780)	
54 % Large Configuration Discount and Support Prepayment*					(2,114,480)	(379,369)
				Grand Total	**2,202,460**	**330,067**

*All discounts are based on US list prices and for similar quantities and configurations	**3-yr Cost of Ownership:** **2,532,527**
** 8 Hard Disk Drives are included with EVA4400 Starter Kit	**QphH@1000GB:** **123,323**
Source 1=HP, 2=Oracle	**$/QphH@1000GB:** **20.54**
Audited By: Francois Raab for InfoSizing (www.sizing.com)	

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

Measurement Results

Database Scaling (SF/size)	1000
Total Data Storage/Database Size	112.42
Start of Database Load Time	04/19/09 12:51:16
End of Database Load Time	04/19/09 01:58:28
Database Load Time	1:07:12
Query Streams for Throughput Test (S)	64
TPC-H Power	118,577.0
TPC-H Throughput	128,259.1
TPC-H Composite Query-per-Hour Metric (QphH@1000GB)	123,323.1
Total System Price Over 3 Years	2,532,527
TPC-H Price/Performance Metric ($/QphH@1000GB)	20.54

Measurement Intervals

Measurement Interval in Throughput Test (Ts)	39,520

Duration of Stream Execution:

Power Run	Seed	Query Start Time Query End Time	Duration (sec)	RF1 Start Time RF1 End Time	RF2 Start Time RF2 End Time
	419015828	04/18/05 02:03:28 04/18/05 02:24:16	1,248	04/19/09 02:03:28 04/19/09 02:03:45	04/19/09 02:23:36 04/19/09 02:24:16

Throuput Stream	Seed	Query Start Time Query End Time	Duration (sec)	RF1 Start Time RF1 End Time	RF2 Start Time RF2 End Time
1	419015829	04/18/05 02:24:18 04/18/05 12:14:23	35,405	04/19/09 12:23:52 04/19/09 12:24:11	04/19/09 19:12:24 04/19/09 12:24:47
2	419015830	04/18/05 02:24:18 04/18/05 12:15:08	35,450	04/19/09 12:24:47 04/19/09 12:25:05	04/19/09 19:12:25 04/19/09 12:25:39
3	419015831	04/18/05 02:24:18 04/18/05 10:01:56	27,458	04/19/09 12:25:39 04/19/09 12:25:58	04/19/09 19:12:25 04/19/09 12:26:33
4	419015832	04/18/05 02:24:18 04/18/05 11:18:13	32,035	04/19/09 12:26:33 04/19/09 12:26:52	04/19/09 19:12:26 04/19/09 12:27:26
5	419015833	04/18/05 02:24:18 04/18/05 12:16:13	35,515	04/19/09 12:27:26 04/19/09 12:27:46	04/19/09 19:12:27 04/19/09 12:28:21
6	419015834	04/18/05 02:24:19 04/18/05 10:00:38	27,379	04/19/09 12:28:21 04/19/09 12:28:41	04/19/09 19:12:28 04/19/09 12:29:16
7	419015835	04/18/05 02:24:19 04/18/05 12:11:52	35,253	04/19/09 12:29:16 04/19/09 12:29:34	04/19/09 19:12:29 04/19/09 12:30:10
8	419015836	04/18/05 02:24:19 04/18/05 08:45:01	22,842	04/19/09 12:30:10 04/19/09 12:30:32	04/19/09 19:12:30 04/19/09 12:31:07
9	419015837	04/18/05 02:24:19 04/18/05 11:54:52	34,233	04/19/09 12:31:07 04/19/09 12:31:28	04/19/09 19:12:31 04/19/09 12:32:03
10	419015838	04/18/05 02:24:19 04/18/05 12:15:25	35,466	04/19/09 12:32:03 04/19/09 12:32:23	04/19/09 19:12:32 04/19/09 12:32:57

Duration of Stream Execution (Continued):

Throuput Stream	Seed	Query Start Time Query End Time	Duration (sec)	RF1 Start Time RF1 End Time	RF2 Start Time RF2 End Time
11	419015839	04/18/05 02:24:19 04/18/05 11:40:16	33,357	04/19/09 12:32:57 04/19/09 12:33:20	04/19/09 19:12:33 04/19/09 12:33:55
12	419015840	04/18/05 02:24:19 04/18/05 10:25:12	28,853	04/19/09 12:33:55 04/19/09 12:34:15	04/19/09 19:12:34 04/19/09 12:34:50
13	419015841	04/18/05 02:24:19 04/18/05 12:09:49	35,130	04/19/09 12:34:50 04/19/09 12:35:10	04/19/09 19:12:35 04/19/09 12:35:45
14	419015842	04/18/05 02:24:19 04/18/05 12:23:52	35,973	04/19/09 12:35:45 04/19/09 12:36:05	04/19/09 19:12:36 04/19/09 12:36:40
15	419015843	04/18/05 02:24:19 04/18/05 09:42:19	26,280	04/19/09 12:36:40 04/19/09 12:37:02	04/19/09 19:12:37 04/19/09 12:37:37
16	419015844	04/18/05 02:24:20 04/18/05 11:29:55	32,735	04/19/09 12:37:37 04/19/09 12:37:58	04/19/09 19:12:37 04/19/09 12:38:33
17	419015845	04/18/05 02:24:20 04/18/05 11:24:51	32,431	04/19/09 12:38:33 04/19/09 12:38:54	04/19/09 19:12:38 04/19/09 12:39:28
18	419015846	04/18/05 02:24:20 04/18/05 11:48:30	33,850	04/19/09 12:39:28 04/19/09 12:39:49	04/19/09 19:12:39 04/19/09 12:40:23
19	419015847	04/18/05 02:24:20 04/18/05 09:37:52	26,012	04/19/09 12:40:23 04/19/09 12:40:47	04/19/09 19:12:40 04/19/09 12:41:21
20	419015848	04/18/05 02:24:20 04/18/05 12:14:32	35,412	04/19/09 12:41:21 04/19/09 12:41:43	04/19/09 19:12:41 04/19/09 12:42:17
21	419015849	04/18/05 02:24:20 04/18/05 12:12:05	35,265	04/19/09 12:42:17 04/19/09 12:42:37	04/19/09 19:12:42 04/19/09 12:43:11
22	419015850	04/18/05 02:24:20 04/18/05 12:13:28	35,348	04/19/09 12:43:11 04/19/09 12:43:30	04/19/09 19:12:43 04/19/09 12:44:05
23	419015851	04/18/05 02:24:20 04/18/05 11:15:17	31,857	04/19/09 12:44:05 04/19/09 12:44:23	04/19/09 19:12:44 04/19/09 12:44:57
24	419015852	04/18/05 02:24:20 04/18/05 11:46:17	33,717	04/19/09 12:44:57 04/19/09 12:45:17	04/19/09 19:12:45 04/19/09 12:45:51
25	419015853	04/18/05 02:24:20 04/18/05 12:17:05	35,565	04/19/09 12:45:51 04/19/09 12:46:11	04/19/09 19:12:46 04/19/09 12:46:45
26	419015854	04/18/05 02:24:21 04/18/05 11:38:19	33,238	04/19/09 12:46:45 04/19/09 12:47:06	04/19/09 19:12:47 04/19/09 12:47:40
27	419015855	04/18/05 02:24:21 04/18/05 11:50:16	33,955	04/19/09 12:47:40 04/19/09 12:47:59	04/19/09 19:12:47 04/19/09 12:48:34
28	419015856	04/18/05 02:24:21 04/18/05 11:16:35	31,934	04/19/09 12:48:34 04/19/09 12:48:55	04/19/09 19:12:48 04/19/09 12:49:29
29	419015857	04/18/05 02:24:21 04/18/05 10:40:03	29,742	04/19/09 12:49:29 04/19/09 12:49:51	04/19/09 19:12:49 04/19/09 12:50:25
30	419015858	04/18/05 02:24:21 04/18/05 12:21:53	35,852	04/19/09 12:50:25 04/19/09 12:50:46	04/19/09 19:12:50 04/19/09 12:51:21

Duration of Stream Execution (Continued):

Throuput Stream	Seed	Query Start Time Query End Time	Duration (sec)	RF1 Start Time RF1 End Time	RF2 Start Time RF2 End Time
31	419015859	04/18/05 02:24:21 04/18/05 12:02:36	34,695	04/19/09 12:51:21 04/19/09 12:51:42	04/19/09 19:12:51 04/19/09 12:52:16
32	419015860	04/18/05 02:24:21 04/18/05 11:47:57	33,816	04/19/09 12:52:16 04/19/09 12:52:37	04/19/09 19:12:52 04/19/09 12:53:12
33	419015861	04/18/05 02:24:22 04/18/05 11:51:09	34,007	04/19/09 12:53:12 04/19/09 12:53:34	04/19/09 19:12:53 04/19/09 12:54:09
34	419015862	04/18/05 02:24:22 04/18/05 11:40:15	33,353	04/19/09 12:54:09 04/19/09 12:54:30	04/19/09 19:12:54 04/19/09 12:55:05
35	419015863	04/18/05 02:24:22 04/18/05 11:42:03	33,461	04/19/09 12:55:05 04/19/09 12:55:25	04/19/09 19:12:55 04/19/09 12:55:59
36	419015864	04/18/05 02:24:22 04/18/05 11:27:13	32,571	04/19/09 12:55:59 04/19/09 12:56:22	04/19/09 19:12:56 04/19/09 12:56:56
37	419015865	04/18/05 02:24:22 04/18/05 11:03:40	31,158	04/19/09 12:56:56 04/19/09 12:57:17	04/19/09 19:12:57 04/19/09 12:57:52
38	419015866	04/18/05 02:24:22 04/18/05 11:20:52	32,190	04/19/09 12:57:52 04/19/09 12:58:12	04/19/09 19:12:58 04/19/09 12:58:47
39	419015867	04/18/05 02:24:23 04/18/05 12:12:30	35,287	04/19/09 12:58:47 04/19/09 12:59:08	04/19/09 19:12:59 04/19/09 12:59:43
40	419015868	04/18/05 02:24:23 04/18/05 11:46:47	33,744	04/19/09 12:59:43 04/19/09 13:00:05	04/19/09 19:13:00 04/19/09 13:00:40
41	419015869	04/18/05 02:24:23 04/18/05 12:22:14	35,871	04/19/09 13:00:40 04/19/09 13:01:01	04/19/09 19:13:01 04/19/09 13:01:36
42	419015870	04/18/05 02:24:23 04/18/05 11:40:12	33,349	04/19/09 13:01:36 04/19/09 13:01:59	04/19/09 19:13:01 04/19/09 13:02:33
43	419015871	04/18/05 02:24:23 04/18/05 10:23:15	28,732	04/19/09 13:02:33 04/19/09 13:02:53	04/19/09 19:13:02 04/19/09 13:03:27
44	419015872	04/18/05 02:24:23 04/18/05 09:54:12	26,989	04/19/09 13:03:27 04/19/09 13:03:48	04/19/09 19:13:03 04/19/09 13:04:22
45	419015873	04/18/05 02:24:23 04/18/05 11:48:11	33,828	04/19/09 13:04:22 04/19/09 13:04:41	04/19/09 19:13:04 04/19/09 13:05:16
46	419015874	04/18/05 02:24:24 04/18/05 11:48:13	33,829	04/19/09 13:05:16 04/19/09 13:05:36	04/19/09 19:13:05 04/19/09 13:06:10
47	419015875	04/18/05 02:24:25 04/18/05 10:04:47	27,622	04/19/09 13:06:10 04/19/09 13:06:30	04/19/09 19:13:06 04/19/09 13:07:05
48	419015876	04/18/05 02:24:24 04/18/05 12:23:42	35,958	04/19/09 13:07:05 04/19/09 13:07:25	04/19/09 19:13:07 04/19/09 13:08:00
49	419015877	04/18/05 02:24:27 04/18/05 07:33:31	18,544	04/19/09 13:08:00 04/19/09 13:08:20	04/19/09 19:13:08 04/19/09 13:08:56
50	419015878	04/18/05 02:24:25 04/18/05 11:59:19	34,494	04/19/09 13:08:56 04/19/09 13:09:17	04/19/09 19:13:09 04/19/09 13:09:51

Duration of Stream Execution (Continued):

Throuput Stream	Seed	Query Start Time Query End Time	Duration (sec)	RF1 Start Time RF1 End Time	RF2 Start Time RF2 End Time
51	419015879	04/18/05 02:24:25 04/18/05 12:13:07	35,322	04/19/09 13:09:51 04/19/09 13:10:14	04/19/09 19:13:10 04/19/09 13:10:49
52	419015880	04/18/05 02:24:25 04/18/05 11:15:09	31,844	04/19/09 13:10:49 04/19/09 13:11:10	04/19/09 19:13:11 04/19/09 13:11:45
53	419015881	04/18/05 02:24:25 04/18/05 12:19:18	35,693	04/19/09 13:11:45 04/19/09 13:12:06	04/19/09 19:13:12 04/19/09 13:12:40
54	419015882	04/18/05 02:24:25 04/18/05 11:58:26	34,441	04/19/09 13:12:40 04/19/09 13:13:02	04/19/09 19:13:13 04/19/09 13:13:37
55	419015883	04/18/05 02:24:27 04/18/05 10:51:08	30,401	04/19/09 13:13:37 04/19/09 13:13:58	04/19/09 19:13:13 04/19/09 13:14:32
56	419015884	04/18/05 02:24:26 04/18/05 10:54:36	30,610	04/19/09 13:14:32 04/19/09 13:14:53	04/19/09 19:13:14 04/19/09 13:15:28
57	419015885	04/18/05 02:24:26 04/18/05 11:14:11	31,785	04/19/09 13:15:28 04/19/09 13:15:49	04/19/09 19:13:15 04/19/09 13:16:27
58	419015886	04/18/05 02:24:26 04/18/05 10:44:23	29,997	04/19/09 13:16:27 04/19/09 13:16:48	04/19/09 19:13:16 04/19/09 13:17:23
59	419015887	04/18/05 02:24:27 04/18/05 11:50:00	33,933	04/19/09 13:17:23 04/19/09 13:17:43	04/19/09 19:13:17 04/19/09 13:18:18
60	419015888	04/18/05 02:24:26 04/18/05 09:35:26	25,860	04/19/09 13:18:18 04/19/09 13:18:40	04/19/09 19:13:18 04/19/09 13:19:14
61	419015889	04/18/05 02:24:27 04/18/05 11:39:15	33,288	04/19/09 13:19:14 04/19/09 13:19:36	04/19/09 19:13:19 04/19/09 13:20:13
62	419015890	04/18/05 02:24:27 04/18/05 10:17:09	28,362	04/19/09 13:20:13 04/19/09 13:20:34	04/19/09 19:13:20 04/19/09 13:21:08
63	419015891	04/18/05 02:24:26 04/18/05 11:46:42	33,736	04/19/09 13:21:08 04/19/09 13:21:30	04/19/09 19:13:21 04/19/09 13:22:04
64	419015892	04/18/05 02:24:27 04/18/05 11:48:05	33,818	04/19/09 13:22:04 04/19/09 13:22:24	04/19/09 19:13:22 04/19/09 13:22:58

TPC-H Timing Intervals (in seconds)

Duration of stream execution:

Stream ID	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
Stream 00	169.8	11.3	19.3	9.4	44.8	6.7	48.7	32.2	112.0	33.4	23.5	22.4
Stream 01	0.1	129.5	764.4	0.1	0.5	121.6	0.1	722.4	2032.9	0.1	315.1	1314.2
Stream 02	0.4	78.5	1062.2	325.9	246.8	10.6	1856.4	528.2	4405.3	4453.1	3663.2	739.0
Stream 03	2008.0	168.1	827.5	310.8	2314.9	106.8	4071.7	914.4	5020.9	0.5	2915.3	1.0
Stream 04	4305.3	168.9	636.6	267.2	3603.2	0.2	0.8	1421.9	5227.1	0.2	2187.4	1167.0
Stream 05	4854.6	137.8	1048.2	517.8	0.5	0.2	0.2	919.2	1941.0	0.6	1548.0	1622.0
Stream 06	4458.7	174.8	1049.8	180.5	1184.7	151.8	2030.4	818.4	6189.7	1983.5	1076.4	1513.0
Stream 07	5285.5	170.9	360.2	506.1	377.9	0.2	0.5	1157.3	5109.0	0.4	1909.4	708.5
Stream 08	3815.7	167.4	339.7	157.4	0.1	95.3	0.1	548.5	5823.6	2518.5	2930.0	1167.5
Stream 09	0.3	130.6	1143.4	0.5	0.2	78.2	5974.8	776.5	4992.8	0.5	2529.1	1836.6
Stream 10	5136.2	121.5	0.1	0.1	0.1	212.7	4793.0	145.7	3448.3	0.1	79.1	3820.3
Stream 11	0.4	132.2	749.9	0.6	0.7	141.3	2944.0	1295.6	0.7	2898.7	1492.6	3495.3
Stream 12	5079.1	0.7	757.6	1.8	1.0	0.5	3503.2	1452.3	0.9	0.1	2987.2	3863.1
Stream 13	0.1	43.9	0.1	66.2	0.1	0.1	3813.2	152.6	0.2	0.1	71.6	1665.6
Stream 14	4268.6	118.1	37.3	396.1	212.8	0.1	0.4	112.0	6613.7	0.3	14.7	51.6
Stream 15	0.1	164.1	1062.4	463.6	1265.8	80.9	0.8	715.7	5357.2	0.1	558.4	1515.8
Stream 16	5340.6	83.6	861.2	272.6	1847.1	75.0	0.6	1217.4	3449.9	1018.1	2895.1	1242.7
Stream 17	0.7	218.0	1564.2	0.5	1896.6	0.5	5054.4	937.5	5397.7	0.4	367.4	738.3
Stream 18	3920.8	169.7	1358.0	838.8	2579.5	195.3	0.1	1254.2	1.6	2166.8	2254.4	928.9
Stream 19	0.3	123.6	1349.2	621.7	2231.5	0.4	0.6	776.6	3776.1	2887.0	728.6	1881.9
Stream 20	4911.8	58.4	0.3	325.6	0.7	12.1	5550.7	60.4	3474.9	0.6	374.7	2128.4
Stream 21	3051.0	45.0	0.1	0.5	0.2	0.1	0.1	903.2	4650.8	0.8	2830.8	1793.0
Stream 22	5267.3	132.5	649.4	0.1	0.4	0.3	0.5	919.6	3844.0	0.3	2053.3	2049.3
Stream 23	0.1	157.3	0.2	0.2	0.2	0.1	0.2	1208.5	7049.8	0.1	1430.9	2522.0
Stream 24	0.3	132.0	0.3	413.7	0.2	0.7	7574.3	866.3	9137.9	2851.3	1411.2	1781.3
Stream 25	5028.6	141.5	612.8	178.4	0.1	0.3	0.6	929.5	1905.2	3845.1	1241.8	930.4
Stream 26	3703.7	146.5	833.8	425.1	2205.4	160.3	2022.5	684.6	7273.2	2259.1	411.8	0.4
Stream 27	5305.3	185.0	0.1	477.7	0.4	0.4	0.1	789.4	5781.2	328.8	1847.8	1724.5
Stream 28	2350.5	190.2	968.9	518.2	2779.1	0.4	0.9	1290.7	4717.0	5560.4	1171.2	1641.6
Stream 29	3719.2	152.8	715.9	0.2	2476.3	72.1	0.3	637.1	4950.8	4360.3	1433.2	1846.4
Stream 30	4883.5	26.9	599.1	0.1	2229.1	0.1	6232.7	74.6	6528.5	2238.8	9.8	0.1
Stream 31	5515.2	153.4	0.3	0.2	1789.1	13.6	0.3	707.2	6992.2	0.4	1183.6	1446.9
Stream 32	5325.3	58.0	0.6	516.3	2672.4	0.2	3180.2	796.6	5343.7	0.1	925.5	3564.5

TPC-H Timing Intervals (in seconds)

Duration of stream execution:

Stream ID	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
Stream 33	3083.0	167.2	964.1	0.1	2028.6	132.3	4063.6	1000.1	6522.4	3927.8	1851.8	881.3
Stream 34	5378.8	98.7	839.5	0.3	0.1	0.9	4796.4	800.7	6558.1	0.6	378.0	0.1
Stream 35	2362.3	77.2	716.3	0.2	0.1	0.3	3611.2	1013.2	7084.7	3523.7	764.9	1560.1
Stream 36	5216.5	98.2	1466.2	136.2	0.3	188.3	2512.7	823.9	9178.0	2748.5	2312.3	662.6
Stream 37	4957.1	127.9	1181.6	432.9	2750.3	0.6	4074.8	697.3	5025.2	0.3	476.6	1281.0
Stream 38	2221.5	68.9	366.9	326.8	2459.6	79.6	3555.1	601.0	6330.2	4320.2	673.1	661.1
Stream 39	5255.6	44.6	1469.7	452.4	2353.9	131.6	5098.3	730.9	5224.7	0.1	728.7	949.9
Stream 40	2119.6	120.5	769.6	1.4	0.4	0.2	3075.3	818.7	8038.4	2472.7	594.5	1465.9
Stream 41	1118.7	226.7	0.4	0.2	0.4	71.6	269.9	941.3	6548.1	0.4	1322.6	149.8
Stream 42	3743.1	188.4	371.6	0.1	0.1	0.4	1913.2	1665.3	4921.0	0.5	15.4	2494.2
Stream 43	5465.9	91.9	938.4	0.5	773.6	209.2	2232.1	518.8	3808.9	3836.1	1843.5	974.7
Stream 44	2103.5	153.0	2.0	278.9	2451.4	115.6	3853.6	1020.6	6024.6	0.4	1725.5	0.4
Stream 45	0.1	124.1	722.9	498.5	4073.5	169.0	1.2	874.9	6441.5	0.1	2510.4	3054.2
Stream 46	0.5	163.9	1196.2	201.3	2318.9	0.6	1971.8	1253.1	3354.1	0.6	3923.1	2186.4
Stream 47	4373.6	180.4	811.0	0.2	2478.7	113.2	1973.0	637.4	5950.2	2995.7	790.1	1262.0
Stream 48	0.5	110.8	0.1	0.8	0.1	0.1	0.1	1307.2	953.6	0.1	963.3	77.3
Stream 49	3687.2	146.9	485.8	178.2	40.7	78.7	2172.0	617.1	5170.1	0.1	2227.9	490.3
Stream 50	0.8	116.9	1093.7	552.7	0.3	77.1	5240.4	1381.1	4008.9	0.2	2566.6	2318.4
Stream 51	5243.0	148.9	193.1	60.8	0.5	216.6	5054.9	224.7	5006.8	0.1	155.9	1253.8
Stream 52	1128.5	123.5	0.4	445.0	2610.8	98.1	0.9	1367.8	5784.3	1497.0	707.6	1181.1
Stream 53	5313.2	152.0	31.1	0.5	0.2	91.2	4690.8	803.9	7290.1	0.1	605.1	670.0
Stream 54	0.6	51.9	1110.4	0.1	0.1	0.1	0.4	212.6	5127.1	4325.5	81.8	2657.0
Stream 55	3183.8	225.6	771.5	315.7	0.1	0.7	0.7	1231.6	7853.4	0.1	1686.0	1362.5
Stream 56	4763.7	124.8	1058.3	276.1	2852.1	87.4	0.6	476.1	6863.4	0.2	344.7	629.1
Stream 57	4333.6	80.4	1053.9	264.6	2656.5	73.0	5323.2	1227.2	2832.4	1394.4	3486.3	1881.6
Stream 58	3234.4	151.1	1292.4	312.5	1828.5	144.6	0.4	1414.2	4055.6	0.5	57.1	1315.4
Stream 59	4436.9	174.5	1335.1	617.1	2722.0	203.6	0.2	1173.9	3879.3	0.4	1306.7	0.1
Stream 60	1638.2	93.7	1214.1	674.4	1759.3	0.2	1916.0	709.5	0.1	0.5	2592.7	2398.4
Stream 61	5270.2	102.4	683.3	383.8	0.5	101.9	0.6	649.1	1.2	2393.4	1485.3	2491.7
Stream 62	5293.2	1.5	0.4	183.2	0.3	121.6	3180.1	796.6	0.7	0.1	1980.5	959.4
Stream 63	2175.0	136.4	728.7	533.5	0.2	0.3	3807.5	675.4	0.1	0.5	3085.7	3847.2
Stream 64	2113.9	164.0	511.6	0.5	0.4	100.7	0.6	1305.5	6787.0	0.6	1531.4	1239.1
Minimum	0.1	0.7	0.1	0.1	0.1	0.1	0.1	60.4	0.1	0.1	9.8	0.1
Maximum	5515.2	226.7	1564.2	838.8	4073.5	216.6	7574.3	1665.3	9178.0	5560.4	3923.1	3863.1
Average	3074.3	126.8	667.7	233.0	1063.7	64.7	2078.1	854.8	4641.6	1137.8	1431.6	1454.0

TPC-H Timing Intervals (in seconds)

Duration of stream execution:

Stream ID	Q13	Q14	Q15a	Q16	Q17	Q18	Q19	Q20	Q21	Q22	RF1	RF2
Stream 00	88.3	5.6	9.3	15.5	41.3	193.8	44.0	17.0	224.8	17.9	16.8	40.5
Stream 01	1.3	0.2	240.3	794.5	736.5	0.7	739.5	435.6	26865.2	190.1	18.2	36.1
Stream 02	0.1	126.7	0.6	1045.7	924.5	348.2	974.4	1354.0	13081.3	224.6	18.3	34.0
Stream 03	0.6	85.7	1.4	1064.7	741.5	4264.6	1026.9	1287.2	1.2	324.3	18.8	34.9
Stream 04	0.7	71.7	154.6	1183.1	752.8	0.4	573.2	433.2	9536.7	342.4	18.5	34.3
Stream 05	0.1	0.4	357.6	1222.2	616.1	0.8	1209.6	707.5	18193.4	616.2	19.4	35.1
Stream 06	553.9	1.0	277.2	1439.6	693.3	136.2	1248.3	1933.3	0.4	284.2	20.3	34.7
Stream 07	0.3	0.1	100.9	207.8	1108.8	15962.2	658.8	1085.0	0.2	543.4	18.2	35.4
Stream 08	2343.2	66.6	127.2	453.0	540.6	0.9	1241.8	241.9	1.9	261.4	22.5	34.6
Stream 09	2275.2	37.7	0.3	256.0	720.4	0.6	1233.6	635.2	11029.0	580.9	20.7	35.1
Stream 10	0.3	76.3	461.9	190.2	986.6	15287.7	91.9	259.9	0.4	353.8	20.0	34.2
Stream 11	0.1	134.7	536.2	1275.5	715.9	14061.2	927.4	2068.1	1.0	484.5	22.7	34.7
Stream 12	0.7	109.9	0.3	681.0	433.8	6697.4	874.2	1831.5	0.1	576.7	20.4	34.3
Stream 13	0.1	12.4	0.1	174.6	767.5	0.1	258.6	196.4	27778.6	128.4	20.3	34.6
Stream 14	0.1	19.0	346.6	1195.9	1645.8	7391.1	106.4	1086.5	12294.1	62.0	20.8	34.8
Stream 15	0.6	81.2	424.9	396.2	535.6	1.2	1052.3	693.3	11371.1	538.1	22.1	34.3
Stream 16	0.8	56.5	0.4	539.0	504.4	2.7	1246.7	238.5	11657.4	185.6	21.4	34.5
Stream 17	0.4	85.5	0.6	1095.8	1558.1	0.7	964.7	801.3	11399.6	348.4	21.1	34.1
Stream 18	2418.3	80.7	0.5	253.7	984.1	0.7	837.5	1967.2	11352.7	286.7	20.9	34.0
Stream 19	7.4	110.6	163.0	558.5	376.4	0.2	1026.1	759.9	8192.8	439.8	23.7	33.8
Stream 20	2369.6	128.1	343.4	535.8	859.8	11886.4	920.2	1097.7	0.4	372.3	22.5	33.6
Stream 21	0.7	128.7	0.4	696.8	1493.5	0.1	1251.2	1117.5	16944.3	356.6	20.0	33.8
Stream 22	2404.3	0.4	0.5	448.1	83.3	0.4	870.8	554.8	15560.7	507.1	19.1	34.4
Stream 23	0.1	128.9	0.1	706.0	922.6	15961.1	715.9	653.8	0.1	398.3	18.1	34.0
Stream 24	0.1	71.6	0.6	424.4	549.3	0.9	742.4	1056.3	6339.2	361.9	19.7	34.3
Stream 25	0.7	107.8	0.3	1184.9	590.9	16375.3	878.7	1227.7	0.1	384.2	19.4	34.7
Stream 26	2654.1	54.2	0.3	532.7	755.1	1.3	1084.0	429.9	7178.8	422.0	20.9	33.4
Stream 27	0.6	92.8	0.1	751.2	1724.6	0.4	95.8	467.3	13867.9	514.1	19.5	34.3
Stream 28	1415.2	131.2	2.8	1077.2	1331.5	4731.8	1159.4	601.5	33.6	260.6	21.0	34.4
Stream 29	0.3	98.1	311.5	563.8	1219.2	3824.0	835.0	2110.5	0.6	413.8	21.5	34.5
Stream 30	0.1	94.7	0.1	36.1	451.5	4326.2	102.2	34.6	7687.0	296.5	20.6	34.9
Stream 31	0.4	16.7	0.1	828.0	508.5	0.1	705.0	1263.4	13465.5	104.8	20.9	33.6
Stream 32	1806.6	86.9	723.8	589.2	521.2	5952.8	626.0	311.4	556.2	258.7	21.4	34.9

TPC-H Timing Intervals (in seconds)

Duration of stream execution:

Stream ID	Q13	Q14	Q15a	Q16	Q17	Q18	Q19	Q20	Q21	Q22	RF1	RF2
Stream 33	0.7	81.0	612.8	955.0	742.9	0.8	814.5	202.0	5617.8	357.4	21.7	34.9
Stream 34	2005.9	126.2	0.3	651.1	565.3	0.5	619.9	1370.4	8665.4	496.0	21.1	34.7
Stream 35	0.1	209.1	0.3	613.9	1203.9	0.1	769.3	783.0	8667.9	499.3	20.5	34.0
Stream 36	1360.6	108.1	0.7	896.6	439.3	2330.9	737.7	859.5	0.5	493.6	22.5	34.0
Stream 37	4102.9	88.7	0.2	1169.4	1328.2	1391.5	604.2	1178.0	0.3	288.8	21.2	34.2
Stream 38	0.5	91.4	0.1	546.1	1889.8	0.5	1103.7	895.2	5738.6	259.3	20.9	34.5
Stream 39	1.1	102.8	135.1	1245.4	509.8	0.1	1306.1	809.9	8590.7	145.9	21.2	34.9
Stream 40	4102.4	62.6	0.5	763.5	541.6	0.3	611.4	253.0	7638.9	292.8	21.8	34.4
Stream 41	0.2	132.9	0.1	563.2	515.2	8180.5	298.6	283.2	14888.8	358.1	21.6	34.4
Stream 42	0.8	139.2	439.4	1033.0	832.4	382.9	1094.7	677.0	13015.7	420.2	22.8	33.9
Stream 43	2315.3	129.0	119.8	1126.6	1334.7	0.3	841.0	1946.0	0.1	225.9	19.9	34.1
Stream 44	0.7	161.4	0.4	915.1	758.2	5376.4	1059.1	557.8	0.8	428.9	20.4	33.9
Stream 45	0.1	82.8	0.4	775.6	1037.9	0.1	742.6	1044.0	11296.9	377.0	19.7	34.9
Stream 46	0.8	142.6	153.9	695.5	892.2	0.8	1069.6	845.1	12973.8	484.9	19.2	34.0
Stream 47	0.4	181.8	252.2	1238.0	893.8	20.0	1216.6	2027.9	0.8	224.7	20.6	34.7
Stream 48	0.1	6.6	0.1	20.2	635.4	16372.1	137.2	793.0	14260.1	320.5	19.9	34.9
Stream 49	0.1	63.3	0.1	703.4	489.6	0.1	1203.8	339.9	137.6	311.8	19.7	36.5
Stream 50	2270.7	31.6	392.9	252.7	531.1	0.3	1250.1	384.4	11409.5	613.4	20.4	34.2
Stream 51	0.5	101.6	547.3	136.3	828.4	15606.7	77.1	78.2	0.8	386.3	23.2	34.8
Stream 52	0.1	125.9	553.4	1026.0	459.0	13089.5	686.8	407.7	0.7	549.4	20.8	35.3
Stream 53	0.1	10.3	146.6	444.4	350.2	3927.5	62.4	1796.5	9003.7	302.9	20.5	34.1
Stream 54	0.1	14.6	0.1	355.7	1367.8	0.1	119.1	126.2	18541.8	347.8	21.9	35.1
Stream 55	2515.5	143.0	408.2	902.7	883.2	5371.4	1005.8	2101.7	1.1	436.5	20.3	34.0
Stream 56	1.0	64.2	0.6	1489.5	464.6	0.9	839.2	755.4	9028.9	488.5	21.5	34.8
Stream 57	0.6	61.3	334.1	565.2	591.8	0.8	1188.2	257.5	3981.4	196.6	21.2	37.2
Stream 58	0.7	0.4	318.2	1084.1	1136.1	0.5	1186.5	533.4	11575.7	354.9	21.8	34.1
Stream 59	3071.1	210.0	0.2	327.0	1681.8	0.4	861.8	1463.2	10211.2	256.8	20.5	35.2
Stream 60	0.1	85.5	159.5	568.1	549.3	0.1	1162.0	1348.1	8629.4	361.1	21.7	34.2
Stream 61	1516.4	121.9	424.1	1792.5	1184.1	11815.8	1128.1	1426.7	0.4	314.6	21.1	37.4
Stream 62	0.2	130.2	190.4	1047.4	561.9	0.4	733.7	1144.5	11695.2	341.1	20.5	34.6
Stream 63	2339.0	131.0	0.6	1386.5	525.2	0.1	1024.3	1114.8	11609.3	614.5	21.3	34.2
Stream 64	0.1	150.5	384.7	849.3	725.5	16368.5	709.7	508.9	0.5	364.6	19.6	34.4
Minimum	0.1	0.1	0.1	20.2	83.3	0.1	62.4	34.6	0.1	62.0	18.1	33.4
Maximum	4102.9	210.0	723.8	1792.5	1889.8	16375.3	1306.1	2110.5	27778.6	616.2	23.7	37.4
Average	685.4	87.3	158.7	758.4	825.1	3554.1	821.0	894.6	7368.4	364.6	20.7	34.6

Benchmark Sponsor: Sharada Bose
Performance Manager BCS
Hewlett-Packard
Pruneridge Avenue, MS4105
94065 Cupertino, CA 95014

April 24, 2009

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

Platform:	**HP Integrity Superdome Itanium/1.6 GHz/18MB iL3 – 32p/64c**
Database Manager:	**Oracle Database 11g Enterprise Edition with Partitioning and Oracle Automatic Storage Management**
Operating System:	**HP-UX 11i v3 64-bit**

The results were:

CPU (Speed)	Memory	Disks	QphH@1000GB
HP Integrity Superdome Itanium/1.6 GHz/18MB iL3 – 32p/64c			
32 x Itanium 9140 (1.6GHz, dual-core)	9 MB Cache/core 384 GB Main	768 x 146GB ext. 4 x 73GB int.	**123,323.1**

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:

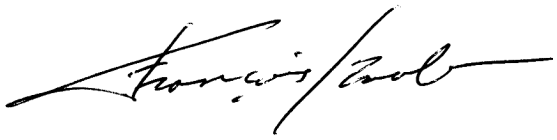
- The database records were defined with the proper layout and size
- The database population was generated using DBGEN
- The database was properly scaled to 1,000GB and populated accordingly
- The compliance of the database auxiliary data structures was verified
- The database load time was correctly measured and reported
- The required ACID properties were verified and met
- The query input variables were generated by QGEN
- The query text was produced using minor modifications and no query variant
- The execution of the queries against the SF1 database produced compliant answers
- A compliant implementation specific layer was used to drive the tests
- The throughput tests involved 64 query streams

- The ratio between the longest and the shortest query was such that some query timings were 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:

The measured configuration used four (4) internal 18GB disks for the operating system and ancillary file system. In the priced configuration these are replaced by four (4) internal 73GB disk drives. Based on their usage, the substitution of these drives has no impact on the reported performance.

Respectfully Yours,



François Raab
President

1 General Items

1.1 Benchmark Sponsor

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

Hewlett-Packard Company is the test sponsor of this TPC Benchmark H benchmark.

1.2 Parameter Settings

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

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 HP-UX and Oracle 11g parameters used in this benchmark.

1.3 Configuration Diagrams

Diagrams of both measured and priced configurations must be provided, accompanied by a description of the differences.

Measured Configuration

- 32 1.6GHz Intel Itanium 9140 CPUs each with 9MB iL3 cache per core
- 384 GB Memory
- 1 I/O Expansion Cabinets
- 64 PCI Fibre Channel 4GB Adapter (dual-port) Cards
- 1 PCI 1000Base-SX Gigabit Ethernet Adpt (A6847A)
- 1 PCI Dual Channel Ultra320 SCSI Adapter
- 32 HP EVA 4400 (with a total of 768 146GB disks)
- 1 High Availability Storage Systems (with a total of 4 18GB disks)
- 1 DVD ROM

Priced Configuration

- 32 1.6GHz Intel Itanium 9140 CPUs each with 9MB iL3 cache per core
- 384 GB Memory
- 1 I/O Expansion Cabinets
- 64 PCI Fibre Channel 4GB Adapter (dual-port) Cards
- 1 PCI-X 2 port 1000Base-SX Gigabit Adapter (A7011A)
- 1 PCI Dual Channel Ultra320 SCSI Adapter
- 32 HP EVA 4400 (with a total of 768 146GB disks)
- 1 HP Surestore Disk System 2120 (with a total of 4 72GB disks)
- 1 DVD ROM

Differences in Configurations

The following substitutions have no impact on the reported performance. The measured system uses a "High Availability Storage System" instead of a "Surestore Disk System 2120"; four 18GB internal hard drives instead of four 36GB internal hard drives; and a "PCI 1000Base-SX Gigabit Ethernet Adapter" instead of a "PCI-X 2 port 1000Base-SX Gigabit Adapter".

Measured Configuration

Server

Storage

HP Integrity Superdome

- 32 1.6GHz Intel Itanium 9140 CPUs each with 9MB iL3 cache per core
- 384 GB Memory
- 1 I/O Expansion Cabinets
- 64 PCI Fibre Channel 4GB Adapter (dual-port) Cards
- 1 PCI 1000Base-SX Gigabit Ethernet Adpt
- 1 PCI Dual Channel Ultra320 SCSI Adapter
- 1 High Availability Storage Systems (4 18GB disks)
- 1 DVD ROM

32 HP EVA 4400

- With a total of 768 15K RPM 146GB disks

128 Fibre Channel Cables

Priced Configuration

Server

Storage

HP Integrity Superdome

- 32 1.6GHz Intel Itanium 9140 CPUs each with 9MB iL3 cache per core
- 384 GB Memory
- 1 I/O Expansion Cabinets
- 64 PCI Fibre Channel 4GB Adapter (dual-port) Cards
- 1 PCI-X 2 port 1000Base-SX Gigabit Adapter
- 1 PCI Dual Channel Ultra320 SCSI Adapter
- 1 HP Surestore Disk System 2120 (4 72GB disks)
- 1 DVD ROM

32 HP EVA 4400

- With a total of 864 15K RPM 146GB disks

Ù Ù

128 Fibre Channel Cables

2 Clause 1 Logical Database Design Related Items

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 describes the scripts that define, create, and analyze the tables and indices for the TPC-H database.

2.2 Physical Organization

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

No record clustering or index clustering was used. Columns were reordered in the tables – please refer to the table create statements for the ordering.

2.3 Horizontal Partitioning

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

Horizontal partitioning was used for all base and index tables except NATION and REGION. The details of this partitioning can be understood by examining the syntax of the table and index definition statements in Appendix B. Similar partitioning was used in the qualification database size.

Section 5.2 describes the distribution of tables and logs across all media.

2.4 Replication

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

No replication was used.

3 Clause 2 Queries and Refresh Functions

3.1 Query Language

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

SQL was the query language used to implement all queries.

3.2 Verifying Method for Random Number Generation

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

TPC supplied versions 2.8.0 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.

QGEN version 2.8.0 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 definition 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 actual query text and query output.

3.5 Query Substitution Parameters and Seeds Used

The query substitution parameters used for all performance tests must be disclosed in tabular format, along with the seeds used to generate these parameters.

Appendix E 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 the isolation level set to "Level 3" (repeatable read).

3.7 Source Code of Refresh Functions

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

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

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 ACID test is included in Appendix C.

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.

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.

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.

5. The total price from the ORDERS table and the extended price from the LINEITEM table were retrieved for a randomly selected order key.
6. The ACID Transaction was performed using the order key from step 1. The transaction was stopped prior to the commit.
7. The ACID Transaction was ROLLED BACK.
8. 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.

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.

9. The consistency of the ORDERS and LINEITEM tables was verified based on a sample of order keys.
10. 100 ACID Transactions were submitted from each of 65 execution streams.
11. 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 some order.

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.

12. An ACID Transaction was started for a randomly selected O_KEY, L_KEY, and DELTA. The ACID Transaction was suspended prior to COMMIT.
13. An ACID Query was started for the same O_KEY used in step 1. The ACID Query blocked and did not see any uncommitted changes made by the ACID Transaction.
14. The ACID Transaction was resumed, and COMMITTED.
15. The ACID Query completed. It returned the data as committed by the ACID Transaction.

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.

16. An ACID Transaction was started for a randomly selected O_KEY, L_KEY, and DELTA. The ACID Transaction was suspended prior to ROLLBACK.
17. 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.
18. The ACID Transaction was ROLLED BACK.
19. The ACID Query completed.

Write-Write Conflict with Commit

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

20. An ACID Transaction, T1, was started for a randomly selected O_KEY, L_KEY, and DELTA. The ACID transaction T1 was suspended prior to COMMIT.
21. Another ACID Transaction, T2, was started using the same O_KEY and L_KEY and a randomly selected DELTA.
22. T2 waited.
23. T1 was allowed to COMMIT and T2 completed.
24. It was verified that T2.L_EXTENDEDPRICE = T1.L_EXTENDEDPRICE +(DELTA1*(T1.L_EXTENDEDPRICE/T1.L_QUANTITY))

Write-Write Conflict with Rollback

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

25. An ACID Transaction, T1, was started for a randomly selected O_KEY, L_KEY, and DELTA. The ACID transaction T1 was suspended prior to ROLLBACK.
26. Another ACID Transaction, T2, was started using the same O_KEY and L_KEY and a randomly selected DELTA.
27. T2 waited.
28. T1 was allowed to ROLLBACK and T2 completed.
29. It was verified that T2.L_EXTENDEDPRICE = T1.L_EXTENDEDPRICE.

Concurrent Progress of Read and Write on Different Tables

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

30. An ACID Transaction, T1, was started for a randomly selected O_KEY, L_KEY, and DELTA. T1 was suspended prior to COMMIT.
31. Another ACID transaction, T2 was started using random values for PS_PARTKEY and PS_SUPPKEY, all columns of the PARTSUPP table for which PS_PARTKEY and PS_SUPPKEy are equal are returned.
32. ACID Transaction T2 completed.
33. T1 was allowed to COMMIT.
34. It was verified that the appropriate rows in the ORDER, LINEITEM, and HISTORY tables have been changed.

Read-Only Query Conflict with Update Transactions

Demonstrates 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.

35. A Transaction, T1, was started which executed Q21 against the qualification database, was started using a randomly selected DELTA.
36. An ACID Transaction, T2, was started for a randomly selected O_KEY, L_KEY and DELTA.
37. T2 completed and appropriate rows in the ORDERS, LINEITEM and HISTORY tables had been changed.
38. Transaction T1 completed executing Q21.

4.5 Durability

The tested system must guarantee durability: the ability to preserve the effects of committed transactions and insure database consistency after recovery from any one of the failures listed in Clause 3.5.3.

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.

39. The disks containing TPC-H tables and log files were on RAID1/0 protected disk groups. During the durability test, one disk was removed from each RAID group containing the data and the log. The test continued uninterrupted, because of the RAID protection.

System Crash

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

The system crash and memory failure tests were combined. Power to the server was turned off during the durability test. When power was restored, the system rebooted and the database was restarted. The durability success file and the HISTORY table were compared and the counts were verified.

Memory Failure

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

See the previous section.

5 Clause 4 Scaling and Database Population

5.1 Ending Cardinality of Tables

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

Table	Cardinality
ORDER	1,500,000,000
LINEITEM	5,999,989,709
CUSTOMER	150,000,000
PART	200,000,000
SUPPLIER	10,000,000
PARTSUPP	800,000,000
NATION	25
REGION	5

5.2 Distribution of Tables and Logs Across Media

Distribution of tables and logs across media:

Each EVA 4400 array (with 24 disks) was configured with two EVA disk groups with 12 disks each. Each EVA disk group was divided into 4 vdisks/LUNs with RAID1/0 redundancy.

DiskGroup1-LUN1 for Oracle/ASM use (eg. tables, indexes, logs)

DiskGroup1-LUN2 for flat-file data

DiskGroup1-LUN3 for swap

DiskGroup1-LUN4 for ACID/quall database tests and miscellaneous usage.

DiskGroup2-LUN1 for Oracle/ASM use (eg. tables, indexes, logs)

DiskGroup2-LUN2 for flat-file data

DiskGroup2-LUN3 for swap

DiskGroup2-LUN4 for ACID/quall database tests and miscellaneous usage.

OS root and the Oracle home directory were configured on two external disks.

64 LUNs, two from each EVA 4400 array, were allocated for Oracle ASM use and a single ASM disk group was built across all LUNs. All tables, indexes, temp space and other Oracle files were configured in this ASM disk group.

5.3 Database Partition/Replication Mapping

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

Horizontal partitioning was used for all base and index tables except NATION and REGION. The details of this partitioning can be understood by examining the syntax of the table and index definition statements in Appendix B. Similar partitioning was used in the qualification database size.

Section 5.2 describes the distribution of tables and logs across all media..

5.4 RAID Feature

Implementation 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.

RAID1/0 was used for all data.

5.5 DBGEN Modification

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 2.8.0 was not modified 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 1:07:12.

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:

Type	# Disks	Disk Size (GB)	Total (GB)
1 HP Surestore Disk System 2120	4	72	288
32 HP EVA 4400	768	146	112,128.0
TOTAL			**112,416.0**
Scale Factor			**1,000**
Storage Ratio			**112.42**

5.8 Database Load Mechanism Details and Illustration

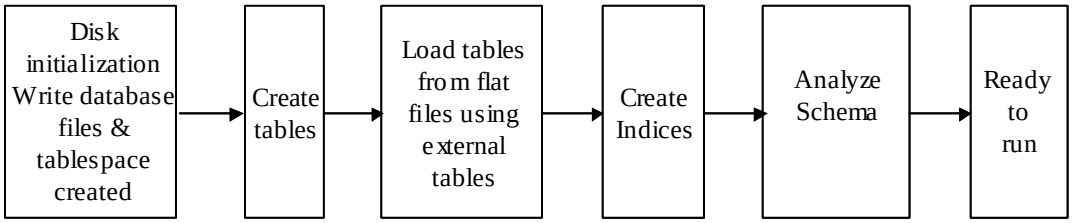
The details of the database load must be described, including a block diagram illustrating the overall process.

The database was loaded using data generation stored on the flat files all on the tested and priced configuration

5.9 Qualification Database Configuration

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

The qualification database used identical scripts to create and load the data with changes to adjust for the database scale factor.



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.

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

All scripts and queries used are included in Appendix E.

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 for both refresh functions must be reported for the power test.

The timing intervals for each query and both update functions are given in the Executive Summary earlier in this document.

6.4 Number of Streams for the Throughput Test

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

64 streams were used for the throughput test.

6.5 Start and End Date/Time of Each Query Stream

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

The throughput test start time and finish time for each stream are given in the Executive Summary earlier in this document.

6.6 Total Elapsed Time of the Measurement Interval

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

The total elapsed time of the throughput test is given in the Executive Summary earlier in this document.

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

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

Start and finish time for each update function in the update stream are given in the Executive Summary earlier in this document.

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

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

The timing intervals for each query and each update function are given in the Executive Summary earlier in this document.

6.9 Performance Metrics

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

The performance metrics, and the numbers, on which they are based, is given in the Executive Summary earlier in this document.

6.10 The Performance Metric and Numerical Quantities from Both Runs

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

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

	QppH@1000GB	QthH@1000GB	QphH@1000GB
Reported Run	118,577.0	128,259.1	123,323.1
Reproducibility Run	180,695.4	129,279.7	152,840.6
% Difference	52.4%	0.8%	23.9%

6.11 System Activity Between Performance Tests

Any activity on the SUT that takes place between the conclusion of the Reported Run and the beginning of Reproducibility Run must be disclosed.

The database was restarted between the two runs.

7 Clause 6 SUT and Driver Implementation Related Items

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.

All stream executions are performed by a single script. QGEN is used to produce query text.

For each power-test run:

- The SQL for RF1 is submitted to the database
- Then the queries as generated by QGEN are submitted in the order defined by Clause 5.3.5.4
- The SQL for RF2 is submitted to the database.

7.2 Implementation-Specific Layer (ISL)

If an implementation specific layer is used, then a detailed description of how it performs its functions must be provided. All related source code, scripts and configuration files must be disclosed. The information provided should be sufficient for an independent reconstruction of the implementation specific layer.

The source code for the "qexec" utility can be found in Appendix E.

7.3 Profile-Directed Optimization

If profile-directed optimization as described in Clause 5.2. is used, such use must be disclosed..

Profile-directed optimization subject to the requirements of 5.2.9 and 5.2.10 was not used.

8 Clause 7 Pricing

8.1 Hardware and Software Used in the Priced System

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.

A detailed list of hardware and software used in the priced system is included in the pricing sheet in the executive summary. All prices are currently effective.

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.

A detailed pricing sheet of all the hardware and software used in this configuration and the 3-year maintenance costs, demonstrating the computation of the total 3-year price of the configuration, is included in the executive summary at the beginning of this document.

8.3 Availability Date

The committed delivery date for general availability of products used in the priced 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.

Server Hardware	Available Now
Server Software	Available Now
Storage	Available Now
Oracle Database 11g Enterprise Edition with Partitioning and Oracle Automatic Storage Management	Available Now*

*For orderablity and pricing, contact: MaryBeth Pierantoni, mary.beth.pierantoni@oracle.com, 916-315-5081

9 Clause 8 Auditor's Information and Attestation Letter

9.1 Auditor's Report

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.

This implementation of the TPC Benchmark H was audited by Francois Raab for InfoSizing Further information regarding the audit process may be obtained from:

Francois Raab

InfoSizing

1373 N. Franklin Steet

Colorado Springs, CO 80903

(719) 473-7555

(719) 473-7554

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

Appendix A Parameter Settings

A.1 1TB_init.ora

```
java_pool_size=1024
result_cache_mode=force
statistics_level=basic
db_cache_advice=OFF
instance_type                 = rdbms
aq_tm_processes               = 0
audit_trail                   = FALSE
compatible                    = 11.0.0.0.0    #for 070801
control_files                 = (+DG1/control1,+DG1/control2)
cpu_count                     = 64
db_block_checksum             = false
db_block_size                 = 32768
db_cache_size                 = 24g
db_file_multiblock_read_count = 64
db_files                      = 2400
db_name                       = 1tb
db_writer_processes           = 16
dml_locks                     = 40000
global_names                  = FALSE
hpux_sched_noage              = 180
instance_name                 = tpch
job_queue_processes           = 0
log_buffer                    = 268435456
log_checkpoints_to_alert      = true
log_checkpoint_interval       = 18000
max_dump_file_size            = unlimited
nls_date_format               = YYYY-MM-DD
open_cursors                  = 1024
optimizer_features_enable     = 11.1.0.6.1
optimizer_index_cost_adj      = 200
optimizer_mode                = CHOOSE
parallel_adaptive_multi_user  = TRUE
parallel_execution_message_size = 65535
parallel_max_servers          = 2560
parallel_min_servers          = 2560
parallel_threads_per_cpu      = 2
pga_aggregate_target          = 60g
processes                     = 5000
recovery_parallelism          = 32
replication_dependency_tracking = false
session_cached_cursors        = 0
shared_pool_size              = 100g
undo_management               = auto
undo_retention                = 200000
```

A.2 system

```
*
* Created on Tue Apr 21 15:25:07 2009
*
version 1
configuration current "" [49ee47c3]
*
* Module entries
*
module mpt best 1.0.[466E36F6]
module dmphpalua best 0.1.[458A95BE]
module dmphdsalua best 0.1.[458A95BE]
module dmpjbod best 0.1.[458A95BE]
module dmpapf best 0.1.[458A95BD]
module dmpapg best 0.1.[458A95BD]
module dmpap best 0.1.[458A95BD]
module dmpaaa best 0.1.[458A95BD]
module dmpaa best 0.1.[458A95BC]
module vols best 1.0.[458A8F52]
module vol best 1.0.[458A8F5C]
module vxdmp best 1.0.[458A8F54]
module sasd best 1.0.[46816471]
module ciss best 1.0.[46816461]
module prm best 1.0.[45D4D130]
module oncksupp best 1.0.[45A7E361]
module lvm best 1.0.[46816424]
module vxportal static 41.0.[45A7EE8C]
module vxfs static 41.0.[45A7EE8C]
module igelan best 1.0.[468C8D38]
module iether best 1.0.[468163C4]
module gelan best 1.0.[466E3625]
module td best 1.0.[468163AB]
module fcpdev best 1.0.[45D4D120]
module fcparray best 1.0.[45D4D120]
module fcp best 1.0.[45D4D120]
module fcd best 1.0.[466E3613]
module colad_enable best 1.0.[466E3604]
module cifs auto 1.0.[473CD153]
module cfsm auto 1.0.[46546C06]
module cfsmdr auto 1.0.[46546C06]
module cachefs best 1.0.[45A7E3E6]
module autofs best 1.0.[45A7E3E6]
module rpcmod best 1.0.[45A7E3E8]
module krb5 best 1.0.[45A7E3E7]
module kgssapi best 1.0.[45A7E3E6]
module klmmod best 1.0.[45A7E3E7]
module rpcsec_gss best 1.0.[45A7E3E9]
module rpcsec best 1.0.[45A7E3E8]
module rpc best 1.0.[45A7E3E8]
module nfs_client best 1.0.[45A7E3E7]
module nfs_client_pv2 best 1.0.[45A7E3E8]
module nfs_client_pv3 best 1.0.[45A7E3E8]
module nfs_client_pv4 best 1.0.[45A7E3E8]
module nfssrv best 1.0.[45A7E3E8]
module nfswrp best 1.0.[45A7E3E8]
module pckt best 1.0.[45A7E362]
module ptm best 1.0.[45A7E367]
module pts best 1.0.[45A7E367]
module ptem best 1.0.[45A7E367]
module ldterm best 1.0.[45A7E35E]
module rng loaded 0.1.[45D4D131]
module cdfs auto 0.1.[45D4D11C]
module dev_config best 1.0.[45D4D11D]
module dmem best 1.0.[45D4D11E]
module diag2 best 1.0.[462EDBDD]
module asyncdsk best 1.0.[4632BD25]
module tgt best 1.0.[45D4D135]
```

```
module stape        best    1.0.[45D4D134]
module sdisk        best    1.0.[45D4D132]
module sctl         best    1.0.[45D4D132]
module schgr        best    1.0.[45D4D132]
module esvroot      best    1.0.[45D4D120]
module estp         best    1.0.[45D4D120]
module estape       best    1.0.[45D4D120]
module eslpt        best    1.0.[45D4D120]
module esdisk       best    1.0.[46689A72]
module esctl        best    1.0.[467AF9C0]
module eschgr       best    1.0.[45D4D11F]
module side_multi           best    1.0.[45D4D133]
module side         best    1.0.[45DB90F6]
module c8xx         best    1.0.[466470EB]
module procsm       best    1.0.[45D4D130]
module rmp3f01      best    1.0.[45D4D131]
module pdh          best    1.0.[45D4D12C]
module ia64_psm     best    1.0.[45D4D123]
module wxb_hp       best    1.0.[45D4D13C]
module sac          best    1.0.[45D4D131]
module acpi_node            best    1.0.[45D4D11A]
module ipmi         best    1.0.[45D4D125]
module ptys         best    1.0.[45D4D130]
module ptym         best    1.0.[45D4D130]
module ffs          best    1.0.[45D4D120]
module pipemod      best    1.0.[45D4D12C]
module pipedev      best    1.0.[45D4D12C]
module tirdwr       best    1.0.[45D4D135]
module timod        best    1.0.[45D4D135]
module sc           best    1.0.[45D4D131]
module echo         best    1.0.[45D4D11F]
module sad          best    1.0.[45D4D131]
module strlog       best    1.0.[45D4D134]
module clone        best    1.0.[45D4D11D]
module hpstreams            best    1.0.[45D4D123]
module nms          best    1.0.[45D4D12A]
module intl100      best    1.0.[45D4D124]
module btlan        best    1.0.[466711D9]
module token_arp            best    1.0.[45D4D136]
module dlpi         best    1.0.[45D4D11E]
module netdiag1     best    1.0.[45D4D12A]
module tels         best    1.0.[45D4D135]
module telm         best    1.0.[45D4D135]
module tun          best    1.0.[45D4D136]
module uipc         best    1.0.[45D4D137]
module inet         best    1.0.[45D4D124]
module sba          best    1.0.[465A9F32]
module root         best    1.0.[45D4D131]
module pci_slot     best    1.0.[45D4D12B]
module lba          best    1.0.[4654E067]
module cell         best    1.0.[45D4D11D]
module asio0        best    1.0.[466710A8]
module iospy        loaded  0.1.[47E03C0C]
*
* Dump entries
*
dump lvol
*
* Tunables entries
*
tunable o_sync_is_o_dsync           1
tunable nkthread  11488
tunable filecache_max       3%
tunable process_id_min      0
tunable cmc_plat_poll       15
tunable create_fastlinks    1
tunable hfs_max_revra_blocks        20
tunable hfs_revra_per_disk          256
tunable maxdsiz_64bit       0x100000000
tunable maxfiles_lim        4096
tunable maxssiz_64bit       268435456
tunable maxtsiz_64bit       4294967296
tunable msgmnb  65536
tunable msgtql  5120
tunable ninode  120000
tunable npty        200
tunable nswapdev100
tunable semmns  8192
tunable semume  512
tunable shmmax  0x40000000000
tunable shmmni  2048
tunable timezone 480
tunable max_thread_proc  2048
tunable vxfs_ifree_timelag3600000
tunable vps_ceiling         64
tunable swchunk 65536
tunable shmseg  512
tunable semvmx  32768
tunable semmnu  4092
tunable semmni  4096
tunable nstrpty     200
tunable nproc       7168
tunable nfile       2000000
tunable msgmni  512
tunable maxuprc  3277
tunable maxtsiz  1073741824
tunable maxssiz  0x10000000
tunable maxfiles  4096
tunable maxdsiz  0x40000000
tunable max_async_ports  4096
tunable hfs_ra_per_disk  256
tunable hfs_max_ra_blocks           20
tunable STRMSGSZ        65535
tunable pagezero_daemon_enabled 0
tunable filecache_min       1%
tunable as_isolation_level  1
env
########## MACHINE PARAMETERS
#####################
########## PATHS
#################################
export KIT_DIR=/dbms/oracle10i/kit
export SCHEMA_DIR=$KIT_DIR/schema
export PERL=/opt/perl/bin/perl
export UTILS=$KIT_DIR/utils
export TEST_DB=/tmp
export QUAL_DB=$TEST_DB
export DBGEN=$KIT_DIR/dbgen
```

```
export ACID_DIR=$KIT_DIR/acid
export QEXEC=$KIT_DIR/utils
export QUERIES=$KIT_DIR/queries
export ANSWERS=$KIT_DIR/answers
export
ANS2VAL=/dbms/oracle10i/kit/acid/answers2validate
export ACID_OUT=$KIT_DIR/out
export DSS_CONFIG=$DBGEN
export DSS_QUERY=$KIT_DIR/queries
export DSS_PATH=$ADE_VIEW_ROOT
export MAINT=$KIT_DIR/maintenance
export CC=/opt/ansic/bin/cc
export FRAME=$KIT_DIR/frame
export FRAME_DIR=/dbms/oracle10i/frame
export SCALE_FACTOR=1000
export UPDATE_1_DOP=64
export UPDATE_2_DOP=128
############ FRAME STUFF
export FRAME_PATH=$KIT_DIR/frame

export ORACORE3INCL=$ORACLE_HOME/rdbms/demo
export
ORACORE3PUBL=$ORACLE_HOME/rdbms/public
export RDBMSPUBL=$ORACLE_HOME/rdbms/public
export
NETWORKPUBL=$ORACLE_HOME/network/public
export RDBMSDEMO=$ORACLE_HOME/rdbms/demo
export PLSQLDEMO=$ORACLE_HOME/plsql/demo
export PLSQLPUBL=$ORACLE_HOME/plsql/public
export O=$ORACLE_HOME
export
PATH=./:${BUMPX_DIR}:${UTILS}:${DBGEN}:${MAI
NT}:${ACID_DIR}:${FRAME}/bin:${FRAME}/bin:${RE
GR_TEST}:${PATH}
#
########### ENVIRONMENT VARIABLES
##################
export WORKLOAD=TPCH
export HOST=
export GETOPT=-DSTDLIB_HAS_GETOPT
export PLATFORM=
export REF_DATA_SET_DIR=/flat2/reference
export REF_DATA_SET_DIR=/flat1/sf1000_reference

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

########### RULES - do not change these
#############
case "$SCALE_FACTOR" in
  1) export NUM_STREAMS=2;;
  10) export NUM_STREAMS=3;;
  100) export NUM_STREAMS=5;;
  300) export NUM_STREAMS=6;;
  1000) export NUM_STREAMS=64;;
  3000) export NUM_STREAMS=8;;
  10000) export NUM_STREAMS=24;;
  30000) export NUM_STREAMS=10;;
esac
DATABASE_USER=tpch/tpch
```

A.3 profile

```
stty erase "^H" kill "^x" intr "^C" eof "^D" susp "^z"
export EDITOR=/usr/bin/vi

export ORACLE_HOME_11g=/oracle
export ORACLE_HOME=$ORACLE_HOME_11g
#export ORACLE_SID=tpch
export ORACLE_SID=qual
export THIS_SETUP_MESSAGE="THIS SETUP IS NOW
11G"
export THIS_SETUP=11G

#export ORACLE_HOME_10g=/ora_bits/10gR2/10.2.0
#export ORACLE_HOME=$ORACLE_HOME_10g
#export ORACLE_SID=tpch_10g
#export THIS_SETUP_MESSAGE="THIS SETUP IS
NOW 10GR2"
#export THIS_SETUP=10G


#export ORACLE_SID=ASM
#echo 'ORACLE_SID is ASM'

echo $ORACLE_SID
echo  $THIS_SETUP_MESSAGE

#export ORACLE_SID=qual
#echo 'ORACLE_SID is qual'


export KIT_DIR=/dbms/oracle10i/kit

export
SHLIB_PATH=$ORACLE_HOME/lib:$ORACLE_HOME
/lib32:$ORACLE_HOME/rdbms/lib:$ORACLE_HOME/ne
twork/lib
export
LD_LIBRARY_PATH=$ORACLE_HOME/lib:$ORACLE
_HOME/lib64:$ORACLE_HOME/rdbms/lib:$ORACLE_H
OME/network/lib64
export SAVEHIST=2049
export FRAME_PATH=/dbms/oracle10i/frame
export O=$ORACLE_HOME
export ORACLE_PATH=/dbms/oracle10i/frame/tools
export PS1="`whoami`-(`hostname`)> "
export skgxp_trace_path=/tmp/srq.tpch1
export ASYNC_BUF_CONF=256
#export ASYNC_BUF_CONF=6000
#MAX_CONCURRENT in async.h is 5000
echo "export
ASYNC_BUF_CONF=$ASYNC_BUF_CONF"

export
PATH=./:$ORACLE_HOME/bin:/usr/local/bin:$ORACLE
_HOME:$ORACLE_HOME/lib:/opt/perf_tools/bin:/tools:/t
```

```
pch/run_power:/tpch:/dbms/oracle10i/frame/bin:/dbms/oracl
e10i/frame:/dbms/oracle10i/tools/bin:/tools/Tusc:/dbms/tpcd
_v8/bumpx/bumpx:/dbms/tpcd_v8/bumpx/dbgen:/dbms/tpc
d_v8/out/scripts:/opt/ansic/bin:/opt/langtools/bin:/sbin:/usr/s
bin:.:/bin:/usr/bin:/usr/local/bin:/usr/contrib/bin:/etc:/usr/incl
ude:/dbms/oracle10i/kit:/dbms/oracle10i/kit/dbgen:/dbms/or
acle10i/kit/bumpx:/dbms/oracle10i/local/TestIO:/usr/ccs/bin
/:/opt/caliper/bin:/opt/rdma/bin:~/bin

alias ltt="ls -ltr |tail -30"
alias cd_frame="cd /dbms/oracle10i/frame"
alias cd_stats="cd /dbms/oracle10i/frame/stats"
alias cd_q="cd /dbms/oracle10i/frame/queries/queries_tpch"
alias cd_log="cd /oracle/rdbms/log"
alias cd_u="cd
/dbms/oracle10i/frame/queries/queries_tpch/updates"
alias ltm="ls -lt |more"
alias cdbin="cd /dbms/tpcd_v8/bin"
alias cdload="cd /dbms/oracle10i/kit/audit/1tb.ASM"
alias cdtools="cd /dbms/oracle10i/tools/bin"
alias cdq="cd /tpch/tpch/run_power"
alias pso="ps -ef | grep ora | grep -v sleep"
alias pso_hc="ps -fu oracle | sort -n -k2"
alias setterm="TERM=dtterm;export TERM"
alias taillog="tail -f
/oracle/log/diag/rdbms/1tb/$ORACLE_SID/trace/alert_$OR
ACLE_SID.log"
alias taillog_1g="tail -f
/oracle/log/diag/rdbms/1gb/$ORACLE_SID/trace/alert_$O
RACLE_SID.log"
alias ftp_oracle="/usr/bin/ftp 141.146.44.21"
alias ftp_eiger="/usr/bin/ftp 156.152.3.235"
alias cdlog="cd
/oracle/log/diag/rdbms/1tb/$ORACLE_SID/trace"
alias maxpga="ora smm | grep \"maximum PGA
allocated\""
alias dotail="tail -n 1 "
export
LFRAME_PATH=/dbms/oracle10i/lframe/lframe_final
export PATH=$LFRAME_PATH/bin:$PATH

umask 002
iosum(){
if [ "$1" -eq "" ] ; then
   echo usage:  iosum iterations
else
 sar -d 2 $1 | ${FRAME_PATH}/bin/io.pl
fi
}
```

A.4 initasm.ora

```
instance_type=asm
shared_pool_size=4G
MEMORY_TARGET=6G
#MEMORY_TARGET=5G
asm_diskgroups=DG1
ASM.instance_number=1
instance_number=1
processes=500
ASM_DISKSTRING='/dbms/links/roradsk*'
core_dump_dest='/opt/app/admin/ASM/log'
```

Appendix B Build Programs and Scripts

B.1 dbcre.sh

```
#!/bin/ksh

echo START CREATE DB at `date`
export ORACLE_SID=tpch

sqlplus  /NOLOG <<!
connect / as sysdba
set timing on
set echo on

shutdown abort;


startup pfile=/oracle/dbs/1TB_init.ora nomount;
create database
  controlfile reuse
  logfile '+DG1' size 120000m reuse,
          '+DG1' size 120000m reuse
  datafile '+DG1' size 5000m reuse
  sysaux datafile '+DG1' size 5000m reuse
  undo tablespace ts_undo1
       datafile  '+DG1' size 32000m reuse
  maxdatafiles 3000
  maxinstances 2
;

set termout off
set echo off
spool /tmp/cat
@?/rdbms/admin/catalog.sql;
@?/rdbms/admin/catparr.sql;
@?/rdbms/admin/catproc.sql;
connect system/manager
@?/sqlplus/admin/pupbld.sql;
@?/rdbms/admin/utlxplan.sql;
spool off
!
echo END CREATE DB at `date`
```

B.2 sctso.sh

```
#!/bin/ksh


echo CREATE TABLESPACES at `date`
export ORACLE_SID=tpch


(( i = 1 ))
while (( i <= 6 ))
do
sqlplus  / as sysdba <<! &
set timing on
set echo on

alter tablespace ts_undo1
add datafile '+DG1' size 128000m reuse;
;
!
(( i = $i + 1 ))
done

sqlplus  / as sysdba <<! &
set timing on
set echo on

--drop tablespace ts_default including contents;
create tablespace ts_default
datafile '+DG1' size 15000m reuse
extent management local autoallocate nologging;
!

sqlplus  / as sysdba <<! &
set timing on
set echo on

--drop tablespace ts_temp including contents;
create temporary tablespace ts_temp
tempfile '+DG1' size 128000m reuse
extent management local
uniform size 5M
;
!

wait

(( i = 1 ))

while (( i <= 35 ))
do

sqlplus  / as sysdba <<! &

set timing on
set echo on
alter tablespace ts_temp
  add tempfile '+DG1' size 128000m reuse;
!
(( i = $i + 1 ))
done

wait


(( i = 1 ))
while (( i <= 84 ))
do
sqlplus  / as sysdba <<! &
set timing on
set echo on
--drop tablespace ts_l${i} including contents;
create tablespace ts_l${i}
```

```
datafile '+DG1' size 25600m reuse
extent management dictionary
default storage (initial 100m next 100m maxextents
unlimited pctincrease 0)
nologging
;
!
(( i = $i + 1 ))
done

wait

(( i = 1 ))
while (( i <= 84 ))
do
sqlplus  / as sysdba <<! &
set timing on
set echo on
--drop tablespace ts_o${i} including contents;
create tablespace ts_o${i}
datafile '+DG1' size 6100m reuse
extent management dictionary
default storage (initial 20m next 20m maxextents unlimited
pctincrease 0)
nologging
;
!
(( i= $i + 1 ))
done

wait

sqlplus  / as sysdba <<! &
set timing on
set echo on
--drop tablespace ts_c including contents;
create bigfile tablespace ts_c
datafile '+DG1' size 38000m  reuse
extent management local autoallocate nologging;
!

sqlplus  / as sysdba <<! &
set timing on
set echo on

--drop tablespace ts_p including contents;
create bigfile tablespace ts_p
datafile '+DG1' size 38000m reuse
extent management local autoallocate nologging;
!

sqlplus  / as sysdba <<! &
set timing on
set echo on

--drop tablespace ts_okey including contents;
create bigfile tablespace ts_okey
datafile '+DG1' size 80000m reuse
extent management local autoallocate nologging;
!

sqlplus  / as sysdba <<! &
set timing on
set echo on
--drop tablespace ts_s including contents;
create tablespace ts_s
datafile '+DG1' size 2800M reuse
extent management local autoallocate nologging;
!


sqlplus  / as sysdba <<! &
set timing on
set echo on

--drop tablespace ts_custkey including contents;
create tablespace ts_custkey
datafile '+DG1' size 5000m reuse
extent management local
uniform size 5M
nologging;
!

sqlplus  / as sysdba <<! &
set timing on
set echo on

--drop tablespace ts_lokey including contents;
create tablespace ts_lokey
datafile '+DG1' size 128000m reuse
extent management local
uniform size 5M
nologging;
!

sqlplus  / as sysdba <<! &
set timing on
set echo on

--drop tablespace ts_psupp including contents;
create tablespace ts_psupp
datafile '+DG1' size 128000m reuse
extent management dictionary
default storage (initial 500m next 500m maxextents
unlimited pctincrease 0)
nologging
;
!
wait

(( i = 1 ))

while (( i <= 3))
do
sqlplus  / as sysdba <<! &
set timing on
set echo on
```

```
alter tablespace ts_psupp
add datafile '+DG1' size 128000m reuse;
!

(( i = $i + 1 ))
done


wait

(( i = 1 ))

while (( i <= 4 ))
do
sqlplus  / as sysdba <<! &
set timing on
set echo on

alter tablespace ts_lokey
add datafile '+DG1' size 128000m reuse;
!

(( i = $i + 1 ))
done


wait


echo END CREATE TABLESPACES at `date`
```

B.3 dapop.sh

```
#!/bin/ksh

echo START TABLE CREATION at `date`
export ORACLE_SID=tpch;

#/dbms/oracle10i/frame/bin/tshut
#/dbms/oracle10i/frame/bin/tshut.asm
#/dbms/oracle10i/frame/bin/tstart.asm
#/dbms/oracle10i/frame/bin/tstart

sqlplus /NOLOG <<!
connect / as sysdba
set timing on
set echo on
set termout on

drop user tpch cascade;
grant DBA
to tpch identified by tpch;

alter user tpch default tablespace ts_default;
alter user tpch temporary tablespace ts_temp;

connect tpch/tpch;
drop directory data_dir1;
drop directory data_dir2;
drop directory data_dir3;
drop directory data_dir4;

create directory data_dir1 as '/flat1/1TB/';
create directory data_dir2 as '/flat2/1TB/';
create directory data_dir3 as '/flat3/1TB/';
create directory data_dir4 as '/flat4/1TB/';

drop table l_et;
create table l_et(
   l_orderkey          number ,
   l_partkey           number ,
   l_suppkey           number ,
   l_linenumber        number ,
   l_quantity          number ,
   l_extendedprice     number ,
   l_discount          number ,
   l_tax               number ,
   l_returnflag        char(1) ,
   l_linestatus        char(1) ,
   l_shipdate          date ,
   l_commitdate        date ,
   l_receiptdate       date ,
   l_shipinstruct      char(25) ,
   l_shipmode          char(10) ,
   l_comment           varchar(44)
)
organization external (
type ORACLE_LOADER
default directory data_dir1
access parameters
(
                records delimited by newline
          date_cache 3000
          badfile data_dir1:'l_et.bad'
          logfile data_dir1:'l_et.log'
                fields terminated by '|'
                missing field values are null
          )
          location (
             data_dir1:'lineitem.tbl.1',
             data_dir1:'lineitem.tbl.2',
             data_dir1:'lineitem.tbl.3',
             data_dir1:'lineitem.tbl.4',
             data_dir1:'lineitem.tbl.5',
             data_dir1:'lineitem.tbl.6',
             data_dir1:'lineitem.tbl.7',
             data_dir1:'lineitem.tbl.8',
             data_dir1:'lineitem.tbl.9',
             data_dir1:'lineitem.tbl.10',
             data_dir1:'lineitem.tbl.11',
             data_dir1:'lineitem.tbl.12',
             data_dir1:'lineitem.tbl.13',
             data_dir1:'lineitem.tbl.14',
             data_dir1:'lineitem.tbl.15',
             data_dir1:'lineitem.tbl.16',
             data_dir1:'lineitem.tbl.17',
```

```
        data_dir1:'lineitem.tbl.18',
        data_dir1:'lineitem.tbl.19',
        data_dir1:'lineitem.tbl.20',
        data_dir1:'lineitem.tbl.21',
        data_dir2:'lineitem.tbl.22',
        data_dir2:'lineitem.tbl.23',
        data_dir2:'lineitem.tbl.24',
        data_dir2:'lineitem.tbl.25',
        data_dir2:'lineitem.tbl.26',
        data_dir2:'lineitem.tbl.27',
        data_dir2:'lineitem.tbl.28',
        data_dir2:'lineitem.tbl.29',
        data_dir2:'lineitem.tbl.30',
        data_dir2:'lineitem.tbl.31',
        data_dir2:'lineitem.tbl.32',
        data_dir2:'lineitem.tbl.33',
        data_dir2:'lineitem.tbl.34',
        data_dir2:'lineitem.tbl.35',
        data_dir2:'lineitem.tbl.36',
        data_dir2:'lineitem.tbl.37',
        data_dir2:'lineitem.tbl.38',
        data_dir2:'lineitem.tbl.39',
        data_dir2:'lineitem.tbl.40',
        data_dir2:'lineitem.tbl.41',
        data_dir2:'lineitem.tbl.42',
        data_dir3:'lineitem.tbl.43',
        data_dir3:'lineitem.tbl.44',
        data_dir3:'lineitem.tbl.45',
        data_dir3:'lineitem.tbl.46',
        data_dir3:'lineitem.tbl.47',
        data_dir3:'lineitem.tbl.48',
        data_dir3:'lineitem.tbl.49',
        data_dir3:'lineitem.tbl.50',
        data_dir3:'lineitem.tbl.51',
        data_dir3:'lineitem.tbl.52',
        data_dir3:'lineitem.tbl.53',
        data_dir3:'lineitem.tbl.54',
        data_dir3:'lineitem.tbl.55',
        data_dir3:'lineitem.tbl.56',
        data_dir3:'lineitem.tbl.57',
        data_dir3:'lineitem.tbl.58',
        data_dir3:'lineitem.tbl.59',
        data_dir3:'lineitem.tbl.60',
        data_dir3:'lineitem.tbl.61',
        data_dir3:'lineitem.tbl.62',
        data_dir3:'lineitem.tbl.63',
        data_dir4:'lineitem.tbl.64',
        data_dir4:'lineitem.tbl.65',
        data_dir4:'lineitem.tbl.66',
        data_dir4:'lineitem.tbl.67',
        data_dir4:'lineitem.tbl.68',
        data_dir4:'lineitem.tbl.69',
        data_dir4:'lineitem.tbl.70',
        data_dir4:'lineitem.tbl.71',
        data_dir4:'lineitem.tbl.72',
        data_dir4:'lineitem.tbl.73',
        data_dir4:'lineitem.tbl.74',
        data_dir4:'lineitem.tbl.75',
        data_dir4:'lineitem.tbl.76',
        data_dir4:'lineitem.tbl.77',
        data_dir4:'lineitem.tbl.78',
        data_dir4:'lineitem.tbl.79',
        data_dir4:'lineitem.tbl.80',
        data_dir4:'lineitem.tbl.81',
        data_dir4:'lineitem.tbl.82',
        data_dir4:'lineitem.tbl.83',
        data_dir4:'lineitem.tbl.84'
    ))
    reject limit unlimited parallel;


    drop table o_et;
    create table o_et(
       o_orderkey          number ,
       o_custkey           number ,
       o_orderstatus       char(1) ,
       o_totalprice        number ,
       o_orderdate         date ,
       o_orderpriority     char(15) ,
       o_clerk             char(15) ,
       o_shippriority      number ,
       o_comment           varchar(79)
    )
    organization external (
    type ORACLE_LOADER
    default directory data_dir1
    access parameters
    (
                records delimited by newline
          date_cache 3000
          badfile data_dir2:'o_et.bad'
          logfile data_dir2:'o_et.log'
                fields terminated by '|'
                missing field values are null
          )
          location (
        data_dir1:'orders.tbl.1',
        data_dir1:'orders.tbl.2',
        data_dir1:'orders.tbl.3',
        data_dir1:'orders.tbl.4',
        data_dir1:'orders.tbl.5',
        data_dir1:'orders.tbl.6',
        data_dir1:'orders.tbl.7',
        data_dir1:'orders.tbl.8',
        data_dir1:'orders.tbl.9',
        data_dir1:'orders.tbl.10',
        data_dir1:'orders.tbl.11',
        data_dir1:'orders.tbl.12',
        data_dir1:'orders.tbl.13',
        data_dir1:'orders.tbl.14',
        data_dir1:'orders.tbl.15',
        data_dir1:'orders.tbl.16',
        data_dir1:'orders.tbl.17',
        data_dir1:'orders.tbl.18',
        data_dir1:'orders.tbl.19',
        data_dir1:'orders.tbl.20',
        data_dir1:'orders.tbl.21',
        data_dir2:'orders.tbl.22',
```

```
    data_dir2:'orders.tbl.23',
    data_dir2:'orders.tbl.24',
    data_dir2:'orders.tbl.25',
    data_dir2:'orders.tbl.26',
    data_dir2:'orders.tbl.27',
    data_dir2:'orders.tbl.28',
    data_dir2:'orders.tbl.29',
    data_dir2:'orders.tbl.30',
    data_dir2:'orders.tbl.31',
    data_dir2:'orders.tbl.32',
    data_dir2:'orders.tbl.33',
    data_dir2:'orders.tbl.34',
    data_dir2:'orders.tbl.35',
    data_dir2:'orders.tbl.36',
    data_dir2:'orders.tbl.37',
    data_dir2:'orders.tbl.38',
    data_dir2:'orders.tbl.39',
    data_dir2:'orders.tbl.40',
    data_dir2:'orders.tbl.41',
    data_dir2:'orders.tbl.42',
    data_dir3:'orders.tbl.43',
    data_dir3:'orders.tbl.44',
    data_dir3:'orders.tbl.45',
    data_dir3:'orders.tbl.46',
    data_dir3:'orders.tbl.47',
    data_dir3:'orders.tbl.48',
    data_dir3:'orders.tbl.49',
    data_dir3:'orders.tbl.50',
    data_dir3:'orders.tbl.51',
    data_dir3:'orders.tbl.52',
    data_dir3:'orders.tbl.53',
    data_dir3:'orders.tbl.54',
    data_dir3:'orders.tbl.55',
    data_dir3:'orders.tbl.56',
    data_dir3:'orders.tbl.57',
    data_dir3:'orders.tbl.58',
    data_dir3:'orders.tbl.59',
    data_dir3:'orders.tbl.60',
    data_dir3:'orders.tbl.61',
    data_dir3:'orders.tbl.62',
    data_dir3:'orders.tbl.63',
    data_dir4:'orders.tbl.64',
    data_dir4:'orders.tbl.65',
    data_dir4:'orders.tbl.66',
    data_dir4:'orders.tbl.67',
    data_dir4:'orders.tbl.68',
    data_dir4:'orders.tbl.69',
    data_dir4:'orders.tbl.70',
    data_dir4:'orders.tbl.71',
    data_dir4:'orders.tbl.72',
    data_dir4:'orders.tbl.73',
    data_dir4:'orders.tbl.74',
    data_dir4:'orders.tbl.75',
    data_dir4:'orders.tbl.76',
    data_dir4:'orders.tbl.77',
    data_dir4:'orders.tbl.78',
    data_dir4:'orders.tbl.79',
    data_dir4:'orders.tbl.80',
    data_dir4:'orders.tbl.81',
    data_dir4:'orders.tbl.82',
    data_dir4:'orders.tbl.83',
    data_dir4:'orders.tbl.84'
))
reject limit unlimited parallel;


drop table ps_et;
create table ps_et(
   ps_partkey          number ,
   ps_suppkey          number ,
   ps_availqty         number ,
   ps_supplycost       number ,
   ps_comment          varchar(199)
)
organization external (
type ORACLE_LOADER
default directory data_dir1
access parameters
(
                records delimited by newline
          badfile data_dir3:'ps_et.bad'
          logfile data_dir3:'ps_et.log'
                fields terminated by '|'
                missing field values are null
          )
          location (
    data_dir1:'partsupp.tbl.1',
    data_dir1:'partsupp.tbl.2',
    data_dir1:'partsupp.tbl.3',
    data_dir1:'partsupp.tbl.4',
    data_dir1:'partsupp.tbl.5',
    data_dir1:'partsupp.tbl.6',
    data_dir1:'partsupp.tbl.7',
    data_dir1:'partsupp.tbl.8',
    data_dir1:'partsupp.tbl.9',
    data_dir1:'partsupp.tbl.10',
    data_dir1:'partsupp.tbl.11',
    data_dir1:'partsupp.tbl.12',
    data_dir1:'partsupp.tbl.13',
    data_dir1:'partsupp.tbl.14',
    data_dir1:'partsupp.tbl.15',
    data_dir1:'partsupp.tbl.16',
    data_dir2:'partsupp.tbl.17',
    data_dir2:'partsupp.tbl.18',
    data_dir2:'partsupp.tbl.19',
    data_dir2:'partsupp.tbl.20',
    data_dir2:'partsupp.tbl.21',
    data_dir2:'partsupp.tbl.22',
    data_dir2:'partsupp.tbl.23',
    data_dir2:'partsupp.tbl.24',
    data_dir2:'partsupp.tbl.25',
    data_dir2:'partsupp.tbl.26',
    data_dir2:'partsupp.tbl.27',
    data_dir2:'partsupp.tbl.28',
    data_dir2:'partsupp.tbl.29',
    data_dir2:'partsupp.tbl.30',
    data_dir2:'partsupp.tbl.31',
    data_dir2:'partsupp.tbl.32',
```

```
      data_dir3:'partsupp.tbl.33',
      data_dir3:'partsupp.tbl.34',
      data_dir3:'partsupp.tbl.35',
      data_dir3:'partsupp.tbl.36',
      data_dir3:'partsupp.tbl.37',
      data_dir3:'partsupp.tbl.38',
      data_dir3:'partsupp.tbl.39',
      data_dir3:'partsupp.tbl.40',
      data_dir3:'partsupp.tbl.41',
      data_dir3:'partsupp.tbl.42',
      data_dir3:'partsupp.tbl.43',
      data_dir3:'partsupp.tbl.44',
      data_dir3:'partsupp.tbl.45',
      data_dir3:'partsupp.tbl.46',
      data_dir3:'partsupp.tbl.47',
      data_dir3:'partsupp.tbl.48',
      data_dir4:'partsupp.tbl.49',
      data_dir4:'partsupp.tbl.50',
      data_dir4:'partsupp.tbl.51',
      data_dir4:'partsupp.tbl.52',
      data_dir4:'partsupp.tbl.53',
      data_dir4:'partsupp.tbl.54',
      data_dir4:'partsupp.tbl.55',
      data_dir4:'partsupp.tbl.56',
      data_dir4:'partsupp.tbl.57',
      data_dir4:'partsupp.tbl.58',
      data_dir4:'partsupp.tbl.59',
      data_dir4:'partsupp.tbl.60',
      data_dir4:'partsupp.tbl.61',
      data_dir4:'partsupp.tbl.62',
      data_dir4:'partsupp.tbl.63',
      data_dir4:'partsupp.tbl.64'
))
reject limit unlimited parallel;


drop table p_et;
create table p_et(
   p_partkey          number ,
   p_name             varchar(55) ,
   p_mfgr             char(25) ,
   p_brand            char(10) ,
   p_type             varchar(25) ,
   p_size             number ,
   p_container        char(10) ,
   p_retailprice      number ,
   p_comment          varchar(23)
)
organization external (
type ORACLE_LOADER
default directory data_dir1
access parameters
(
                records delimited by newline
          badfile data_dir4:'p_et.bad'
          logfile data_dir4:'p_et.log'
                fields terminated by '|'
                missing field values are null
          )
          location (
      data_dir1:'part.tbl.1',
      data_dir1:'part.tbl.2',
      data_dir1:'part.tbl.3',
      data_dir1:'part.tbl.4',
      data_dir2:'part.tbl.5',
      data_dir2:'part.tbl.6',
      data_dir2:'part.tbl.7',
      data_dir2:'part.tbl.8',
      data_dir3:'part.tbl.9',
      data_dir3:'part.tbl.10',
      data_dir3:'part.tbl.11',
      data_dir3:'part.tbl.12',
      data_dir4:'part.tbl.13',
      data_dir4:'part.tbl.14',
      data_dir4:'part.tbl.15',
      data_dir4:'part.tbl.16'
))
reject limit unlimited parallel;

drop table c_et;
create table c_et(
   c_custkey          number ,
   c_name             varchar(25) ,
   c_address          varchar(40) ,
   c_nationkey        number ,
   c_phone            char(15) ,
   c_acctbal          number ,
   c_mktsegment       char(10) ,
   c_comment          varchar(117)
)
organization external (
type ORACLE_LOADER
default directory data_dir1
access parameters
(
                records delimited by newline
          badfile data_dir4:'c_et.bad'
          logfile data_dir4:'c_et.log'
                fields terminated by '|'
                missing field values are null
          )
          location (
      data_dir1:'customer.tbl.1',
      data_dir1:'customer.tbl.2',
      data_dir1:'customer.tbl.3',
      data_dir1:'customer.tbl.4',
      data_dir2:'customer.tbl.5',
      data_dir2:'customer.tbl.6',
      data_dir2:'customer.tbl.7',
      data_dir2:'customer.tbl.8',
      data_dir3:'customer.tbl.9',
      data_dir3:'customer.tbl.10',
      data_dir3:'customer.tbl.11',
      data_dir3:'customer.tbl.12',
      data_dir4:'customer.tbl.13',
      data_dir4:'customer.tbl.14',
      data_dir4:'customer.tbl.15',
      data_dir4:'customer.tbl.16'
```

```
))
reject limit unlimited parallel;

drop table s_et;
create table s_et(
   s_suppkey          number ,
   s_name             char(25) ,
   s_address          varchar(40) ,
   s_nationkey        number ,
   s_phone            char(15) ,
   s_acctbal          number ,
   s_comment          varchar(101)
)
organization external (
type ORACLE_LOADER
default directory data_dir1
access parameters
(
                    records delimited by newline
            badfile data_dir4:'s_et.bad'
            logfile data_dir4:'s_et.log'
            fields terminated by '|'
            missing field values are null
          )
          location (
      data_dir4:'supplier.tbl'
          ))
reject limit unlimited parallel;

drop table n_et;
create table n_et(
   n_nationkey        number ,
   n_name             char(25) ,
   n_regionkey        number ,
   n_comment          varchar(152)
)
organization external (
type ORACLE_LOADER
default directory data_dir1
access parameters
(
                    records delimited by newline
            badfile data_dir4:'n_et.bad'
            logfile data_dir4:'n_et.log'
                    fields terminated by '|'
                    missing field values are null
          )
          location (
          data_dir4:'nation.tbl'))
reject limit unlimited;

drop table r_et;
create table r_et(
   r_regionkey        number ,
   r_name             char(25) ,
   r_comment          varchar(152)
)
organization external (
type ORACLE_LOADER
default directory data_dir1
access parameters
(
                    records delimited by newline
            badfile data_dir4:'r_et.bad'
            logfile data_dir4:'r_et.log'
                    fields terminated by '|'
                    missing field values are null
          )
          location (
          data_dir4:'region.tbl'))
reject limit unlimited;


drop table  lineitem;
create table lineitem(
   l_shipdate         ,
   l_orderkey         NOT NULL,
   l_discount         NOT NULL,
   l_extendedprice    NOT NULL,
   l_suppkey          NOT NULL,
   l_quantity         NOT NULL,
   l_returnflag       ,
   l_partkey          NOT NULL,
   l_linestatus       ,
   l_tax              NOT NULL,
   l_commitdate       ,
   l_receiptdate      ,
   l_shipmode         ,
   l_linenumber       NOT NULL,
   l_shipinstruct     ,
   l_comment
)
pctfree 1
pctused 99
initrans 10
storage (freelist groups 4 freelists 84)
parallel
nologging
partition by range (l_shipdate)
subpartition by hash(l_partkey)
subpartitions 128
(
partition item1 values less than (to_date('1992-01-
01','YYYY-MM-DD'))
tablespace ts_l1
,
partition item2 values less than (to_date('1992-02-
01','YYYY-MM-DD'))
tablespace ts_l2
,
partition item3 values less than (to_date('1992-03-
01','YYYY-MM-DD'))
tablespace ts_l3
,
partition item4 values less than (to_date('1992-04-
01','YYYY-MM-DD'))
tablespace ts_l4
,
```

```
partition item5 values less than (to_date('1992-05-
01','YYYY-MM-DD'))
tablespace ts_l5
,
partition item6 values less than (to_date('1992-06-
01','YYYY-MM-DD'))
tablespace ts_l6
,
partition item7 values less than (to_date('1992-07-
01','YYYY-MM-DD'))
tablespace ts_l7
,
partition item8 values less than (to_date('1992-08-
01','YYYY-MM-DD'))
tablespace ts_l8
,
partition item9 values less than (to_date('1992-09-
01','YYYY-MM-DD'))
tablespace ts_l9
,
partition item10 values less than (to_date('1992-10-
01','YYYY-MM-DD'))
tablespace ts_l10
,
partition item11 values less than (to_date('1992-11-
01','YYYY-MM-DD'))
tablespace ts_l11
,
partition item12 values less than (to_date('1992-12-
01','YYYY-MM-DD'))
tablespace ts_l12
,
partition item13 values less than (to_date('1993-01-
01','YYYY-MM-DD'))
tablespace ts_l13
,
partition item14 values less than (to_date('1993-02-
01','YYYY-MM-DD'))
tablespace ts_l14
,
partition item15 values less than (to_date('1993-03-
01','YYYY-MM-DD'))
tablespace ts_l15
,
partition item16 values less than (to_date('1993-04-
01','YYYY-MM-DD'))
tablespace ts_l16
,
partition item17 values less than (to_date('1993-05-
01','YYYY-MM-DD'))
tablespace ts_l17
,
partition item18 values less than (to_date('1993-06-
01','YYYY-MM-DD'))
tablespace ts_l18
,
partition item19 values less than (to_date('1993-07-
01','YYYY-MM-DD'))
tablespace ts_l19
,
partition item20 values less than (to_date('1993-08-
01','YYYY-MM-DD'))
tablespace ts_l20
,
partition item21 values less than (to_date('1993-09-
01','YYYY-MM-DD'))
tablespace ts_l21
,
partition item22 values less than (to_date('1993-10-
01','YYYY-MM-DD'))
tablespace ts_l22
,
partition item23 values less than (to_date('1993-11-
01','YYYY-MM-DD'))
tablespace ts_l23
,
partition item24 values less than (to_date('1993-12-
01','YYYY-MM-DD'))
tablespace ts_l24
,
partition item25 values less than (to_date('1994-01-
01','YYYY-MM-DD'))
tablespace ts_l25
,
partition item26 values less than (to_date('1994-02-
01','YYYY-MM-DD'))
tablespace ts_l26
,
partition item27 values less than (to_date('1994-03-
01','YYYY-MM-DD'))
tablespace ts_l27
,
partition item28 values less than (to_date('1994-04-
01','YYYY-MM-DD'))
tablespace ts_l28
,
partition item29 values less than (to_date('1994-05-
01','YYYY-MM-DD'))
tablespace ts_l29
,
partition item30 values less than (to_date('1994-06-
01','YYYY-MM-DD'))
tablespace ts_l30
,
partition item31 values less than (to_date('1994-07-
01','YYYY-MM-DD'))
tablespace ts_l31
,
partition item32 values less than (to_date('1994-08-
01','YYYY-MM-DD'))
tablespace ts_l32
,
partition item33 values less than (to_date('1994-09-
01','YYYY-MM-DD'))
tablespace ts_l33
,
partition item34 values less than (to_date('1994-10-
01','YYYY-MM-DD'))
```

```
tablespace ts_l34
,
partition item35 values less than (to_date('1994-11-
01','YYYY-MM-DD'))
tablespace ts_l35
,
partition item36 values less than (to_date('1994-12-
01','YYYY-MM-DD'))
tablespace ts_l36
,
partition item37 values less than (to_date('1995-01-
01','YYYY-MM-DD'))
tablespace ts_l37
,
partition item38 values less than (to_date('1995-02-
01','YYYY-MM-DD'))
tablespace ts_l38
,
partition item39 values less than (to_date('1995-03-
01','YYYY-MM-DD'))
tablespace ts_l39
,
partition item40 values less than (to_date('1995-04-
01','YYYY-MM-DD'))
tablespace ts_l40
,
partition item41 values less than (to_date('1995-05-
01','YYYY-MM-DD'))
tablespace ts_l41
,
partition item42 values less than (to_date('1995-06-
01','YYYY-MM-DD'))
tablespace ts_l42
,
partition item43 values less than (to_date('1995-07-
01','YYYY-MM-DD'))
tablespace ts_l43
,
partition item44 values less than (to_date('1995-08-
01','YYYY-MM-DD'))
tablespace ts_l44
,
partition item45 values less than (to_date('1995-09-
01','YYYY-MM-DD'))
tablespace ts_l45
,
partition item46 values less than (to_date('1995-10-
01','YYYY-MM-DD'))
tablespace ts_l46
,
partition item47 values less than (to_date('1995-11-
01','YYYY-MM-DD'))
tablespace ts_l47
,
partition item48 values less than (to_date('1995-12-
01','YYYY-MM-DD'))
tablespace ts_l48
,
partition item49 values less than (to_date('1996-01-
01','YYYY-MM-DD'))
tablespace ts_l49
,
partition item50 values less than (to_date('1996-02-
01','YYYY-MM-DD'))
tablespace ts_l50
,
partition item51 values less than (to_date('1996-03-
01','YYYY-MM-DD'))
tablespace ts_l51
,
partition item52 values less than (to_date('1996-04-
01','YYYY-MM-DD'))
tablespace ts_l52
,
partition item53 values less than (to_date('1996-05-
01','YYYY-MM-DD'))
tablespace ts_l53
,
partition item54 values less than (to_date('1996-06-
01','YYYY-MM-DD'))
tablespace ts_l54
,
partition item55 values less than (to_date('1996-07-
01','YYYY-MM-DD'))
tablespace ts_l55
,
partition item56 values less than (to_date('1996-08-
01','YYYY-MM-DD'))
tablespace ts_l56
,
partition item57 values less than (to_date('1996-09-
01','YYYY-MM-DD'))
tablespace ts_l57
,
partition item58 values less than (to_date('1996-10-
01','YYYY-MM-DD'))
tablespace ts_l58
,
partition item59 values less than (to_date('1996-11-
01','YYYY-MM-DD'))
tablespace ts_l59
,
partition item60 values less than (to_date('1996-12-
01','YYYY-MM-DD'))
tablespace ts_l60
,
partition item61 values less than (to_date('1997-01-
01','YYYY-MM-DD'))
tablespace ts_l61
,
partition item62 values less than (to_date('1997-02-
01','YYYY-MM-DD'))
tablespace ts_l62
,
partition item63 values less than (to_date('1997-03-
01','YYYY-MM-DD'))
tablespace ts_l63
```

```
,
partition item64 values less than (to_date('1997-04-
01','YYYY-MM-DD'))
tablespace ts_l64
,
partition item65 values less than (to_date('1997-05-
01','YYYY-MM-DD'))
tablespace ts_l65
,
partition item66 values less than (to_date('1997-06-
01','YYYY-MM-DD'))
tablespace ts_l66
,
partition item67 values less than (to_date('1997-07-
01','YYYY-MM-DD'))
tablespace ts_l67
,
partition item68 values less than (to_date('1997-08-
01','YYYY-MM-DD'))
tablespace ts_l68
,
partition item69 values less than (to_date('1997-09-
01','YYYY-MM-DD'))
tablespace ts_l69
,
partition item70 values less than (to_date('1997-10-
01','YYYY-MM-DD'))
tablespace ts_l70
,
partition item71 values less than (to_date('1997-11-
01','YYYY-MM-DD'))
tablespace ts_l71
,
partition item72 values less than (to_date('1997-12-
01','YYYY-MM-DD'))
tablespace ts_l72
,
partition item73 values less than (to_date('1998-01-
01','YYYY-MM-DD'))
tablespace ts_l73
,
partition item74 values less than (to_date('1998-02-
01','YYYY-MM-DD'))
tablespace ts_l74
,
partition item75 values less than (to_date('1998-03-
01','YYYY-MM-DD'))
tablespace ts_l75
,
partition item76 values less than (to_date('1998-04-
01','YYYY-MM-DD'))
tablespace ts_l76
,
partition item77 values less than (to_date('1998-05-
01','YYYY-MM-DD'))
tablespace ts_l77
,
partition item78 values less than (to_date('1998-06-
01','YYYY-MM-DD'))
tablespace ts_l78
,
partition item79 values less than (to_date('1998-07-
01','YYYY-MM-DD'))
tablespace ts_l79
,
partition item80 values less than (to_date('1998-08-
01','YYYY-MM-DD'))
tablespace ts_l80
,
partition item81 values less than (to_date('1998-09-
01','YYYY-MM-DD'))
tablespace ts_l81
,
partition item82 values less than (to_date('1998-10-
01','YYYY-MM-DD'))
tablespace ts_l82
,
partition item83 values less than (to_date('1998-11-
01','YYYY-MM-DD'))
tablespace ts_l83
,
partition item84 values less than (MAXVALUE)
tablespace ts_l84 )
as select
   l_shipdate        ,
   l_orderkey        ,
   l_discount        ,
   l_extendedprice   ,
   l_suppkey         ,
   l_quantity        ,
   l_returnflag      ,
   l_partkey         ,
   l_linestatus      ,
   l_tax             ,
   l_commitdate      ,
   l_receiptdate     ,
   l_shipmode        ,
   l_linenumber      ,
   l_shipinstruct    ,
   l_comment
from l_et ORDER BY l_orderkey;


drop table  orders;
create table orders(
   o_orderdate       ,
   o_orderkey        NOT NULL,
   o_custkey         NOT NULL,
   o_orderpriority   ,
   o_shippriority    ,
   o_clerk           ,
   o_orderstatus     ,
   o_totalprice      ,
   o_comment
)
pctfree 1
pctused 99
initrans 10
```

```
storage (freelist groups 4 freelists 99)
parallel
nologging
partition by range (o_orderdate)
subpartition by hash(o_custkey)
subpartitions 128
(
partition ord1 values less than (to_date('1992-01-
01','YYYY-MM-DD'))
tablespace ts_o1
,
partition ord2 values less than (to_date('1992-02-
01','YYYY-MM-DD'))
tablespace ts_o2
,
partition ord3 values less than (to_date('1992-03-
01','YYYY-MM-DD'))
tablespace ts_o3
,
partition ord4 values less than (to_date('1992-04-
01','YYYY-MM-DD'))
tablespace ts_o4
,
partition ord5 values less than (to_date('1992-05-
01','YYYY-MM-DD'))
tablespace ts_o5
,
partition ord6 values less than (to_date('1992-06-
01','YYYY-MM-DD'))
tablespace ts_o6
,
partition ord7 values less than (to_date('1992-07-
01','YYYY-MM-DD'))
tablespace ts_o7
,
partition ord8 values less than (to_date('1992-08-
01','YYYY-MM-DD'))
tablespace ts_o8
,
partition ord9 values less than (to_date('1992-09-
01','YYYY-MM-DD'))
tablespace ts_o9
,
partition ord10 values less than (to_date('1992-10-
01','YYYY-MM-DD'))
tablespace ts_o10
,
partition ord11 values less than (to_date('1992-11-
01','YYYY-MM-DD'))
tablespace ts_o11
,
partition ord12 values less than (to_date('1992-12-
01','YYYY-MM-DD'))
tablespace ts_o12
,
partition ord13 values less than (to_date('1993-01-
01','YYYY-MM-DD'))
tablespace ts_o13
,
partition ord14 values less than (to_date('1993-02-
01','YYYY-MM-DD'))
tablespace ts_o14
,
partition ord15 values less than (to_date('1993-03-
01','YYYY-MM-DD'))
tablespace ts_o15
,
partition ord16 values less than (to_date('1993-04-
01','YYYY-MM-DD'))
tablespace ts_o16
,
partition ord17 values less than (to_date('1993-05-
01','YYYY-MM-DD'))
tablespace ts_o17
,
partition ord18 values less than (to_date('1993-06-
01','YYYY-MM-DD'))
tablespace ts_o18
,
partition ord19 values less than (to_date('1993-07-
01','YYYY-MM-DD'))
tablespace ts_o19
,
partition ord20 values less than (to_date('1993-08-
01','YYYY-MM-DD'))
tablespace ts_o20
,
partition ord21 values less than (to_date('1993-09-
01','YYYY-MM-DD'))
tablespace ts_o21
,
partition ord22 values less than (to_date('1993-10-
01','YYYY-MM-DD'))
tablespace ts_o22
,
partition ord23 values less than (to_date('1993-11-
01','YYYY-MM-DD'))
tablespace ts_o23
,
partition ord24 values less than (to_date('1993-12-
01','YYYY-MM-DD'))
tablespace ts_o24
,
partition ord25 values less than (to_date('1994-01-
01','YYYY-MM-DD'))
tablespace ts_o25
,
partition ord26 values less than (to_date('1994-02-
01','YYYY-MM-DD'))
tablespace ts_o26
,
partition ord27 values less than (to_date('1994-03-
01','YYYY-MM-DD'))
tablespace ts_o27
,
partition ord28 values less than (to_date('1994-04-
01','YYYY-MM-DD'))
tablespace ts_o28
```

```
,
partition ord29 values less than (to_date('1994-05-
01','YYYY-MM-DD'))
tablespace ts_o29
,
partition ord30 values less than (to_date('1994-06-
01','YYYY-MM-DD'))
tablespace ts_o30
,
partition ord31 values less than (to_date('1994-07-
01','YYYY-MM-DD'))
tablespace ts_o31
,
partition ord32 values less than (to_date('1994-08-
01','YYYY-MM-DD'))
tablespace ts_o32
,
partition ord33 values less than (to_date('1994-09-
01','YYYY-MM-DD'))
tablespace ts_o33
,
partition ord34 values less than (to_date('1994-10-
01','YYYY-MM-DD'))
tablespace ts_o34
,
partition ord35 values less than (to_date('1994-11-
01','YYYY-MM-DD'))
tablespace ts_o35
,
partition ord36 values less than (to_date('1994-12-
01','YYYY-MM-DD'))
tablespace ts_o36
,
partition ord37 values less than (to_date('1995-01-
01','YYYY-MM-DD'))
tablespace ts_o37
,
partition ord38 values less than (to_date('1995-02-
01','YYYY-MM-DD'))
tablespace ts_o38
,
partition ord39 values less than (to_date('1995-03-
01','YYYY-MM-DD'))
tablespace ts_o39
,
partition ord40 values less than (to_date('1995-04-
01','YYYY-MM-DD'))
tablespace ts_o40
,
partition ord41 values less than (to_date('1995-05-
01','YYYY-MM-DD'))
tablespace ts_o41
,
partition ord42 values less than (to_date('1995-06-
01','YYYY-MM-DD'))
tablespace ts_o42
,
partition ord43 values less than (to_date('1995-07-
01','YYYY-MM-DD'))
tablespace ts_o43
,
partition ord44 values less than (to_date('1995-08-
01','YYYY-MM-DD'))
tablespace ts_o44
,
partition ord45 values less than (to_date('1995-09-
01','YYYY-MM-DD'))
tablespace ts_o45
,
partition ord46 values less than (to_date('1995-10-
01','YYYY-MM-DD'))
tablespace ts_o46
,
partition ord47 values less than (to_date('1995-11-
01','YYYY-MM-DD'))
tablespace ts_o47
,
partition ord48 values less than (to_date('1995-12-
01','YYYY-MM-DD'))
tablespace ts_o48
,
partition ord49 values less than (to_date('1996-01-
01','YYYY-MM-DD'))
tablespace ts_o49
,
partition ord50 values less than (to_date('1996-02-
01','YYYY-MM-DD'))
tablespace ts_o50
,
partition ord51 values less than (to_date('1996-03-
01','YYYY-MM-DD'))
tablespace ts_o51
,
partition ord52 values less than (to_date('1996-04-
01','YYYY-MM-DD'))
tablespace ts_o52
,
partition ord53 values less than (to_date('1996-05-
01','YYYY-MM-DD'))
tablespace ts_o53
,
partition ord54 values less than (to_date('1996-06-
01','YYYY-MM-DD'))
tablespace ts_o54
,
partition ord55 values less than (to_date('1996-07-
01','YYYY-MM-DD'))
tablespace ts_o55
,
partition ord56 values less than (to_date('1996-08-
01','YYYY-MM-DD'))
tablespace ts_o56
,
partition ord57 values less than (to_date('1996-09-
01','YYYY-MM-DD'))
tablespace ts_o57
,
```

```
partition ord58 values less than (to_date('1996-10-
01','YYYY-MM-DD'))
tablespace ts_o58
,
partition ord59 values less than (to_date('1996-11-
01','YYYY-MM-DD'))
tablespace ts_o59
,
partition ord60 values less than (to_date('1996-12-
01','YYYY-MM-DD'))
tablespace ts_o60
,
partition ord61 values less than (to_date('1997-01-
01','YYYY-MM-DD'))
tablespace ts_o61
,
partition ord62 values less than (to_date('1997-02-
01','YYYY-MM-DD'))
tablespace ts_o62
,
partition ord63 values less than (to_date('1997-03-
01','YYYY-MM-DD'))
tablespace ts_o63
,
partition ord64 values less than (to_date('1997-04-
01','YYYY-MM-DD'))
tablespace ts_o64
,
partition ord65 values less than (to_date('1997-05-
01','YYYY-MM-DD'))
tablespace ts_o65
,
partition ord66 values less than (to_date('1997-06-
01','YYYY-MM-DD'))
tablespace ts_o66
,
partition ord67 values less than (to_date('1997-07-
01','YYYY-MM-DD'))
tablespace ts_o67
,
partition ord68 values less than (to_date('1997-08-
01','YYYY-MM-DD'))
tablespace ts_o68
,
partition ord69 values less than (to_date('1997-09-
01','YYYY-MM-DD'))
tablespace ts_o69
,
partition ord70 values less than (to_date('1997-10-
01','YYYY-MM-DD'))
tablespace ts_o70
,
partition ord71 values less than (to_date('1997-11-
01','YYYY-MM-DD'))
tablespace ts_o71
,
partition ord72 values less than (to_date('1997-12-
01','YYYY-MM-DD'))
tablespace ts_o72
,
partition ord73 values less than (to_date('1998-01-
01','YYYY-MM-DD'))
tablespace ts_o73
,
partition ord74 values less than (to_date('1998-02-
01','YYYY-MM-DD'))
tablespace ts_o74
,
partition ord75 values less than (to_date('1998-03-
01','YYYY-MM-DD'))
tablespace ts_o75
,
partition ord76 values less than (to_date('1998-04-
01','YYYY-MM-DD'))
tablespace ts_o76
,
partition ord77 values less than (to_date('1998-05-
01','YYYY-MM-DD'))
tablespace ts_o77
,
partition ord78 values less than (to_date('1998-06-
01','YYYY-MM-DD'))
tablespace ts_o78
,
partition ord79 values less than (to_date('1998-07-
01','YYYY-MM-DD'))
tablespace ts_o79
,
partition ord80 values less than (to_date('1998-08-
01','YYYY-MM-DD'))
tablespace ts_o80
,
partition ord81 values less than (to_date('1998-09-
01','YYYY-MM-DD'))
tablespace ts_o81
,
partition ord82 values less than (to_date('1998-10-
01','YYYY-MM-DD'))
tablespace ts_o82
,
partition ord83 values less than (to_date('1998-11-
01','YYYY-MM-DD'))
tablespace ts_o83
,
partition ord84 values less than (MAXVALUE)
tablespace ts_o84 )
as select
   o_orderdate        ,
   o_orderkey         ,
   o_custkey          ,
   o_orderpriority    ,
   o_shippriority     ,
   o_clerk            ,
   o_orderstatus      ,
   o_totalprice       ,
   o_comment
from o_et order by o_orderkey;
```

```
drop table  partsupp;
create table partsupp(
   ps_partkey          NOT NULL,
   ps_suppkey          NOT NULL,
   ps_supplycost       NOT NULL,
   ps_availqty         ,
   ps_comment
)
parallel
nologging
partition by hash(ps_partkey)
partitions 128
tablespace ts_psupp
as select
   ps_partkey          ,
   ps_suppkey          ,
   ps_supplycost       ,
   ps_availqty         ,
   ps_comment
from ps_et;


drop table  customer;
create table customer(
   c_custkey           NOT NULL,
   c_mktsegment        ,
   c_nationkey         ,
   c_name              ,
   c_address           ,
   c_phone             ,
   c_acctbal           ,
   c_comment
)
pctfree 0
pctused 99
parallel
nologging
partition by hash (c_custkey)
partitions 128
tablespace ts_c
storage (initial 100m)
as select
   c_custkey           ,
   c_mktsegment        ,
   c_nationkey         ,
   c_name              ,
   c_address           ,
   c_phone             ,
   c_acctbal           ,
   c_comment
from c_et;


drop table  part;

create table part(
   p_partkey           NOT NULL,
   p_type              ,
   p_size              ,
   p_brand             ,
   p_name              ,
   p_container         ,
   p_mfgr              ,
   p_retailprice       ,
   p_comment
)
pctfree 0
pctused 99
parallel
nologging
partition by hash (p_partkey)
partitions 128
tablespace ts_p
storage (initial 100m)
as select
   p_partkey           ,
   p_type              ,
   p_size              ,
   p_brand             ,
   p_name              ,
   p_container         ,
   p_mfgr              ,
   p_retailprice       ,
   p_comment
from p_et;


drop table  supplier;
create table supplier(
   s_suppkey           NOT NULL,
   s_nationkey         ,
   s_comment           ,
   s_name              ,
   s_address           ,
   s_phone             ,
   s_acctbal
)
pctfree 0
pctused 99
parallel
nologging
partition by hash (s_suppkey)
partitions 128
tablespace ts_s
as select
   s_suppkey           ,
   s_nationkey         ,
   s_comment           ,
   s_name              ,
   s_address           ,
   s_phone             ,
   s_acctbal
from s_et;

drop table  nation;
create table nation(
   n_nationkey         NOT NULL,
```

```
   n_name             ,
   n_regionkey        ,
   n_comment          )
tablespace ts_default
as select * from n_et;

drop table  region;
create table region(
   r_regionkey        ,
   r_name             ,
   r_comment          )
tablespace ts_default
as select * from r_et;


drop table l_et;
drop table o_et;
drop table ps_et;
drop table p_et;
drop table c_et;
drop table s_et;
drop table n_et;
drop table r_et;

!

echo DONE TABLE CREATION at `date`
```

B.4 ixcre.sh

```
#!/bin/ksh

echo START INDEX at `date`
export ORACLE_SID=tpch

sqlplus  tpch/tpch <<!
set echo on
set timing on
set termout on

drop index i_l_orderkey;
create index i_l_orderkey
on lineitem (l_orderkey)
global partition by hash (l_orderkey)
partitions 128
pctfree 10
initrans 10
tablespace ts_lokey
storage (freelist groups 4 freelists 99)
parallel
compute statistics
nologging;


drop index i_o_orderkey;
create unique index i_o_orderkey
on orders (o_orderkey)
global partition by hash (o_orderkey)
partitions 128
pctfree 10
initrans 10
tablespace ts_okey
storage (freelist groups 4 freelists 99 )
parallel
compute statistics
nologging;


drop index i_c_custkey;
create unique index i_c_custkey
on customer (c_custkey)
pctfree 2
initrans 10
tablespace ts_custkey
storage (freelists 99)
parallel
compute statistics
nologging;


drop index i_ps_pkey_skey;
create index i_ps_pkey_skey
on partsupp (ps_partkey,ps_suppkey)
global partition by hash (ps_partkey)
partitions 128
pctfree 5
initrans 10
tablespace ts_lokey
storage (freelist groups 4 freelists 99)
parallel
compute statistics
nologging;
!

echo DONE INDEX at `date`
```

B.5 anl.sh

```
#!/bin/ksh

echo START ANALYZE at `date`
export ORACLE_SID=tpch;

sqlplus  tpch/tpch <<!
set timing on
set echo on
set termout on

execute dbms_stats.gather_schema_stats('TPCH' ,
estimate_percent => 1, degree => 128 , granularity =>
'GLOBAL', method_opt => 'for all columns size 1' );
connect / as sysdba
execute dbms_stats.gather_system_stats;
exec dbms_auto_task_admin.disable;
alter system switch logfile;
```

```
!

echo END ANALYZE at `date`
```

B.6 Loadasm

```
#!/bin/ksh

echo START LOADASM at `date`
export ORACLE_SID=ASM

sqlplus /NOLOG <<!
connect / as sysdba;
shutdown abort;
startup pfile=/oracle/dbs/initasm.ora ;
alter diskgroup all mount;
drop diskgroup dg1 including contents;

create diskgroup dg1 External REDUNDANCY
DISK
'/dbms/links/roradsk1' SIZE 307200M,
'/dbms/links/roradsk2' SIZE 307200M,
'/dbms/links/roradsk3' SIZE 307200M,
'/dbms/links/roradsk4' SIZE 307200M,
'/dbms/links/roradsk5' SIZE 307200M,
'/dbms/links/roradsk6' SIZE 307200M,
'/dbms/links/roradsk7' SIZE 307200M,
'/dbms/links/roradsk8' SIZE 307200M,
'/dbms/links/roradsk9' SIZE 307200M,
'/dbms/links/roradsk10' SIZE 307200M,
'/dbms/links/roradsk11' SIZE 307200M,
'/dbms/links/roradsk12' SIZE 307200M,
'/dbms/links/roradsk13' SIZE 307200M,
'/dbms/links/roradsk14' SIZE 307200M,
'/dbms/links/roradsk15' SIZE 307200M,
'/dbms/links/roradsk16' SIZE 307200M,
'/dbms/links/roradsk17' SIZE 307200M,
'/dbms/links/roradsk18' SIZE 307200M,
'/dbms/links/roradsk19' SIZE 307200M,
'/dbms/links/roradsk20' SIZE 307200M,
'/dbms/links/roradsk21' SIZE 307200M,
'/dbms/links/roradsk22' SIZE 307200M,
'/dbms/links/roradsk23' SIZE 307200M,
'/dbms/links/roradsk24' SIZE 307200M,
'/dbms/links/roradsk25' SIZE 307200M,
'/dbms/links/roradsk26' SIZE 307200M,
'/dbms/links/roradsk27' SIZE 307200M,
'/dbms/links/roradsk28' SIZE 307200M,
'/dbms/links/roradsk29' SIZE 307200M,
'/dbms/links/roradsk30' SIZE 307200M,
'/dbms/links/roradsk31' SIZE 307200M,
'/dbms/links/roradsk32' SIZE 307200M,
'/dbms/links/roradsk33' SIZE 307200M,
'/dbms/links/roradsk34' SIZE 307200M,
'/dbms/links/roradsk35' SIZE 307200M,
'/dbms/links/roradsk36' SIZE 307200M,
'/dbms/links/roradsk37' SIZE 307200M,
'/dbms/links/roradsk38' SIZE 307200M,
'/dbms/links/roradsk39' SIZE 307200M,
'/dbms/links/roradsk40' SIZE 307200M,
'/dbms/links/roradsk41' SIZE 307200M,
'/dbms/links/roradsk42' SIZE 307200M,
'/dbms/links/roradsk43' SIZE 307200M,
'/dbms/links/roradsk44' SIZE 307200M,
'/dbms/links/roradsk45' SIZE 307200M,
'/dbms/links/roradsk46' SIZE 307200M,
'/dbms/links/roradsk47' SIZE 307200M,
'/dbms/links/roradsk48' SIZE 307200M,
'/dbms/links/roradsk49' SIZE 307200M,
'/dbms/links/roradsk50' SIZE 307200M,
'/dbms/links/roradsk51' SIZE 307200M,
'/dbms/links/roradsk52' SIZE 307200M,
'/dbms/links/roradsk53' SIZE 307200M,
'/dbms/links/roradsk54' SIZE 307200M,
'/dbms/links/roradsk55' SIZE 307200M,
'/dbms/links/roradsk56' SIZE 307200M,
'/dbms/links/roradsk57' SIZE 307200M,
'/dbms/links/roradsk58' SIZE 307200M,
'/dbms/links/roradsk59' SIZE 307200M,
'/dbms/links/roradsk60' SIZE 307200M,
'/dbms/links/roradsk61' SIZE 307200M,
'/dbms/links/roradsk62' SIZE 307200M,
'/dbms/links/roradsk63' SIZE 307200M,
'/dbms/links/roradsk64' SIZE 307200M;
alter diskgroup dg1 rebalance power 0;
!

sqlplus /NOLOG <<!
connect / as sysdba;
shutdown normal;
!

export ORACLE_SID=ASM
sqlplus /NOLOG <<!
connect / as sysdba
startup pfile=/oracle/dbs/initasm.ora mount
!
echo END LOADASM at `date`
```

Appendix C Acid Scripts

C.1 a_query.sql

```
Rem
Rem $Header: a_query.sql 06-aug-99.10:51:10 mpoess Exp
$
Rem
Rem a_query.sql
Rem
Rem  Copyright (c) Oracle Corporation 1999. All Rights
Reserved.
Rem
Rem    NAME
Rem      a_query.sql - <one-line expansion of the name>
Rem
rem  DESCRIPTION
Rem       Performs ACID Query for TPC-D benchmark.
Rem       Asks user to input values for o_key
Rem       The range of okey is 1 to 600000
Rem
========================================
======================
Rem
Rem Usage:   sqlplus tpcd/tpcd @a_query <o_key>
Rem
Rem
Rem    MODIFIED   (MM/DD/YY)
Rem    mpoess      08/06/99 - Creation
Rem    mpoess      08/06/99 - Created
Rem

set serverout on;

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

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

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

exit;
```

C.2 a_query2.sql

```
Rem
Rem $Header: aquery2.sql 07-aug-99.23:54:47 mpoess Exp
$
Rem
Rem aquery2.sql
Rem
Rem  Copyright (c) Oracle Corporation 1999. All Rights
Reserved.
Rem
Rem    NAME
Rem      aquery2.sql - <one-line expansion of the name>
Rem
Rem  DESCRIPTION
Rem       Performs query on PARTSUPP for TPC-D
benchmark
Rem       Isolation Test 5.
Rem       Asks user to input values for ps_partkey and
ps_suppkey
Rem       The range for ps_partkey is 1 to 20000
Rem       The range for ps_suppkey is 1 to 1000
Rem       A valid combination is 46 and 47
Rem  Usage:   sqlplus tpcd/tpcd @a_query2 <ps_partkey>
<ps_suppkey>
Rem
Rem    MODIFIED   (MM/DD/YY)
Rem    mpoess      08/07/99 - Creation
Rem    mpoess      08/07/99 - Created
Rem
rem  DESCRIPTION
rem       Performs query on PARTSUPP for TPC-D
benchmark
rem       Isolation Test 5.
rem       Asks user to input values for ps_partkey and
ps_suppkey
rem       The range for ps_partkey is 1 to 20000
rem       The range for ps_suppkey is 1 to 1000
rem       A valid combination is 46 and 47

set serverout on;

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

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

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

exit;
```

C.3 atom.sh

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

```
#
# $Header: atom.sh 08-aug-99.13:48:02 mpoess Exp $
#
# atom.sh
#
#  Copyright (c) Oracle Corporation 1999. All Rights
Reserved.
#
#    NAME
#      atom.sh - <one-line expansion of the name>
#
#  DESCRIPTION
#      Performs atomicity tests.
#      Usage: atom.sh [-n iter] [-p prog] [-u usr/pswd] -h
#
#      Options: See usage below
#
#    NOTES
#      <other useful comments, qualifications, etc.>
#
#    MODIFIED   (MM/DD/YY)
#    mpoess      08/08/99 - Creation
#    mpoess      08/08/99 - Creation
#

. $KIT_DIR/env

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

usage() {

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

ITER=3
SF=1
PROG=$KIT_DIR/utils/atranspl
OUT=${OUT_DIR}/atom
USER=${DATABASE_USER}

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

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

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

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

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

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

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

C.4 atrans.sql

```
Rem
Rem $Header: atrans.sql 07-aug-99.21:27:13 mpoess Exp $
Rem
Rem atrans.sql
Rem
Rem  Copyright (c) Oracle Corporation 1999. All Rights
Reserved.
Rem
Rem    NAME
Rem      atrans.sql - <one-line expansion of the name>
Rem
Rem   DESCRIPTION
Rem       Creates ACID Transaction Package for TPC-D
benchmark.
Rem       Asks user to input values for o_key, delta and
output file.
Rem
Rem    NOTES
Rem      <other useful comments, qualifications, etc.>
Rem
Rem    MODIFIED   (MM/DD/YY)
Rem    mpoess      08/07/99 - Creation
Rem    mpoess      08/07/99 - Created
Rem
```

```
set serverout on;
set termout on;
set echo on;

CREATE OR REPLACE PACKAGE d_atrans
IS
PROCEDURE doatrans
(
        l_key           IN OUT integer,
        o_key           IN OUT integer,
        delta           IN OUT integer,
        l_pkey          IN OUT integer,
        l_skey          IN OUT integer,
        l_quan          IN OUT integer,
        l_newquan       IN OUT integer,
        l_tax           IN OUT number,
        l_disc          IN OUT number,
        l_eprice        IN OUT number,
        l_neweprice     IN OUT number,
        o_tprice IN OUT number,
        o_newtprice     IN OUT number,
        rprice          IN OUT number,
        cost            IN OUT number
);
END;
/

CREATE OR REPLACE PACKAGE BODY d_atrans
IS
PROCEDURE doatrans
(
        l_key           IN OUT integer,
        o_key           IN OUT integer,
        delta           IN OUT integer,
        l_pkey          IN OUT integer,
        l_skey          IN OUT integer,
        l_quan          IN OUT integer,
        l_newquan       IN OUT integer,
        l_tax           IN OUT number,
        l_disc          IN OUT number,
        l_eprice        IN OUT number,
        l_neweprice     IN OUT number,
        o_tprice IN OUT number,
        o_newtprice     IN OUT number,
        rprice          IN OUT number,
        cost            IN OUT number
)
IS
      ototal number;
      not_serializable EXCEPTION;
      PRAGMA EXCEPTION_INIT(not_serializable,-
8177);
BEGIN
 -- EXECUTE IMMEDIATE 'ALTER SESSION SET
ISOLATION_LEVEL = SERIALIZABLE';
 LOOP BEGIN

   select o_totalprice
        into o_tprice
        from orders
        where o_orderkey = o_key;

   select l_quantity, l_extendedprice, l_partkey, l_suppkey,
l_tax, l_discount
      into l_quan, l_eprice, l_pkey, l_skey, l_tax, l_disc
      from lineitem
      where l_orderkey = o_key
      and   l_linenumber = l_key;

   ototal := o_tprice - trunc((trunc((l_eprice * (1.0-
l_disc)),2) * (1.0+l_tax)),2);
   rprice := trunc((l_eprice/l_quan), 2);
   cost := trunc((rprice * delta), 2);
   l_neweprice := l_eprice + cost;
   o_newtprice := trunc((l_neweprice * (1.0 - l_disc)), 2);
   o_newtprice := ototal + trunc((o_newtprice * (1.0 +
l_tax)), 2);
   l_newquan := l_quan + delta;

   update lineitem
      set l_extendedprice = l_neweprice,
      l_quantity = l_newquan
      where l_orderkey = o_key
      and l_linenumber = l_key;

   update orders
      set o_totalprice = o_newtprice
      where o_orderkey = o_key;

    insert into history (h_p_key, h_s_key, h_o_key, h_l_key,
h_delta, h_date_t)
      values (l_pkey, l_skey, o_key, l_key, delta, sysdate);

 -- dbms_lock.sleep(30);
 --   commit;
   EXIT;

 EXCEPTION
   WHEN not_serializable THEN
    ROLLBACK;
 END;

 END LOOP;

END doatrans;
END;
/

exit;
```

C.5 atranspl.c

```
/* Copyright (c) 2001, 2002, Oracle Corporation.  All rights
reserved.  */

/*
```

```
  NAME
    atranspl.c - <one-line expansion of the name>

  DESCRIPTION
    TPC-HR benchmark ACID transaction driver, OCI
version 8

  NOTES
    <other useful comments, qualifications, etc.>

  MODIFIED   (MM/DD/YY)
  mpoess      10/23/02 - mpoess_update_from_visa
  mpoess      10/17/01 - add parameter in ACIDinit
  mpoess      02/22/01 - enlarge timing array
  mpoess      01/04/01 - Creation

*/

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

#include "atranspl.h"

/* Declare error handling functions */

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

/* declarations for ORDERS */

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

/* declarations for LINEITEM */

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

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

sb2 l_npricei;

/* other declarations */

int delta = 0;
double rprice;
double cost;

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

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

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

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

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

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

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

time_t curr_time;        /* Current Time                  */

/* OCI handles */

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

/* OCI bind handles */

#ifdef NOLKEY
```

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

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

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

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

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

char sqlstmt[1024];

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

void usage()
{

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

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

}


void ACIDexit() {

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

}



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

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

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

```
    fprintf(stderr,"%s\n",msg);
    break;
  case OCI_INVALID_HANDLE:
    fprintf(stderr, "Error: Invalid Handle.\n");
    if (type)
      (void) OCIErrorGet(errhp,1,NULL, (sb4 *) &errcode,
(text*) msg,
                    2048,OCI_HTYPE_ERROR);
    else
      (void) OCIErrorGet(errhp,1,NULL, (sb4 *) &errcode,
(text*) msg,
                    2048,OCI_HTYPE_ENV);
    fprintf(stderr,"%s\n",msg);
    break;
  }
  /* Rollback just in case */

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

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

  ACIDexit();

  exit(1);
}

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

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

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

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

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

  proc_no = atoi(argv[1]);

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

  num_streams = atoi(argv[2]);

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

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

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

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

  /* Process  optional parameters */

  argc -= 4;
  argv += 4;

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

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

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

  /* Initialize the cursors etc. */

  (void) ACIDinit();

  /* sleep for some time (triggering) */

  sleep(trig);

  /* start doing the ACID transactions */

  tr_start = gettime();

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

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

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

    /* Obtain l_key from l_key query */

    OCIsexec(tpcsvc,curi,errhp,1);

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

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

    /* Generate delta if necessary */

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

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

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

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

    OCIsexec(tpcsvc,curr,errhp,1);

    curr_time = time(NULL);

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

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

    /* Shall we commit? */

    if (BIT(flag, COMMIT)) {
      need_commit = 1;
      while (need_commit) {

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

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

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

    /*
    curr_time = time(NULL);
```

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

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

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

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

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

  tr_end = gettime();

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

  /*  Disconnect from ORACLE. */

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

  ACIDexit();

  exit(0);
}


void ACIDinit()
{

  /* run random seed */

  srand48(getpid());

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

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

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

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

  /* get username and password */

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

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


OCIaset(tpcsvc,OCI_HTYPE_SVCCTX,tpcsrv,0,OCI_ATT
R_SERVER,errhp);
```

```
OCIaset(tpcusr,OCI_HTYPE_SESSION,lname,strlen(lname
),OCI_ATTR_USERNAME,
        errhp);

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

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


OCIaset(tpcsvc,OCI_HTYPE_SVCCTX,tpcusr,0,OCI_ATT
R_SESSION,errhp);

  /* Enable session parallel dml */

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

  /* Enable session parallel ddl */

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


  /* Make session serializable */

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

  /* Set optimizer_index_cost_adj = 25 */

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

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


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

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


OCIbbname(curi,&l_keyi_bp,errhp,":l_key",ADR(l_key),SI
Z(l_key),SQLT_INT);

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

#endif /* NOLKEY */

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

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

  /* bind variables */


OCIbbname(curr,l_key_bp,errhp,":l_key",ADR(l_key),SIZ(
l_key),SQLT_INT);

OCIbbname(curr,o_key_bp,errhp,":o_key",ADR(o_key),SI
Z(o_key),SQLT_INT);

OCIbbname(curr,delta_bp,errhp,":delta",ADR(delta),SIZ(de
lta),SQLT_INT);

OCIbbname(curr,l_pkey_bp,errhp,":l_pkey",ADR(l_pkey),S
IZ(l_pkey),SQLT_INT);

OCIbbname(curr,l_skey_bp,errhp,":l_skey",ADR(l_skey),SI
Z(l_skey),SQLT_INT);

OCIbbname(curr,l_quan_bp,errhp,":l_quan",ADR(l_quan),S
IZ(l_quan),SQLT_INT);

OCIbbname(curr,l_newquan_bp,errhp,":l_newquan",ADR(l
_newquan),
          SIZ(l_newquan),SQLT_INT);

OCIbbname(curr,l_tax_bp,errhp,":l_tax",ADR(l_tax),SIZ(l_
tax),SQLT_FLT);

OCIbbname(curr,l_disc_bp,errhp,":l_disc",ADR(l_disc),SIZ
(l_disc),SQLT_FLT);

OCIbbname(curr,l_eprice_bp,errhp,":l_eprice",ADR(l_epric
e),SIZ(l_eprice),
          SQLT_FLT);
```

```
OCIbbname(curr,l_neweprice_bp,errhp,":l_neweprice",ADR(l_neweprice),
        SIZ(l_neweprice),SQLT_FLT);


OCIbbname(curr,o_tprice_bp,errhp,":o_tprice",ADR(o_tprice),SIZ(o_tprice),
        SQLT_FLT);

OCIbbname(curr,o_newtprice_bp,errhp,":o_newtprice",ADR(o_newtprice),
        SIZ(o_newtprice), SQLT_FLT);

OCIbbname(curr,rprice_bp,errhp,":rprice",ADR(rprice),SIZ(rprice), SQLT_FLT);

OCIbbname(curr,cost_bp,errhp,":cost",ADR(cost),SIZ(cost), SQLT_FLT);

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

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

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

  /* bind variables */


OCIbbname(cure1,l_neweprice1_bp,errhp,":l_neweprice",ADR(l_neweprice),
        SIZ(l_neweprice),SQLT_FLT);

OCIbbname(cure1,l_newquan1_bp,errhp,":l_newquan",ADR(l_newquan),
        SIZ(l_newquan),SQLT_INT);

OCIbbname(cure1,o_key1_bp,errhp,":o_key",ADR(o_key),SIZ(o_key),SQLT_INT);

OCIbbname(cure1,l_key1_bp,errhp,":l_key",ADR(l_key),SIZ(l_key),SQLT_INT);


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

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

}
```

C.6 atranspl.h

```
/* Copyright (c) 2001, 2002, Oracle Corporation.  All rights reserved.  */

/*
  NAME
    atranspl.h - <one-line expansion of the name>

  DESCRIPTION

  MODIFIED   (MM/DD/YY)
  mpoess     10/23/02 - mpoess_update_from_visa
  mpoess     10/17/01 - add TXT parameter
  mpoess     04/09/01 - add hint to find max linenumber
  mpoess     01/04/01 - Creation

*/
#ifndef ATRANSPL_H

#define ATRANSPL_H

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

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

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

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

extern int errno;

#ifndef NULL
#define NULL 0
#endif

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

```
#ifndef DISCARD
# define DISCARD (void)
#endif

#ifndef sword
# define sword int
#endif

#ifndef ub1
#define ub1 unsigned char
#endif

#define UNAME_LEN 64
#define WRITE_BUF_LEN 1024

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

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

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

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

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

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

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

#define OCIsexec(svch,stmh,errh,iter) \

if((status=OCIStmtExecute(svch,stmh,errh,iter,0,NULL,NU
LL,NULL,OCI_DEFAULT)) != OCI_SUCCESS) \
      sql_error(errh,status,1); \
   else \
      DISCARD 0

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

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

#define OCIcom(svcp,errh) \

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

#define OCIrol(svcp,errh) \

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

#define ISOTXT "alter session set isolation_level =
serializable"
#define PDMLTXT "alter session force parallel dml parallel
(degree 4)"
#define PDDLTXT "alter session force parallel ddl parallel
(degree 4)"
#define OICATXT "alter session set
optimizer_index_cost_adj=25"
```

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

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

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

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

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

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

#endif /* ATRANSPL_H */
```

C.7 ckpt.sh

```
#!/bin/ksh
#
# $Header: ckpt.sh 08-aug-99.17:37:07 mpoess Exp $
#
# ckpt.sh
#
#  Copyright (c) Oracle Corporation 1999. All Rights
Reserved.
#
#   NAME
#     ckpt.sh - <one-line expansion of the name>
#
#  DESCRIPTION
#     Usage: ckpt.sh
#     Start database checkpoint
#
#   NOTES
#     <other useful comments, qualifications, etc.>
#
#   MODIFIED   (MM/DD/YY)
#   mpoess      08/08/99 - Creation
#   mpoess      08/08/99 - Creation
#

. $KIT_DIR/env

sqlplus -s /NOLOG << !

        connect / as sysdba;
        alter system switch logfile;
        alter system switch logfile;
        exit;
!
```

C.8 cnt_hist.sql

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

C.9 consist.sh

```
#!/bin/ksh
#
# $Header: consist.sh 08-aug-99.14:20:51 mpoess Exp $
#
# consist.sh
#
#  Copyright (c) Oracle Corporation 1999. All Rights
Reserved.
#
#   NAME
#     consist.sh - <one-line expansion of the name>
#
#  DESCRIPTION
#     Performs consistency tests.
#     Usage: consist.sh [-n iter] [-s number of stream] [-p
prog]
#                       [-u usr/pswd] -h
#
#     Options: See usage below
#
#   NOTES
#     <other useful comments, qualifications, etc.>
#
#   MODIFIED   (MM/DD/YY)
#   mpoess      08/08/99 - Creation
#   mpoess      08/08/99 - Creation
#

. $KIT_DIR/env

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

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

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

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

STREAM=${NUM_STREAMS}
let STREAM="$STREAM + 1" # add one for the update
stream
ITER=100
PROG=atranspl
USER=${DATABASE_USER}
CK=10

usage() {

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

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

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


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

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

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

i=0

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

echo "Check consistency before Submitting Transactions
`date`"
echo "Check consistency before Submitting Transactions
`date`" >> $CON1

echo "Obtain 10 keys from the each key file to check
consistency"

i=0
while [ $i -lt $STREAM ]
do
KEYS=`head -10 ${KEY}${i} | awk '{printf "%d ", $1}'`
echo "The 10 Keys for file $i are: $KEYS"
#for j in `head -10 ${KEY}${i} | awk '{printf "%d ", $1}'`
for j in $KEYS
do
   sqlplus $USER
@/dbms/oracle10i/kit/acid/consistency/consist $j >>
$CON1
   echo "------------------------------" >> $CON1
done
   i=`expr $i + 1`
done

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

i=0

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

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

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

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

wait

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

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

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

cat
${ORACLE_HOME}/log/diag/rdbms/1gb/qual/trace/alert_$
{ORACLE_SID}.log >> $CHK

i=0
while [ $i -lt $STREAM ]
do
KEYS=`head -10 ${KEY}$i | awk '{printf "%d ", $1}'`
#for j in `head -10 ${KEY}$i | awk '{printf "%d ", $1}'`
echo "The keys to check for consistency after the test from
file $i are:"
echo "$KEYS"
for j in $KEYS
do
   sqlplus $USER
@/dbms/oracle10i/kit/acid/consistency/consist $j >>
$CON2
   echo "------------------------------" >> $CON2
done
   i=`expr $i + 1`
done
```

C.10 consist.sql

```
Rem
Rem $Header: consist.sql 08-aug-99.16:59:17 mpoess Exp $
Rem
Rem consist.sql
Rem
Rem  Copyright (c) Oracle Corporation 1999. All Rights
Reserved.
Rem
Rem    NAME
Rem      consist.sql - <one-line expansion of the name>
Rem
Rem  DESCRIPTION
Rem      Verifies the consistency of TPC-D database using
the
Rem      consistency condition.
Rem
Rem Usage:   sqlplus tpcd/tpcd @consist
Rem
Rem NOTE
Rem REQUIRES PACKAGES prvtotpt and dbmsotpt
rem
Rem    MODIFIED   (MM/DD/YY)
Rem    mpoess     08/08/99 - Creation
Rem    mpoess     08/08/99 - Created
Rem

set verify off
rem set termout on
rem set echo on


REM
REM Get today's date.
REM

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

set serverout on;

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


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

   diff := l_tprice - o_tprice;

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

```
END;
.
/


spool off
exit
```

C.11 count_tx.sh

```
#!/bin/ksh

STEM=$1
ITER=$2
OUT=$3
FIN=FALSE
while [ "$FIN" = "FALSE" ]
do
  s=0
  FIN=TRUE
  while [ $s -lt $STEM ]
  do
    nt=`grep "Transaction Completed" $OUT/dura${s} | wc -
l`
    if [ $nt -lt $ITER ];then
      FIN=FALSE
    fi
    s=`expr $s + 1`
  done
  sleep 5
done
echo all streams have commited $ITER transactions
```

C.12 d_hist.sql

```
Rem
Rem $Header: d_hist.sql 07-aug-99.21:33:08 mpoess Exp $
Rem
Rem d_hist.sql
Rem
Rem  Copyright (c) Oracle Corporation 1999. All Rights
Reserved.
Rem
Rem    NAME
Rem      d_hist.sql - <one-line expansion of the name>
Rem
Rem    DESCRIPTION
Rem      Creates a history table for ACID test purpose.
Rem
Rem    NOTES
Rem      <other useful comments, qualifications, etc.>
Rem
Rem    MODIFIED   (MM/DD/YY)
Rem    mpoess      08/07/99 - Creation
Rem    mpoess      08/07/99 - Created
Rem

set termout on;
set serverout on;
set echo on;

drop table history;

create table history
(
        h_p_key number,
        h_s_key number,
        h_o_key number,
        h_l_key  number,
        h_delta number,
        h_date_t date
);

exit;
```

C.13 end_acid.sh

```
#!/bin/ksh
#
# $Header: end_acid.sh 08-aug-99.17:06:20 mpoess Exp $
#
# end_acid.sh
#
#  Copyright (c) Oracle Corporation 1999. All Rights
Reserved.
#
#    NAME
#      end_acid.sh - <one-line expansion of the name>
#
#  DESCRIPTION
#      end_cons.sh <pid of the durability run>
#      Options: See usage below
#
#    NOTES
#      <other useful comments, qualifications, etc.>
#
#    MODIFIED   (MM/DD/YY)
#    mpoess      08/08/99 - Creation
#    mpoess      08/08/99 - Creation
#

. $KIT_DIR/env

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

SHELL_PID=`cat ${DURA_DIR}/shellpid`
ITER=100
STEM=${NUM_STREAMS}
let STEM="$STEM + 1" # add one for the update stream
```

```
PROG=${ACID_DIR}/atranspl.ott
IN=${ACID_DIR}/acid_in
DURA=${DURA_DIR}/drate
OUT=${DURA_DIR}/drate
DSMPL=${DURA_DIR}/durasmpl
KEY=${DURA_DIR}/key${SHELL_PID}_
USER=tpch/tpch
TRIG=1
HCNT=duracnta

# get history count

sqlplus $USER @cnt_hist > $DURA_DIR/$HCNT 2>&1

# perform the consistency

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

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


cat
$ORACLE_HOME/log/diag/rdbms/1gb/qual/trace/alert_qua
l.log > ${DURA_DIR}/alert_qual.log.p
ost_dura  2>&1

cat
$ORACLE_HOME/log/diag/asm/+asm/ASM/trace/alert_A
SM.log > ${DURA_DIR}/alert_ASM.log.post_
dura 2>&1
```

C.14 iso.sh

```
#!/bin/ksh
#
# $Header: iso.sh 17-aug-99.15:44:51 mpoess Exp $
#
# iso.sh
#
#  Copyright (c) Oracle Corporation 1999. All Rights
Reserved.
#
#   NAME
#     iso.sh
#
#   DESCRIPTION
#    This script triggers all 6 isolation tests. In addition,
#    it creates more readable formats of the isolation test
output.
#   NOTES
#     <other useful comments, qualifications, etc.>
#
#   MODIFIED   (MM/DD/YY)
#   mpoess      08/17/99 - Creation
#   mpoess      08/17/99 - Creation
#

for iso in iso1 iso2 iso3 iso4 iso5 iso6;do
          echo Running isolation test $iso
          /dbms/oracle10i/kit/acid/isolation/${iso}.sh
#         echo Creating nicely formated output of ACID test
$iso
#         /dbms/oracle10i/kit/acid/isolation/xiso.pl -o
${ACID_OUT}/${iso}
done
```

C.15 iso1.sh

```
#!/bin/ksh
#
# $Header: iso1.sh 29-jul-98.17:00:11 akarasik Exp $
#
# iso1.sh
#
#  Copyright (c) Oracle Corporation 1998. All Rights
Reserved.
#
#   NAME
#     iso1.sh
#
#  DESCRIPTION
#      Usage: iso1.sh [-u user/password] [-n remote_node] -h
#      Options: See usage below
#  NOTES
#          For a cross node isolation test, assume the local
node is
#          one of the participating nodes.  The other node can
be
#          specified by the -n option.
#      You need to set the environment variable
TPCD_KIT_DIR
#
#   MODIFIED   (MM/DD/YY)
#   mpoess      12/16/98 - update to version 8.1.6
#   mpoess      09/25/98 - update audit
#   akarasik    07/29/98 -
#   akarasik    07/29/98 - Creation
#

. $KIT_DIR/env
```

```
# May need to change the following:
RSH=rsh

OH=$ORACLE_HOME
#ACID_DIR=$KIT_DIR/acid is set in env
OUT_DIR=$ACID_OUT

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

USER=$DATABASE_USER
PROG=atranspl


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

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

usage() {

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

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

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


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

# generate key files

randkey 1 0.1 u"$USER" > $KEYFILE

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

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

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

sleep 1

# start ACID transaction, Sleep for 60 second before
COMMIT

$PROG 1 1 1 0 i$KEYFILE u$USER s60 b0 >>
$TXN1FILE &

# let's sleep 10 seconds before starting ACID query

sleep 10

# start ACID query with the same OKEY

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

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

cat $TXN1FILE $TXN2FILE >> $ISOFILE

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

C.16 iso2.sh

```
#!/bin/ksh
#
# $Header: iso2.sh 04-aug-99.09:19:54 mpoess Exp $
#
# iso2.sh
#
```

```
#  Copyright (c) Oracle Corporation 1999. All Rights
Reserved.
#
#   NAME
#     iso2.sh - <one-line expansion of the name>
#
#   DESCRIPTION
#     Usage: iso2.sh [-u user/password] [-n remote_node] -h
#     Options: See usage below
#   NOTES
#      For a cross node isolation test, assume the local node
is
#      one of the participating nodes.  The other node can be
#      specified by the -n option.
#      You need to set the environment variable
TPCD_KIT_DIR
#
#   MODIFIED   (MM/DD/YY)
#   mpoess      08/04/99 - Creation
#   mpoess      08/04/99 - Creation
#
#
#
==========================================
======================+
# May need to change the following:

. $KIT_DIR/env

RSH=rsh

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

DURA_DIR=$ACID_DIR/dura

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

USER=$DATABASE_USER
PROG=atranspl

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

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

usage() {

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

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


# generate key files

randkey 1 0.1 u"$USER" > $KEYFILE

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

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

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

sleep 1

# start ACID transaction, Sleep for 30 second before
ROLLBACK

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

# let's sleep 10 seconds before starting ACID query

sleep 10

# start ACID query with the same OKEY

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

```
sqlplus $USER @$ACID_DIR/isolation/a_query $OKEY
>> $TXN2FILE
fi

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

cat $TXN1FILE $TXN2FILE >> $ISOFILE

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

C.17 iso3.sh

```
#!/bin/ksh
#
# $Header: iso3.sh 04-aug-99.09:20:35 mpoess Exp $
#
# iso3.sh
#
#  Copyright (c) Oracle Corporation 1999. All Rights
Reserved.
#
#   NAME
#     iso3.sh - <one-line expansion of the name>
#
#  DESCRIPTION
#     Usage: iso3.sh [-u user/password] [-n remote_node] -h
#     Options: See usage below
#  NOTES
#      For a cross node isolation test, assume the local node
is
#      one of the participating nodes.  The other node can be
#      specified by the -n option.
#           We need to make sure the remote node has access
to the
#           file system on the local node.  Otherwise, we need
to rcp
#           the keyfile to the remote system.
#      You need to set the environment variable
TPCD_KIT_DIR
#
#   MODIFIED   (MM/DD/YY)
#   mpoess     08/04/99 - Creation
#   mpoess     08/04/99 - Creation
#

. $KIT_DIR/env

# May need to change the following:
RSH=rsh

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

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

USER=$DATABASE_USER
PROG=atranspl

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

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

usage() {

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

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

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


# generate key files

randkey 1 0.1 u"$USER" > $KEYFILE
if [ "$HOST" != "" ]
then
  rcp $KEYFILE ${HOST}:$KEYFILE
fi

sleep 1

# start ACID transaction, Sleep for 30 second before
COMMIT

$PROG 1 2 1 0 i$KEYFILE u$USER s30 b0 >>
$TXN1FILE &

# let's sleep 10 seconds before starting second ACID
transaction

sleep 10
```

```
# start another ACID transaction with the same LKEY and
OKEY
# but different DELTA

# Do not sleep before COMMIT so that we can see TXN2
has waited.

if [ "$HOST" != "" ]
then
echo "Starting TXN2 on node $HOST" >> $TXN2FILE
${RSH} -n ${HOST} $PROG 2 2 1 1 i$KEYFILE u$USER
s1 b1 >> $TXN2FILE &
else
$PROG 2 2 1 1 i$KEYFILE u$USER s1 b1 >>
$TXN2FILE &
fi

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

cat $TXN1FILE $TXN2FILE >> $ISOFILE

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

C.18 iso4.sh

```
#!/bin/ksh
#
# $Header: iso4.sh 04-aug-99.09:21:12 mpoess Exp $
#
# iso4.sh
#
#  Copyright (c) Oracle Corporation 1999. All Rights
Reserved.
#
#   NAME
#     iso4.sh - <one-line expansion of the name>
#
#  DESCRIPTION
#     Usage: iso4.sh [-u user/password] [-n remote_node] -h
#     Options: See usage below
#  NOTES
#      For a cross node isolation test, assume the local node
is
#      one of the participating nodes.  The other node can be
#      specified by the -n option.
#      We need to make sure the remote node has access to
the
#      file system on the local node.  Otherwise, we need to
rcp
#      the keyfile to the remote system.
#      You need to set the environment variable
TPCD_KIT_DIR
#
#   MODIFIED   (MM/DD/YY)
#    mpoess     08/04/99 - Creation
#    mpoess     08/04/99 - Creation
#

. $KIT_DIR/env

# May need to change the following:
RSH=rsh

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

DURA_DIR=$ACID_DIR/dura

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

USER=$DATABASE_USER
PROG=atranspl

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

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

usage() {

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

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

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


# generate key files

randkey 1 0.1 u"$USER" > $KEYFILE

if [ "$HOST" != "" ]
then
  rcp $KEYFILE ${HOST}:$KEYFILE
fi
```

```
sleep 1

# start ACID transaction, Sleep for 30 second before
ROLLBACK

$PROG 1 2 0 0 i$KEYFILE u$USER s30 b0 >>
$TXN1FILE &

# let's sleep 10 seconds before starting second ACID
transaction

sleep 10

# start another ACID transaction with the same LKEY and
OKEY
# but different DELTA

# Do not sleep before COMMIT so that we can see TXN2
has waited.

if [ "$HOST" != "" ]
then
echo "Starting TXN2 on node $HOST" >> $TXN2FILE
${RSH} -n ${HOST} $PROG 2 2 1 1 i$KEYFILE u$USER
s1 b1 >> $TXN2FILE &
else
$PROG 2 2 1 1 i$KEYFILE u$USER s1 b1 >>
$TXN2FILE &
fi

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

cat $TXN1FILE $TXN2FILE >> $ISOFILE

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

C.19 iso5.sh

```
#!/bin/ksh
#
# $Header: iso5.sh 04-aug-99.09:21:45 mpoess Exp $
#
# iso5.sh
#
#  Copyright (c) Oracle Corporation 1999. All Rights
Reserved.
#
#    NAME
#      iso5.sh - <one-line expansion of the name>
#
#  DESCRIPTION
#      Usage: iso5.sh [-u user/password] [-n remote_node] -h
#      Options: See usage below
#  NOTES
#      For a cross node isolation test, assume the local node
is
#      one of the participating nodes.  The other node can be
#      specified by the -n option.
#      You need to set the environment variable
TPCD_KIT_DIR
#
#   MODIFIED   (MM/DD/YY)
#   mpoess      08/04/99 - Creation
#   mpoess      08/04/99 - Creation
#

. $KIT_DIR/env

# May need to change the following:
RSH=rsh

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

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

USER=$DATABASE_USER
PROG=atranspl

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

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

usage() {

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

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

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


# generate key files
```

```
randkey 1 0.1 u"$USER" > $KEYFILE

if [ "$HOST" != "" ]
then
  rcp $KEYFILE ${HOST}:$KEYFILE
fi

sleep 1


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

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

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

sleep 1

# start ACID transaction, Sleep for 60 second before COMMIT

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

# let's sleep 5 seconds before starting PARTSUPP query

sleep 5

# First generate PS_PARTKEY and PS_SUPPKEY

PSKEY=`randpsup 1`

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

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

wait

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

cat $TXN1FILE $TXN2FILE >> $ISOFILE

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

C.20 iso6.sh

```
#!/bin/ksh
#
# $Header: iso6.sh 04-aug-99.09:22:12 mpoess Exp $
#
# iso6.sh
#
#  Copyright (c) Oracle Corporation 1999. All Rights Reserved.
#
#   NAME
#     iso6.sh - <one-line expansion of the name>
#
#  DESCRIPTION
#     Usage: iso6.sh [-u user/password] [-n remote_node] -h
#     Options: See usage below
#  NOTES
#      For a cross node isolation test, assume the local node is
#      one of the participating nodes.  The other node can be
#      specified by the -n option.
#      We need to make sure the remote node has access to the
#      file system on the local node.  Otherwise, we need to rcp
#      the keyfile to the remote system.
#      You need to set the environment variable TPCD_KIT_DIR
#
#   MODIFIED   (MM/DD/YY)
#   mpoess      08/04/99 - Creation
#   mpoess      08/04/99 - Creation
#

. $KIT_DIR/env

# May need to change the following:
RSH=rsh

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

```
DURA_DIR=$ACID_DIR/dura

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

USER=$DATABASE_USER
PROG=atranspl

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

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

usage() {

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

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

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


# generate key files

randkey 1 0.1 u"$USER" > $KEYFILE
#rcp $KEYFILE ${HOST}:$KEYFILE

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

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

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

sleep 1

# start Query 1, use 0 as the delta

echo "Running Query 21 at `date`" >> $TXN1FILE
sqlplus $USER @$KIT_DIR/acid/isolation/q21 >>
$TXN1FILE &

# sleep 2 seconds before starting ACID transaction

sleep 2

# start ACID transaction, COMMIT after one second

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

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

# start Query 1

sleep 2

echo "Running 2nd Query 21 at `date`" >> $TXN3FILE
sqlplus $USER @$KIT_DIR/acid/isolation/q21 >>
$TXN3FILE &
# wait for everyone to finish

wait

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

cat $TXN1FILE $TXN2FILE $TXN3FILE >> $ISOFILE

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

C.21 prepare4acid.sh

```
#!/bin/ksh
#
# $Header: prepare4acid.sh 12-aug-99.17:09:18 mpoess Exp
$
#
```

```
# prepare4acid.sh
#
#  Copyright (c) Oracle Corporation 1999. All Rights
Reserved.
#
#   NAME
#     prepare4acid.sh
#
#   DESCRIPTION
#    Prepares the qualification database for the acid tests.
#
#   NOTES
#
#   MODIFIED   (MM/DD/YY)
#   mpoess      08/12/99 - Creation
#   mpoess      08/12/99 - Creation
#
. $KIT_DIR/env

sqlplus $DATABASE_USER @d_hist
sqlplus $DATABASE_USER @atrans
```

C.22 q1.sql

```
 Rem
Rem $Header: template.sql 06-feb-96.13:23:14 mpoess
Exp $
Rem
Rem q1.sql
Rem
Rem  Copyright (c) Oracle Corporation 2001. All Rights
Reserved.
Rem
Rem    NAME
Rem      q1.sql - <one-line expansion of the name>
Rem
Rem    DESCRIPTION
Rem      used in isolation test 6
Rem
Rem    NOTES
Rem      <other useful comments, qualifications, etc.>
Rem
Rem    MODIFIED   (MM/DD/YY)
Rem    mpoess      02/13/01 - Created
Rem

set serverout on;

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

select
      l_returnflag,
      l_linestatus,
      sum(l_quantity) as sum_qty,
      sum(l_extendedprice) as sum_base_price,
      sum(l_extendedprice * (1 - l_discount)) as
sum_disc_price,
      sum(l_extendedprice * (1 - l_discount) * (1 + l_tax)) as
sum_charge,
      avg(l_quantity) as avg_qty,
      avg(l_extendedprice) as avg_price,
      avg(l_discount) as avg_disc,
      count(*) as count_order
from
      lineitem
where
      l_shipdate <= to_date ('1998-12-01','YYYY-MM-DD')
- 0
group by
      l_returnflag,
      l_linestatus
order by
      l_returnflag,
      l_linestatus;

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

exit;
```

C.23 q21.sql

```
set serverout on;

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



select * from (
select
      s_name,
      count(*)  numwait
from
      supplier,
      lineitem l1,
      orders,
      nation
where
      s_suppkey = l1.l_suppkey
      and o_orderkey = l1.l_orderkey
      and o_orderstatus = 'F'
      and l1.l_receiptdate > l1.l_commitdate
      and exists (
            select
```

```
                *
            from
                lineitem l2
            where
                l2.l_orderkey = l1.l_orderkey
                and l2.l_suppkey <> l1.l_suppkey
        )
        and not exists (
            select
                *
            from
                lineitem l3
            where
                l3.l_orderkey = l1.l_orderkey
                and l3.l_suppkey <> l1.l_suppkey
                and l3.l_receiptdate > l3.l_commitdate
        )
        and s_nationkey = n_nationkey
        and n_name = 'SAUDI ARABIA'
group by
        s_name
order by
        numwait desc,
        s_name)
where rownum <= 10;

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

exit;
```

C.24 randkey.c

```
/* Copyright (c) 2001, 2002, Oracle Corporation.  All rights
reserved.  */

/*

  NAME
    randkey.c - <one-line expansion of the name>

  DESCRIPTION
    Generate random keys for ACID transactions:
    O_ORDERKEY unique random (1..SF*150000*4) and
only
    first 8 keys out of every 32 are populated.
      and
    L_ORDERKEY based on Clause 3.1.6.2
    DELTA random (1..100)
*/

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

#define ORDERCNT 150000.0

/* MK_SPARSE adopted from dss.h */

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

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

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

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

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

/* OCI handles */

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

OCIBind *l_key_bp;
OCIBind *o_key_bp;

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

char sqlstmt[1024];


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


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

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

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

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

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

 ACIDexit();

 exit(1);
}
```

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

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

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

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

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

 argc -= 2;
 argv += 2;

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

 ACIDinit();

 /* initialize array for random numbers */

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

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

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

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

    /* Obtain l_key from l_key query */

    OCIsexec(tpcsvc,curi,errhp,1);

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

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

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

  ACIDexit();
  free(res);

}


void usage() {

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

void ACIDinit()
{

  /* run random seed */

  srand48(getpid());

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

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

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

  /* get username and password */

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

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


OCIaset(tpcsvc,OCI_HTYPE_SVCCTX,tpcsrv,0,OCI_ATT
R_SERVER,errhp);

OCIaset(tpcusr,OCI_HTYPE_SESSION,lname,strlen(lname
),OCI_ATTR_USERNAME,
        errhp);

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

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


OCIaset(tpcsvc,OCI_HTYPE_SVCCTX,tpcusr,0,OCI_ATT
R_SESSION,errhp);

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

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


OCIbbname(curi,l_key_bp,errhp,":l_key",ADR(l_key),SIZ(l
_key),SQLT_INT);

OCIbbname(curi,o_key_bp,errhp,":o_key",ADR(o_key),SI
Z(o_key),SQLT_INT);
}
```

C.25 randpsup.c

```
/* Copyright (c) 2001, 2002, Oracle Corporation.  All rights
reserved.  */

/*

   NAME
     randpsup.c - <one-line expansion of the name>

   DESCRIPTION
     Generate random keys for ACID PARTSUPP
transactions:
```

```
    (Clause 4.2.3)
    PS_PARTKEY random within [SF*200000]
      and
    PS_SUPPKEY = (PS_PARTKEY + (i * ((S/4) +
(int)(PS_PARTKEY - 1)
                /S))) % S + 1
    where i random within [0..3] and S = SF * 10000

MODIFIED
  mpoess     10/23/02 - mpoess_update_from_visa
  mpoess     01/04/01 - Creation

*/

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

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

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

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

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


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

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

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

  /* seed the random number generator */

  srand48(getpid());

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

  PART_SUPP_BRIDGE(ps_skey, pkey, supp);

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

  exit(0);
}


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

C.26 run_acid.sh

```
#!/bin/ksh
#
# $Header: run_acid.sh 08-aug-99.15:30:10 mpoess Exp $
#
# run_acid.sh
#
#  Copyright (c) Oracle Corporation 1999. All Rights
Reserved.
#
#    NAME
#      run_acid.sh - <one-line expansion of the name>
#
#  DESCRIPTION
#      Usage: run_acid.sh [-n iter] [-s stream] [-p prog] [-i
infile]
#                         [-o outfile] [-d durafile] [-u usr/pswd]
#                         [-t trigger] [-f scale factor] -h
#
#      Options: See usage below
#
#    MODIFIED   (MM/DD/YY)
#    mpoess      08/08/99 - Creation
#    mpoess      08/08/99 - Creation
#

. $KIT_DIR/env

OH=$ORACLE_HOME
ACID_DIR=$ACID_DIR
OUT_DIR=$ACID_OUT

usage() {

   echo ""
   echo "Usage: $0 [-n iter] [-s stream] [-p prog] [-i infile] [-
o outfile]"
   echo "          [-d durafile] [-u usr/pswd] -h"
   echo ""
```

```
  echo "-n iter     : number of iterations, default is 100"
  echo "-s stream   : number of streams, default is 2"
  echo "-p prog     : program to run, default is atranspl.ott"
  echo "-i infile   : input file prefix, suffix by process
number within a"
  echo "              stream and run ID, default is ./acid_in"
  echo "-o outfile  : output file prefix, similar to input file"
  echo "              default is ./out/acid_out"
  echo "-d durafile : durability file prefix, used for durability
tests"
  echo "              default is ./dura/acid_dura"
  echo "-u usr/pswd : user/password combo for database
access, default is tpch/tpch"
  echo "-t trigger  : trigger time between process starts,
default is 1 second"
  echo "-h          : print this usage summary"
  exit 1;
}

ITER=1000
STEM=${NUM_STREAMS}
let STEM="$STEM + 1" # add one for the update stream
SF=1
PROG=atranspl
IN=${ACID_DIR}/acid_in
DURA_DIR=$ACID_OUT/dura
OUT=$DURA_DIR/drate
DURA=$DURA_DIR/dura
KEY=${DURA_DIR}/key$$_
echo "$$" > ${DURA_DIR}/shellpid
USER=tpch/tpch
TRIG=1
HCNT=duracntb

set -- `getopt "n:s:p:i:o:d:u:ht:f:" "$@"` || usage

# get all the options

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

#collect system info before durability start
cat /var/adm/syslog/syslog.log >
${DURA_DIR}/syslog_pre_dura 2>&1
ps -ef > ${DURA_DIR}/ps.out.pre_dura 2>&1

cat
$ORACLE_HOME/log/diag/rdbms/1gb/qual/trace/alert_qua
l.log > ${DURA_DIR}/alert_qual.log.p
re_dura 2>&1

cat
$ORACLE_HOME/log/diag/asm/+asm/ASM/trace/alert_A
SM.log > ${DURA_DIR}/alert_ASM.log.pre_d
ura 2>&1


echo "Starting ACID run..."

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

# Get history count before the run

sqlplus $USER @cnt_hist > $DURA_DIR/$HCNT 2>&1

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

wait
# perform the consistency

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

echo "Starting Transaction Counting Program"
count_tx.sh $STEM 100 $DURA_DIR &

i=0
while [ $i -lt $STEM ]
do

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

done

wait
```

```
echo "ACID run completed"
```

C.27 sample.sh

```
#!/bin/ksh
#
# $Header: sample.sh 08-aug-99.17:10:00 mpoess Exp $
#
# sample.sh
#
#  Copyright (c) Oracle Corporation 1999. All Rights
Reserved.
#
#    NAME
#      sample.sh - <one-line expansion of the name>
#
#    DESCRIPTION
#      <short description of component this file
declares/defines>
#
#    NOTES
#      <other useful comments, qualifications, etc.>
#
#    MODIFIED   (MM/DD/YY)
#    mpoess      08/08/99 - Creation
#    mpoess      08/08/99 - Creation
#

# $1 durability output file

. $KIT_DIR/env

cat $1 | grep o_key | awk '{printf "%d \n", $2}' | head -106 >
/tmp/okey$$
cat $1 | grep l_key | awk '{printf "%d \n", $2}' | head -106 >
/tmp/lkey$$



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

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

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

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

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

C.28 sample.sql

```
Rem
Rem $Header: sample.sql 08-aug-99.17:10:34 mpoess Exp
$
Rem
Rem sample.sql
Rem
Rem  Copyright (c) Oracle Corporation 1999. All Rights
Reserved.
Rem
Rem    NAME
Rem      sample.sql - <one-line expansion of the name>
Rem
Rem    DESCRIPTION
Rem      <short description of component this file
declares/defines>
Rem
Rem    NOTES
Rem      <other useful comments, qualifications, etc.>
Rem
Rem    MODIFIED   (MM/DD/YY)
Rem    mpoess      08/08/99 - Creation
Rem    mpoess      08/08/99 - Created
Rem

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

exit;
```

Appendix D Query text and Output

Begin Execution at Wed Apr 22 09:44:23 2009

```
-- using default substitutions
-- @(#)1.sql        2.1.6.2
-- TPC-H/TPC-R Pricing Summary Report Query (Q1)
-- Functional Query Definition
-- Approved February 1998


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

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


4 rows processed.


-- @(#)2.sql      2.1.6.2
-- TPC-H/TPC-R Minimum Cost Supplier
Query (Q2)
-- Functional Query Definition
-- Approved February 1998


select * from (
select
s_acctbal,
s_name,
n_name,
p_partkey,
p_mfgr,
s_address,
s_phone,
s_comment
from
part,
supplier,
partsupp,
nation,
region
where
p_partkey = ps_partkey
and s_suppkey = ps_suppkey
and p_size = 15
and p_type like '%BRASS'
and s_nationkey = n_nationkey
and n_regionkey = r_regionkey
and r_name = 'EUROPE'
and ps_supplycost = (
select
min(ps_supplycost)
from
partsupp,
supplier,
nation,
region
where
p_partkey = ps_partkey
and s_suppkey = ps_suppkey
and s_nationkey = n_nationkey
and n_regionkey = r_regionkey
and r_name = 'EUROPE'
)
order by
```

```
s_acctbal desc,
n_name,
s_name,
p_partkey
)
where rownum <= 100
```

```
S_ACCTBAL S_NAME N_NAME
P_PARTKEY P_MFGR
S_ADDRESS S_PHONE
S_COMMENT
9938.53 Supplier#000005359 UNITED
KINGDOM
185358.00 Manufacturer#4
QKuHYh,vZGiwu2FWEJoLDx04 33-429-790-
6131
uriously regular requests hag
9937.84 Supplier#000005969 ROMANIA
108438.00 Manufacturer#1
ANDENSOSmk,miq23Xfb5RWt6dvUcvt6Qa 29-520-
692-3537
efully express instructions. regular requests against the slyly
fin
9936.22 Supplier#000005250 UNITED
KINGDOM
249.00 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
29821.00 Manufacturer#4
y3OD9UywSTOk 17-779-299-1839
ackages boost blithely. blithely regular deposits c
9871.22 Supplier#000006373 GERMANY
43868.00 Manufacturer#5
J8fcXWsTqM 17-813-485-8637
etect blithely bold asymptotes. fluffily ironic platelets wake
furiously; blit
<deleted>

7887.08 Supplier#000009792 GERMANY
164759.00 Manufacturer#3
Y28ITVeYriT3kIGdV2K8fSZ V2UqT5H1Otz 17-988-
938-4296
ckly around the carefully fluffy theodolites. slyly ironic
pack
7871.50 Supplier#000007206 RUSSIA
104695.00 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
8363.00 Manufacturer#4
WCNfBPZeSXh3h,c 32-454-883-3821
usly unusual pinto beans. brave ideas sleep carefully quickly
ironi
7850.66 Supplier#000001518 UNITED
KINGDOM
86501.00 Manufacturer#1
ONda3YJiHKJOC 33-730-383-3892
ifts haggle fluffily pending pai
7843.52 Supplier#000006683 FRANCE
11680.00 Manufacturer#4
2Z0JGkiv01Y00oCFwUGfviIbhzCdy 16-464-517-
8943
express, final pinto beans x-ray slyly asymptotes. unusual,
unusual

100 rows processed.
```

```
-- @(#)3.sql 2.1.6.2
-- TPC-H/TPC-R Shipping Priority Query (Q3)
-- Functional Query Definition
-- Approved February 1998


select * from (
select
l_orderkey,
sum(l_extendedprice * (1 - l_discount)) as revenue,
o_orderdate,
o_shippriority
from
customer,
orders,
lineitem
where
c_mktsegment = 'BUILDING'
and c_custkey = o_custkey
and l_orderkey = o_orderkey
and o_orderdate < to_date( '1995-03-15', 'YYYY-MM-DD')
and l_shipdate > to_date( '1995-03-15', 'YYYY-MM-DD')
group by
l_orderkey,
o_orderdate,
o_shippriority
order by
revenue desc,
o_orderdate)
where rownum <= 10
```

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


10 rows processed.
```

```
-- @(#)4.sql        2.1.6.2
-- TPC-H/TPC-R Order Priority Checking Query (Q4)
-- Functional Query Definition
-- Approved February 1998


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

O_ORDERPRIORITY ORDER_COUNT
1-URGENT       10594.00
2-HIGH         10476.00
3-MEDIUM       10410.00
4-NOT SPECIFIED 10556.00
5-LOW          10487.00


5 rows processed.


-- @(#)5.sql        2.1.6.2
-- TPC-H/TPC-R Local Supplier Volume Query (Q5)
-- Functional Query Definition
-- Approved February 1998


select
n_name,
sum(l_extendedprice * (1 - l_discount)) as revenue
from
customer,
orders,
lineitem,
supplier,
nation,
region
where
c_custkey = o_custkey
and l_orderkey = o_orderkey
and l_suppkey = s_suppkey
and c_nationkey = s_nationkey
and s_nationkey = n_nationkey
and n_regionkey = r_regionkey
and r_name = 'ASIA'
and o_orderdate >= to_date( '1994-01-01',  'YYYY-MM-
DD')
and o_orderdate < add_months(to_date( '1994-01-01',
'YYYY-MM-DD'),  12)
group by
n_name
order by
revenue desc

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


5 rows processed.


-- @(#)6.sql        2.1.6.2
-- TPC-H/TPC-R Forecasting Revenue Change Query (Q6)
-- Functional Query Definition
-- Approved February 1998


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

REVENUE
123141078.23


1 row processed.


-- @(#)7.sql    2.1.6.2
-- TPC-H/TPC-R Volume Shipping Query (Q7)
-- Functional Query Definition
-- Approved February 1998


select
supp_nation,
```

```
cust_nation,
l_year,
sum(volume) as revenue
from
(
select
n1.n_name as supp_nation,
n2.n_name as cust_nation,
                                to_number (to_char
(l_shipdate,'yyyy')) as l_year,
l_extendedprice * (1 - l_discount) as volume
from
supplier,
lineitem,
orders,
customer,
nation n1,
nation n2
where
s_suppkey = l_suppkey
and o_orderkey = l_orderkey
and c_custkey = o_custkey
and s_nationkey = n1.n_nationkey
and c_nationkey = n2.n_nationkey
and (
(n1.n_name = 'FRANCE' and n2.n_name = 'GERMANY')
or (n1.n_name = 'GERMANY' and n2.n_name =
'FRANCE')
)
and l_shipdate between to_date( '1995-01-01', 'YYYY-MM-
DD') and to_date( '1996-12-31', 'YYYY-MM-DD')
) shipping
group by
supp_nation,
cust_nation,
l_year
order by
supp_nation,
cust_nation,
l_year
```

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


4 rows processed.
```

```
-- @(#)8a.sql       2.1.6.2
-- TPC-H/TPC-R National Market Share Query (Q8)
-- Approved February 1998


select
o_year,
sum(case when nation='BRAZIL' then volume else 0 end )/
sum(volume)
as mkt_share
from
(
select
to_number (to_char (o_orderdate, 'yyyy')) as o_year,
l_extendedprice * (1 - l_discount) as volume,
n2.n_name as nation
from
part,
supplier,
lineitem,
orders,
customer,
nation n1,
nation n2,
region
where
p_partkey = l_partkey
and s_suppkey = l_suppkey
and l_orderkey = o_orderkey
and o_custkey = c_custkey
and c_nationkey = n1.n_nationkey
and n1.n_regionkey = r_regionkey
and r_name = 'AMERICA'
and s_nationkey = n2.n_nationkey
and o_orderdate between to_date ('1995-01-01', 'YYYY-
MM-DD') and to_date ('1996-12-31', 'YYYY-MM-DD')
and p_type = 'ECONOMY ANODIZED STEEL'
) all_nations
group by
o_year
order by
o_year
```

```
O_YEAR               MKT_SHARE
1995.00              0.03
1996.00              0.04


2 rows processed.
```

```
-- @(#)9.sql        2.1.6.2
-- TPC-H/TPC-R Product Type Profit Measure Query (Q9)
-- Functional Query Definition
-- Approved February 1998


select
nation,
o_year,
sum(amount) as sum_profit
```

```
from
(
select
n_name as nation,
to_number (to_char (o_orderdate, 'yyyy')) as o_year,
l_extendedprice * (1 - l_discount) - ps_supplycost *
l_quantity as amount
from
part,
supplier,
                lineitem,
partsupp,
orders,
                nation
where
s_suppkey = l_suppkey
and ps_suppkey = l_suppkey
and ps_partkey = l_partkey
and p_partkey = l_partkey
and o_orderkey = l_orderkey
and s_nationkey = n_nationkey
and p_name like '%green%'
) profit
group by
nation,
o_year
order by
nation,
o_year desc
```

NATION	O_YEAR	SUM_PROFIT
ALGERIA	1998.00	31342867.23
ALGERIA	1997.00	57138193.02
ALGERIA	1996.00	56140140.13
ALGERIA	1995.00	53051469.65
ALGERIA	1994.00	53867582.13
ALGERIA	1993.00	54942718.13
ALGERIA	1992.00	54628034.71
ARGENTINA	1998.00	30211185.71
ARGENTINA	1997.00	50805741.75
ARGENTINA	1996.00	51923746.58
ARGENTINA	1995.00	49298625.77
ARGENTINA	1994.00	50835610.11
ARGENTINA	1993.00	51646079.18
ARGENTINA	1992.00	50410314.99
BRAZIL	1998.00	27217924.38
BRAZIL	1997.00	48378669.20
BRAZIL	1996.00	50482870.36
BRAZIL	1995.00	47623383.63
BRAZIL	1994.00	47840165.73
BRAZIL	1993.00	49054694.04

<deleted>

UNITED KINGDOM	1998.00	28494874.00
UNITED KINGDOM	1997.00	49381810.90
UNITED KINGDOM	1996.00	51386853.96
UNITED KINGDOM	1995.00	51509586.79
UNITED KINGDOM	1994.00	48086499.71
UNITED KINGDOM	1993.00	49166827.22
UNITED KINGDOM	1992.00	49349122.08
UNITED STATES	1998.00	25126238.95
UNITED STATES	1997.00	50077306.42
UNITED STATES	1996.00	48048649.47
UNITED STATES	1995.00	48809032.42
UNITED STATES	1994.00	49296747.18
UNITED STATES	1993.00	48029946.80
UNITED STATES	1992.00	48671944.50
VIETNAM	1998.00	30442736.06
VIETNAM	1997.00	50309179.79
VIETNAM	1996.00	50488161.41
VIETNAM	1995.00	49658284.61
VIETNAM	1994.00	50596057.26
VIETNAM	1993.00	50953919.15
VIETNAM	1992.00	49613838.32

175 rows processed.

```
-- @(#)10.sql       2.1.6.2
-- TPC-H/TPC-R Returned Item Reporting Query (Q10)
-- Functional Query Definition
-- Approved February 1998


select  *  from  (
select
c_custkey,
c_name,
sum(l_extendedprice * (1 - l_discount)) as revenue,
c_acctbal,
n_name,
c_address,
c_phone,
c_comment
from
customer,
orders,
lineitem,
nation
where
c_custkey = o_custkey
and l_orderkey = o_orderkey
and o_orderdate >= to_date ('1993-10-01',  'YYYY-MM-
DD')
and o_orderdate < add_months(  to_date( '1993-10-01',
'YYYY-MM-DD'),  3)
and l_returnflag = 'R'
and c_nationkey = n_nationkey
```

```
group by
c_custkey,
c_name,
c_acctbal,
c_phone,
n_name,
c_address,
c_comment
order by
revenue desc)
where rownum <= 20

C_CUSTKEY C_NAME REVENUE
C_ACCTBAL N_NAME
C_ADDRESS C_PHONE
C_COMMENT
57040.00 Customer#000057040 734235.25
632.87 JAPAN
Eioyzjf4pp 22-895-641-3466
sits. slyly regular requests sleep alongside of the regular inst
143347.00 Customer#000143347 721002.69
2557.47 EGYPT
1aReFYv,Kw4 14-742-935-3718
ggle carefully enticing requests. final deposits use bold, bold
pinto beans. ironic, idle re
60838.00 Customer#000060838 679127.31
2454.77 BRAZIL
64EaJ5vMAHWJlBOxJklpNc2RJiWE 12-913-494-
9813
need to boost against the slyly regular account
101998.00 Customer#000101998 637029.57
3790.89 UNITED KINGDOM
01c9CILnNtfOQYmZj 33-593-865-6378
ress foxes wake slyly after the bold excuses. ironic platelets
are furiously carefully bold theodolites
125341.00 Customer#000125341 633508.09
4983.51 GERMANY
S29ODD6bceU8QSuuEJznkNaK 17-582-695-
5962
arefully even depths. blithely even excuses sleep furiously.
foxes use except the dependencies. ca

<deleted>

110246.00 Customer#000110246 566842.98
7763.35 VIETNAM
7KzflgX MDOq7sOkI 31-943-426-9837
egular deposits serve blithely above the fl
142549.00 Customer#000142549 563537.24
5085.99 INDONESIA
ChqEoK43OysjdHbtKCp6dKqjNyvvi9 19-955-562-
2398
sleep pending courts. ironic deposits against the carefully
unusual platelets cajole carefully express accounts.
146149.00 Customer#000146149 557254.99
1791.55 ROMANIA
s87fvzFQpU 29-744-164-6487
of the slyly silent accounts. quickly final accounts across
the
52528.00 Customer#000052528 556397.35
551.79 ARGENTINA
NFztyTOR10UOJ 11-208-192-3205
deposits hinder. blithely pending asymptotes breach slyly
regular re
23431.00 Customer#000023431 554269.54
3381.86 ROMANIA
HgiV0phqhaIa9aydNoIlb 29-915-458-2654
nusual, even instructions: furiously stealthy n


20 rows processed.


-- @(#)11.sql 2.1.6.2
-- TPC-H/TPC-R Important Stock Identification Query
(Q11)
-- Functional Query Definition
-- Approved February 1998


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

PS_PARTKEY VALUE
129760.00 17538456.86
166726.00 16503353.92
191287.00 16474801.97
161758.00 16101755.54
34452.00 15983844.72
139035.00 15907078.34
9403.00 15451755.62
154358.00 15212937.88
38823.00 15064802.86
```

```
85606.00          15053957.15
33354.00          14408297.40
154747.00         14407580.68
82865.00          14235489.78
76094.00          14094247.04
222.00            13937777.74
121271.00         13908336.00
55221.00          13716120.47
22819.00          13666434.28
76281.00          13646853.68
85298.00          13581154.93
85158.00          13554904.00

<deleted>

52338.00          7898638.08
194299.00         7898421.24
105235.00         7897829.94
77207.00          7897752.72
96712.00          7897575.27
10157.00          7897046.25
171154.00         7896814.50
79373.00          7896186.00
113808.00         7893353.88
27901.00          7892952.00
128820.00         7892882.72
25891.00          7890511.20
122819.00         7888881.02
154731.00         7888301.33
101674.00         7879324.60
51968.00          7879102.21
72073.00          7877736.11
5182.00           7874521.73


1048 rows processed.


-- @(#)12.sql      2.1.6.2
-- TPC-H/TPC-R Shipping Modes and Order Priority Query
(Q12)
-- Functional Query Definition
-- Approved February 1998


select
        l_shipmode,
        sum(case
                when o_orderpriority = '1-URGENT'
                        or o_orderpriority = '2-HIGH'
                        then 1
                else 0
        end) as high_line_count,
        sum(case
                when o_orderpriority <> '1-URGENT'
                        and o_orderpriority <> '2-HIGH'
                        then 1
                else 0
        end) as low_line_count
from
        orders,
        lineitem
where
        o_orderkey = l_orderkey
        and l_shipmode in ('MAIL', 'SHIP')
        and l_commitdate < l_receiptdate
        and l_shipdate < l_commitdate
and l_receiptdate >= to_date( '1994-01-01',  'YYYY-MM-
DD')
and l_receiptdate < add_months(to_date ('1994-01-01',
'YYYY-MM-DD'),  12)
group by
        l_shipmode
order by
        l_shipmode

L_SHIPMODE HIGH_LINE_COUNT
LOW_LINE_COUNT
MAIL       6202.00             9324.00
SHIP       6200.00             9262.00


2 rows processed.


-- @(#)13.sql      2.1.6.2
-- TPC-H/TPC-R Customer Distribution Query (Q13)
-- Functional Query Definition
-- Approved February 1998


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

C_COUNT             CUSTDIST
0.00                50005.00
9.00                6641.00
10.00               6532.00
11.00               6014.00
8.00                5937.00
```

```
12.00           5639.00
13.00           5024.00
19.00           4793.00
7.00            4687.00
17.00           4587.00
18.00           4529.00
20.00           4516.00
15.00           4505.00
14.00           4446.00
16.00           4273.00

<deleted>

3.00            415.00
30.00           376.00
31.00           226.00
32.00           148.00
2.00            134.00
33.00           75.00
34.00           50.00
35.00           37.00
1.00            17.00
36.00           14.00
38.00           5.00
37.00           5.00
40.00           4.00
41.00           2.00
39.00           1.00


42 rows processed.


-- @(#)14.sql       2.1.6.2
-- TPC-H/TPC-R Promotion Effect Query (Q14)
-- Functional Query Definition
-- Approved February 1998


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

PROMO_REVENUE
16.38

1 row processed.


-- @(#)15.sql   2.1.6.2
-- TPC-H/TPC-R Top Supplier Query (Q15)
-- Functional Query Definition
-- Approved February 1998


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

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


1 row processed.


-- @(#)16.sql       2.1.6.2
-- TPC-H/TPC-R Parts/Supplier Relationship Query (Q16)
-- Functional Query Definition
-- Approved February 1998


select
```

```
p_brand,
p_type,
p_size,
count(distinct ps_suppkey) as supplier_cnt
from
partsupp,
part
where
p_partkey = ps_partkey
and p_brand <> 'Brand#45'
and p_type not like 'MEDIUM POLISHED%'
and p_size in (49, 14, 23, 45, 19, 3, 36, 9)
and ps_suppkey not in (
select
s_suppkey
from
supplier
where
s_comment like '%Customer%Complaints%'
)
group by
p_brand,
p_type,
p_size
order by
supplier_cnt desc,
p_brand,
p_type,
p_size
```

```
P_BRAND    P_TYPE                  P_SIZE
SUPPLIER_CNT
Brand#41   MEDIUM BRUSHED TIN       3.00
28.00
Brand#54   STANDARD BRUSHED COPPER  14.00
27.00
Brand#11   STANDARD BRUSHED TIN     23.00
24.00
Brand#11   STANDARD BURNISHED BRASS 36.00
24.00
Brand#15   MEDIUM ANODIZED NICKEL   3.00
24.00
Brand#15   SMALL ANODIZED BRASS     45.00
24.00
Brand#15   SMALL BURNISHED NICKEL   19.00
24.00
Brand#21   MEDIUM ANODIZED COPPER   3.00
24.00
Brand#22   SMALL BRUSHED NICKEL     3.00
24.00
Brand#22   SMALL BURNISHED BRASS    19.00
24.00
Brand#25   MEDIUM BURNISHED COPPER  36.00
24.00
Brand#31   PROMO POLISHED COPPER    36.00
24.00
Brand#33   LARGE POLISHED TIN       23.00
24.00
Brand#33   PROMO POLISHED STEEL     14.00
24.00
Brand#35   PROMO BRUSHED NICKEL     14.00
24.00
Brand#41   ECONOMY BRUSHED STEEL    9.00
24.00
Brand#41   ECONOMY POLISHED TIN     19.00
24.00
Brand#41   LARGE PLATED COPPER      36.00
24.00
Brand#42   ECONOMY PLATED BRASS     3.00
24.00
Brand#42   STANDARD POLISHED TIN    49.00
24.00
Brand#43   PROMO BRUSHED TIN       3.00
24.00

<deleted>

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

```
Brand#55   STANDARD PLATED TIN       49.00
3.00


18314 rows processed.


-- @(#)17.sql      2.1.6.2
-- TPC-H/TPC-R Small-Quantity-Order Revenue Query
(Q17)
-- Functional Query Definition
-- Approved February 1998


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

AVG_YEARLY
348406.05


1 row processed.


-- @(#)18.sql      2.1.6.2
-- TPC-H/TPC-R Large Volume Customer Query (Q18)
-- Function Query Definition
-- Approved February 1998


select  *  from  (
select
c_name,
c_custkey,
o_orderkey,
o_orderdate,
o_totalprice,
sum(l_quantity)
from
customer,
orders,
lineitem
where
o_orderkey in (
select
l_orderkey
from
lineitem
group by
l_orderkey having
sum(l_quantity) > 300
)
and c_custkey = o_custkey
and o_orderkey = l_orderkey
group by
c_name,
c_custkey,
o_orderkey,
o_orderdate,
o_totalprice
order by
o_totalprice desc,
o_orderdate
)
where rownum <= 100

C_NAME                C_CUSTKEY
O_ORDERKEY            O_ORDERDATE
O_TOTALPRICE          SUM(L_QUANTITY)
Customer#000128120       128120.00            4722021.00
1994-04-07
544089.09             323.00
Customer#000144617       144617.00            3043270.00
1997-02-12
530604.44             317.00
Customer#000013940       13940.00             2232932.00
1997-04-13
522720.61             304.00
Customer#000066790       66790.00             2199712.00
1996-09-30
515531.82             327.00
Customer#000046435       46435.00             4745607.00
1997-07-03
508047.99             309.00
Customer#000015272       15272.00             3883783.00
1993-07-28
500241.33             302.00
Customer#000146608       146608.00            3342468.00
1994-06-12
499794.58             303.00
Customer#000096103       96103.00             5984582.00
1992-03-16
494398.79             312.00
Customer#000024341       24341.00             1474818.00
1992-11-15
491348.26             302.00
Customer#000137446       137446.00            5489475.00
1997-05-23
487763.25             311.00

<deleted>
```

```
Customer#000112987      112987.00       4439686.00
1996-09-17
418161.49       305.00
Customer#000012599      12599.00        4259524.00
1998-02-12
415200.61       304.00
Customer#000105410      105410.00       4478371.00
1996-03-05
412754.51       302.00
Customer#000149842      149842.00       5156581.00
1994-05-30
411329.35       302.00
Customer#000010129      10129.00        5849444.00
1994-03-21
409129.85       309.00
Customer#000069904      69904.00        1742403.00
1996-10-19
408513.00       305.00
Customer#000017746      17746.00        6882.00
1997-04-09
408446.93       303.00
Customer#000013072      13072.00        1481925.00
1998-03-15
399195.47       301.00
Customer#000082441      82441.00        857959.00
1994-02-07
382579.74       305.00
Customer#000088703      88703.00        2995076.00
1994-01-30
363812.12       302.00


57 rows processed.


-- @(#)19.sql       2.1.6.2
-- TPC-H/TPC-R Discounted Revenue Query (Q19)
-- Functional Query Definition
-- Approved February 1998


select
sum(l_extendedprice* (1 - l_discount)) as revenue
from
lineitem,
part
where
(
p_partkey = l_partkey
and p_brand = 'Brand#12'
and p_container in ('SM CASE', 'SM BOX', 'SM PACK',
'SM PKG')
and l_quantity >= 1 and l_quantity <= 1 + 10
and p_size between 1 and 5
and l_shipmode in ('AIR', 'AIR REG')
and l_shipinstruct = 'DELIVER IN PERSON'
)
or
(
p_partkey = l_partkey
and p_brand = 'Brand#23'
and p_container in ('MED BAG', 'MED BOX', 'MED PKG',
'MED PACK')
and l_quantity >= 10 and l_quantity <= 10 + 10
and p_size between 1 and 10
and l_shipmode in ('AIR', 'AIR REG')
and l_shipinstruct = 'DELIVER IN PERSON'
)
or
(
p_partkey = l_partkey
and p_brand = 'Brand#34'
and p_container in ('LG CASE', 'LG BOX', 'LG PACK', 'LG
PKG')
and l_quantity >= 20 and l_quantity <= 20 + 10
and p_size between 1 and 15
and l_shipmode in ('AIR', 'AIR REG')
and l_shipinstruct = 'DELIVER IN PERSON'
)

REVENUE
3083843.06


1 row processed.


-- @(#)20.sql       2.1.6.2
-- TPC-H/TPC-R Potential Part Promotion Query (Q20)
-- Function Query Definition
-- Approved February 1998


select
s_name,
s_address
from
supplier,
nation
where
s_suppkey in (
select
ps_suppkey
from
partsupp
where
ps_partkey in (
select
p_partkey
from
part
where
p_name like 'forest%'
)
and ps_availqty > (
select
0.5 * sum(l_quantity)
from
```

```
lineitem
where
l_partkey = ps_partkey
and l_suppkey = ps_suppkey
and l_shipdate >= to_date ('1994-01-01', 'YYYY-MM-DD')
and l_shipdate < add_months( to_date ('1994-01-01',
'YYYY-MM-DD'), 12)
)
)
and s_nationkey = n_nationkey
and n_name = 'CANADA'
order by
s_name

S_NAME                S_ADDRESS
Supplier#000000020    iybAE,RmTymrZVYaFZva2SH,j
Supplier#000000091
YV45D7TkfdQanOOZ7q9QxkyGUapU1oOWU6q3
Supplier#000000197
YC2Acon6kjY3zj3Fbxs2k4Vdf7X0cd2F
Supplier#000000226    83qOdU2EYRdPQAQhEtn
GRZEd
Supplier#000000285
Br7e1nnt1yxrw6ImgpJ7YdhFDjuBf
Supplier#000000378    FfbhyCxWvcPrO8ltp9
Supplier#000000402
i9Sw4DoyMhzhKXCH9By,AYSgmD
Supplier#000000530    0qwCMwobKY
OcmLyfRXlagA8ukENJv,
Supplier#000000688    D
fw5ocppmZpYBBIPI718hCihLDZ5KhKX
Supplier#000000710    f19YPvOyb
QoYwjKC,oPycpGfieBAcwKJo
Supplier#000000736
l6i2nMwVuovfKnuVgaSGK2rDy65DlAFLegiL7
Supplier#000000761
zlSLelQUj2XrvTTFnv7WAcYZGvvMTx882d4
Supplier#000000884    bmhEShejaS
Supplier#000000887    urEaTejH5POADP2ARrf
Supplier#000000935    ij98czM
2KzWe7dDTOxB8sq0UfCdvrX
Supplier#000000975    ,AC e,tBpNwKb5xMUzeohxlRn,
hdZJo73gFQF8y
Supplier#000001263    rQWr6nf8ZhB2TAiIDIvo5Io
Supplier#000001399    LmrocnIMSyYOWuANx7
Supplier#000001446
lch9HMNU1R7a0LIybsUodVknk6
Supplier#000001454    TOpimgu2TVXIjhiL93h,

<deleted>

Supplier#000008967    2kwEHyMG
7FwozNImAUE6mH0hYtqYculJM
Supplier#000008972    w2vF6
D5YZO3visPXsqVfLADTK
Supplier#000009032    qK,trB6Sdy4Dz1BRUFNy
Supplier#000009147    rOAuryHxpZ9eOvx
Supplier#000009252    F7cZaPUHwh1
ZKyj3xmAVWC1XdP ue1p5m,i
Supplier#000009278    RqYTzgxj93CLX
0mcYfCENOefD
Supplier#000009327    uoqMdf7e7Gj9dbQ53
Supplier#000009430    igRqmneFt
Supplier#000009567    r4Wfx4c3xsEAjcGj71HHZByornl
D9vrztXlv4
Supplier#000009601
51m637bO,Rw5DnHWFUvLacRx9
Supplier#000009709
rRnCbHYgDgl9PZYnyWKVYSUW0vKg
Supplier#000009753    wLhVEcRmd7PkJF4FBnGK7Z
Supplier#000009796    z,y4Idmr15DOvPUqYG
Supplier#000009799     4wNjXGa4OKWl
Supplier#000009811    E3iuyq7UnZxU7oPZIe2Gu6
Supplier#000009812
APFRMy3lCbgFga53n5t9DxzFPQPgnjrGt32
Supplier#000009862    rJzweWeN58
Supplier#000009868    ROjGgx5gvtkmnUUoeyy7v
Supplier#000009869
ucLqxzrpBTRMewGSM29t0rNTM30g1Tu3Xgg3mKag
Supplier#000009899    7XdpAHrzr1t,UQFZE
Supplier#000009974
7wJ,J5DKcxSU4Kp1cQLpbcAvB5AsvKT


204 rows processed.


-- @(#)21.sql       2.1.6.2
-- TPC-H/TPC-R Suppliers Who Kept Orders Waiting
Query (Q21)
-- Functional Query Definition
-- Approved February 1998


select * from (
select
s_name,
count(*)  numwait
from
supplier,
lineitem l1,
orders,
nation
where
s_suppkey = l1.l_suppkey
and o_orderkey = l1.l_orderkey
and o_orderstatus = 'F'
and l1.l_receiptdate > l1.l_commitdate
and exists (
select
*
from
lineitem l2
where
l2.l_orderkey = l1.l_orderkey
and l2.l_suppkey <> l1.l_suppkey
)
and not exists (
```

```
select
*
from
lineitem l3
where
l3.l_orderkey = l1.l_orderkey
and l3.l_suppkey <> l1.l_suppkey
and l3.l_receiptdate > l3.l_commitdate
)
and s_nationkey = n_nationkey
and n_name = 'SAUDI ARABIA'
group by
s_name
order by
numwait desc,
s_name)
where rownum <= 100
```

S_NAME	NUMWAIT
Supplier#000002829	20.00
Supplier#000005808	18.00
Supplier#000000262	17.00
Supplier#000000496	17.00
Supplier#000002160	17.00
Supplier#000002301	17.00
Supplier#000002540	17.00
Supplier#000003063	17.00
Supplier#000005178	17.00
Supplier#000008331	17.00
Supplier#000002005	16.00
Supplier#000002095	16.00
Supplier#000005799	16.00
Supplier#000005842	16.00
Supplier#000006450	16.00

<deleted>

Supplier#000009564	13.00
Supplier#000009896	13.00
Supplier#000000379	12.00
Supplier#000000673	12.00
Supplier#000000762	12.00
Supplier#000000811	12.00
Supplier#000000821	12.00
Supplier#000001337	12.00
Supplier#000001916	12.00
Supplier#000001925	12.00
Supplier#000002039	12.00
Supplier#000002357	12.00
Supplier#000002483	12.00

100 rows processed.

```
-- @(#)22.sql   2.1.4.2
-- TPC-H/TPC-R Global Sales Opportunity Query (Q22)
-- Functional Query Definition
-- Approved February 1998
select
cntrycode,
count(*) as numcust,
sum(c_acctbal) as totacctbal
from
(
select
substr(c_phone, 1, 2) as cntrycode,
c_acctbal
from
customer
where
substr(c_phone,1, 2) in
('13', '31', '23', '29', '30', '18', '17')
and c_acctbal > (
select
avg(c_acctbal)
from
customer
where
c_acctbal > 0.00
and substr(c_phone, 1, 2) in
('13', '31', '23', '29', '30', '18', '17')
)
and not exists (
select
*
from
orders
where
o_custkey = c_custkey
)
) custsale
group by
cntrycode
order by
cntrycode
```

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

7 rows processed.

Ended Executing this Stream at Wed Apr 22 09:44:40 2009

Stream Started at 1240418663.22
Stream Ended at 1240418680.98
Stream Processed in 17.76 seconds

SQL statements processed: 22

Appendix E Seed and Input Parameters

E.1 Seed

0419015828

E.2 qp1.0

```
14  1994-05-01
2  37  STEEL  AFRICA
9  powder
20  dodger  1996-01-01  MOZAMBIQUE
6  1997-01-01  0.05  25
17  Brand#52  MED JAR
18  313
8  UNITED KINGDOM  EUROPE
   ECONOMY BURNISHED BRASS
21  PERU
13  unusual requests
3  HOUSEHOLD  1995-03-04
22  18  32  16  26  30  20
   33
16  Brand#55  MEDIUM BURNISHED  45
   17  15  1  12  13  14
   43
4  1993-08-01
11  ETHIOPIA  0.0000001000
15  1993-06-01
1  72
10  1994-02-01
19  Brand#32  Brand#44  Brand#22
   1  19  24
5  EUROPE  1997-01-01
7  IRAN  UNITED KINGDOM
12  TRUCK AIR  1993-01-01
```

E.3 qp1.1

```
21  IRAN
3  BUILDING  1995-03-21
18  315
5  MIDDLE EAST  1997-01-01
11  CHINA  0.0000001000
7  BRAZIL  MOROCCO
6  1997-01-01  0.02  25
20  peach  1995-01-01  FRANCE
17  Brand#54  MED CAN
12  RAIL  TRUCK  1994-01-01
16  Brand#35  ECONOMY PLATED  29
   15  21  32  16  9  26
   44
15  1996-01-01
13  unusual requests
10  1994-12-01
2  24  BRASS  EUROPE
8  MOROCCO  AFRICA  LARGE
BRUSHED BRASS
14  1994-08-01
19  Brand#34  Brand#32  Brand#11
   6  20  20
9  pale
22  20  14  22  24  33  17
   19
1  80
4  1996-03-01
```

E.4 qp1.2

```
6  1997-01-01  0.08  24
17  Brand#51  JUMBO BOX
14  1994-11-01
16  Brand#25  STANDARD BRUSHED  32
   33  9  19  7  48  2
   6
19  Brand#41  Brand#15  Brand#15
   1  10  28
10  1993-09-01
9  moccasin
2  12  NICKEL  AFRICA
15  1993-10-01
8  GERMANY  EUROPE  LARGE
PLATED STEEL
5  AFRICA  1997-01-01
22  14  12  13  33  31  19
   29
12  AIR  MAIL  1994-01-01
7  ROMANIA  GERMANY
13  unusual requests
18  312
1  88
4  1993-12-01
20  blush  1993-01-01  VIETNAM
3  HOUSEHOLD  1995-03-06
11  FRANCE  0.0000001000
21  BRAZIL
```

E.5 qp1.3

```
8  UNITED STATES  AMERICA
   LARGE ANODIZED STEEL
5  ASIA  1997-01-01
4  1996-07-01
6  1997-01-01  0.05  25
17  Brand#53  JUMBO JAR
7  IRAQ  UNITED STATES
1  97
18  314
22  32  21  29  14  25  31
   24
14  1995-03-01
9  maroon
10  1994-06-01
```

15 1996-05-01
11 ROMANIA 0.0000001000
20 magenta 1996-01-01 IRAQ
2 50 COPPER EUROPE
21 ROMANIA
19 Brand#43 Brand#43 Brand#14
7 11 24
13 unusual requests
16 Brand#55 LARGE ANODIZED 2
41 39 23 26 40 1
22
12 REG AIR MAIL 1995-01-01
3 AUTOMOBILE 1995-03-23

E.6 qp1.4

5 EUROPE 1993-01-01
21 IRAQ
14 1995-06-01
19 Brand#45 Brand#31 Brand#54
2 12 20
15 1994-01-01
17 Brand#55 JUMBO CAN
12 SHIP MAIL 1995-01-01
6 1993-01-01 0.03 25
4 1994-04-01
9 lawn
8 MOZAMBIQUE AFRICA MEDIUM POLISHED STEEL
16 Brand#35 PROMO PLATED 39
13 9 10 41 37 48
42
11 GERMANY 0.0000001000
2 38 STEEL AMERICA
10 1993-03-01
18 315
1 105
13 unusual requests
7 CANADA MOZAMBIQUE
22 10 21 30 13 19 34
12
3 HOUSEHOLD 1995-03-08
20 tomato 1995-01-01 ALGERIA

E.7 qp1.5

21 CANADA
15 1996-08-01
4 1996-11-01
6 1993-01-01 0.08 24
7 SAUDI ARABIA INDIA
16 Brand#25 SMALL POLISHED 20
3 8 1 27 25 34
47
19 Brand#52 Brand#14 Brand#53
7 13 27
18 313
14 1995-09-01
22 19 32 18 26 17 27
25
11 SAUDI ARABIA 0.0000001000
13 unusual accounts
3 AUTOMOBILE 1995-03-25
1 113
2 25 BRASS EUROPE
5 MIDDLE EAST 1993-01-01
8 INDIA ASIA MEDIUM BURNISHED STEEL
20 goldenrod 1993-01-01 MOROCCO
12 MAIL TRUCK 1996-01-01
17 Brand#52 WRAP BOX
10 1993-12-01
9 hot

E.8 qpl.6

10 1994-10-01
3 FURNITURE 1995-03-10
15 1994-05-01
13 unusual accounts
6 1993-01-01 0.06 24
8 ALGERIA AFRICA SMALL BRUSHED STEEL
9 gainsboro
7 JAPAN ALGERIA
4 1994-08-01
11 INDIA 0.0000001000
22 23 30 18 24 32 12
13
18 314
12 TRUCK FOB 1995-01-01
1 60
5 AFRICA 1993-01-01
16 Brand#55 ECONOMY ANODIZED 6
13 42 11 3 19 10
9
2 13 NICKEL AMERICA
14 1995-12-01
19 Brand#54 Brand#52 Brand#52
2 14 23
20 rose 1997-01-01 ETHIOPIA
17 Brand#54 WRAP PACK
21 SAUDI ARABIA

E.9 qp1.7

18 312
8 PERU AMERICA SMALL PLATED COPPER
20 cornflower 1995-01-01 SAUDI ARABIA
21 JORDAN
2 1 TIN MIDDLE EAST
4 1997-03-01

22 19 28 14 11 27 30
21
17 Brand#51 WRAP CAN
1 68
11 VIETNAM 0.0000001000
9 dodger
19 Brand#51 Brand#35 Brand#41
8 15 20
3 AUTOMOBILE 1995-03-27
13 express accounts
5 AMERICA 1993-01-01
7 EGYPT PERU
10 1993-07-01
16 Brand#35 STANDARD BURNISHED
14 13 27 41 38 9
3 25
6 1993-01-01 0.03 25
14 1996-03-01
15 1996-11-01
12 RAIL FOB 1996-01-01

E.10 qp1.8

19 Brand#14 Brand#22 Brand#41
3 16 27
1 76
15 1994-08-01
17 Brand#53 SM BOX
5 ASIA 1993-01-01
8 INDONESIA ASIA SMALL ANODIZED COPPER
9 cornsilk
12 AIR FOB 1996-01-01
14 1996-07-01
7 VIETNAM INDONESIA
4 1994-11-01
3 FURNITURE 1995-03-12
20 navajo 1994-01-01 INDONESIA
16 Brand#25 MEDIUM POLISHED 18
6 11 20 29 17 19
32
6 1993-01-01 0.08 24
22 33 27 19 25 28 22
21
10 1994-04-01
13 express accounts
2 39 STEEL AMERICA
21 ETHIOPIA
18 313
11 INDONESIA 0.0000001000

E.11 qp1.9

8 ARGENTINA AMERICA STANDARD POLISHED COPPER
13 express deposits
2 27 BRASS MIDDLE EAST
20 aquamarine 1997-01-01 UNITED STATES
17 Brand#55 SM PACK
3 MACHINERY 1995-03-29
6 1994-01-01 0.06 24
21 RUSSIA
18 315
11 RUSSIA 0.0000001000
19 Brand#11 Brand#55 Brand#45
8 17 23
10 1995-01-01
15 1997-03-01
4 1997-06-01
22 34 24 19 29 26 17
27
1 84
7 JORDAN ARGENTINA
12 REG AIR FOB 1996-01-01
9 burnished
14 1996-10-01
5 EUROPE 1994-01-01
16 Brand#55 ECONOMY BRUSHED 10
43 18 50 13 26 39
34

E.12 qp1.10

6 1994-01-01 0.03 25
15 1994-12-01
18 312
17 Brand#52 SM CAN
12 FOB SHIP 1997-01-01
1 92
7 ETHIOPIA CHINA
2 14 NICKEL ASIA
22 24 20 16 33 29 34
22
13 express deposits
21 KENYA
10 1993-10-01
14 1997-01-01
9 black
3 BUILDING 1995-03-14
16 Brand#35 SMALL BURNISHED 9
23 30 35 28 37 16
8
20 lace 1995-01-01 KENYA
19 Brand#13 Brand#33 Brand#34
4 18 30
11 IRAN 0.0000001000
4 1995-03-01
8 CHINA ASIA STANDARD BURNISHED COPPER
5 MIDDLE EAST 1994-01-01

E.13 qp1.11

15 1997-06-01
14 1997-04-01
18 314
17 Brand#53 LG BOX
10 1994-08-01
20 sky 1994-01-01 CANADA
16 Brand#25 LARGE PLATED 12
4 39 49 13 47 42
5
11 UNITED KINGDOM 0.0000001000
1 100
8 IRAN MIDDLE EAST PROMO BRUSHED
COPPER
4 1997-10-01
22 11 21 19 10 31 33
14
5 AFRICA 1994-01-01
12 MAIL SHIP 1997-01-01
3 MACHINERY 1995-03-31
9 yellow
21 FRANCE
2 2 TIN MIDDLE EAST
13 express deposits
6 1994-01-01 0.09 24
19 Brand#25 Brand#21 Brand#33
9 19 26
7 RUSSIA IRAN

E.14 qp1.12

1 108
7 KENYA BRAZIL
16 Brand#55 PROMO BRUSHED 25
14 34 38 36 5 19
7
17 Brand#55 LG PACK
18 315
22 30 20 18 12 10 16
14
12 TRUCK SHIP 1997-01-01
6 1994-01-01 0.06 24
8 BRAZIL AMERICA PROMO
POLISHED TIN
9 thistle
11 IRAQ 0.0000001000
4 1995-07-01
2 40 COPPER ASIA
5 AMERICA 1994-01-01
20 drab 1997-01-01 CHINA
21 UNITED KINGDOM
13 express deposits
10 1993-05-01
19 Brand#22 Brand#54 Brand#33
4 20 23
3 BUILDING 1995-03-16
14 1997-07-01
15 1995-03-01

E.15 qp1.13

21 MOZAMBIQUE
17 Brand#52 LG CAN
7 FRANCE ROMANIA
3 HOUSEHOLD 1995-03-02
1 116
10 1994-02-01
12 RAIL SHIP 1997-01-01
22 18 14 16 21 10 33
19
9 slate
16 Brand#45 MEDIUM ANODIZED 19
35 43 24 9 13 15
2
6 1995-01-01 0.04 25
11 UNITED STATES 0.0000001000
2 28 BRASS AFRICA
4 1993-04-01
5 EUROPE 1995-01-01
14 1997-11-01
8 ROMANIA EUROPE PROMO
BURNISHED TIN
20 peru 1996-01-01 INDIA
13 express deposits
18 313
15 1997-10-01
19 Brand#24 Brand#42 Brand#22
9 10 30

E.16 qp1.14

2 15 NICKEL ASIA
9 saddle
5 MIDDLE EAST 1995-01-01
4 1995-11-01
18 314
1 63
20 brown 1994-01-01 UNITED KINGDOM
15 1995-07-01
16 Brand#25 ECONOMY PLATED 22
6 17 47 2 14 12
21
17 Brand#54 MED BOX
7 UNITED KINGDOM IRAQ
21 INDIA
13 special packages
14 1993-02-01
19 Brand#31 Brand#25 Brand#21
5 11 26
8 IRAQ MIDDLE EAST ECONOMY
BRUSHED TIN
22 33 16 12 13 32 15
34
11 JAPAN 0.0000001000

10 1994-11-01
3 BUILDING 1995-03-18
12 AIR REG AIR 1993-01-01
6 1995-01-01 0.09 24

E.17 qp1.15

16 Brand#55 STANDARD POLISHED 3
30 37 1 47 4 9
12
9 puff
17 Brand#51 MED PACK
8 CANADA AMERICA ECONOMY
PLATED TIN
14 1993-05-01
11 ALGERIA 0.0000001000
10 1993-08-01
12 REG AIR SHIP 1997-01-01
6 1995-01-01 0.06 24
21 ALGERIA
7 MOROCCO CANADA
3 HOUSEHOLD 1995-03-04
15 1993-03-01
5 AFRICA 1995-01-01
22 24 14 27 19 18 21
31
20 maroon 1993-01-01 JAPAN
1 71
13 special packages
19 Brand#33 Brand#13 Brand#15
10 12 22
2 3 TIN AFRICA
4 1993-08-01
18 312

E.18 qp1.16

1 79
3 AUTOMOBILE 1995-03-20
6 1995-01-01 0.04 25
5 AMERICA 1995-01-01
2 41 COPPER EUROPE
16 Brand#45 LARGE ANODIZED 41
25 36 6 4 50 8
22
14 1993-08-01
22 31 13 18 14 16 32
11
17 Brand#53 MED CAN
20 tomato 1996-01-01 BRAZIL
4 1996-03-01
9 papaya
10 1994-06-01
11 JORDAN 0.0000001000
15 1995-10-01
8 SAUDI ARABIA MIDDLE EAST ECONOMY
ANODIZED NICKEL
12 FOB REG AIR 1993-01-01
19 Brand#35 Brand#41 Brand#14
5 13 29
18 314
13 special packages
7 GERMANY SAUDI ARABIA
21 PERU

E.19 qp1.17

3 FURNITURE 1995-03-06
16 Brand#21 PROMO BURNISHED 12
6 25 2 20 18 9
21
5 ASIA 1996-01-01
11 ARGENTINA 0.0000001000
21 INDONESIA
9 navajo
2 29 STEEL AFRICA
15 1993-07-01
10 1993-03-01
18 315
17 Brand#15 JUMBO BOX
7 UNITED STATES JAPAN
8 JAPAN ASIA LARGE POLISHED NICKEL
19 Brand#42 Brand#24 Brand#14
10 14 26
14 1993-11-01
13 special packages
1 87
4 1993-12-01
22 18 11 24 13 20 23
27
20 green 1994-01-01 PERU
6 1996-01-01 0.09 24
12 MAIL REG AIR 1993-01-01

E.20 qp1.18

14 1994-03-01
4 1996-06-01
13 special packages
5 EUROPE 1996-01-01
21 ARGENTINA
11 KENYA 0.0000001000
8 EGYPT MIDDLE EAST LARGE BURNISHED
NICKEL
6 1996-01-01 0.07 24
3 AUTOMOBILE 1995-03-22
17 Brand#12 JUMBO PACK
2 17 NICKEL EUROPE
20 rosy 1993-01-01 GERMANY
1 95
19 Brand#44 Brand#12 Brand#53
6 15 22
10 1993-12-01
9 medium
12 TRUCK REG AIR 1994-01-01
18 313

15 1996-01-01
7 MOZAMBIQUE EGYPT
22 17 34 22 10 25 30
21
16 Brand#51 SMALL POLISHED 5
40 4 15 50 25 9
26

E.21 qp1.19

4 1994-03-01
12 RAIL AIR 1994-01-01
22 31 13 18 32 19 10
23
14 1994-06-01
5 MIDDLE EAST 1996-01-01
15 1993-10-01
16 Brand#41 LARGE BRUSHED 40
10 24 14 46 48 1
33
2 4 TIN AMERICA
8 VIETNAM ASIA MEDIUM BRUSHED
NICKEL
10 1994-09-01
17 Brand#14 JUMBO CAN
9 lemon
21 ROMANIA
7 INDIA VIETNAM
3 FURNITURE 1995-03-08
6 1996-01-01 0.04 25
13 special requests
18 314
11 BRAZIL 0.0000001000
20 cornsilk 1996-01-01 VIETNAM
19 Brand#41 Brand#45 Brand#52
1 16 29
1 103

E.22 qp1.20

16 Brand#21 STANDARD BURNISHED
18 11 20 38 6 9
39 35
15 1996-05-01
14 1994-09-01
13 special requests
4 1996-10-01
22 34 11 32 18 27 17
16
18 312
19 Brand#54 Brand#33 Brand#51
6 17 25
7 ALGERIA JORDAN
1 111
12 AIR RAIL 1996-01-01
17 Brand#11 WRAP BOX
5 AFRICA 1996-01-01
10 1993-07-01
20 navy 1995-01-01 IRAQ
3 MACHINERY 1995-03-24
9 indian
21 IRAQ
11 MOROCCO 0.0000001000
2 42 COPPER EUROPE
6 1996-01-01 0.02 25
8 JORDAN MIDDLE EAST MEDIUM
PLATED NICKEL

E.23 qp1.21

20 azure 1993-01-01 ARGENTINA
14 1994-12-01
21 CANADA
12 SHIP AIR 1994-01-01
15 1994-02-01
17 Brand#13 WRAP PACK
4 1994-07-01
19 Brand#51 Brand#11 Brand#41
2 18 21
13 special requests
10 1994-04-01
11 CANADA 0.0000001000
1 119
16 Brand#51 MEDIUM PLATED 46
8 17 7 43 31 16
5
5 AMERICA 1997-01-01
18 313
7 PERU ETHIOPIA
8 ETHIOPIA AFRICA MEDIUM
ANODIZED BRASS
22 12 29 13 11 15 10
17
9 ghost
6 1997-01-01 0.07 24
3 FURNITURE 1995-03-10
2 30 STEEL AMERICA

E.24 qp1.22

16 Brand#41 ECONOMY BRUSHED 45
16 42 1 31 37 4
6
14 1995-04-01
13 pending requests
2 18 BRASS MIDDLE EAST
21 SAUDI ARABIA
10 1995-01-01
11 MOZAMBIQUE 0.0000001000
4 1997-02-01
1 66
22 17 27 15 10 12 20
18
18 315
12 FOB AIR 1995-01-01

19 Brand#53 Brand#54 Brand#45
7 19 29
5 ASIA 1997-01-01
7 INDONESIA RUSSIA
8 RUSSIA EUROPE SMALL POLISHED
BRASS
6 1997-01-01 0.04 25
3 MACHINERY 1995-03-26
15 1996-08-01
20 lavender 1997-01-01 MOROCCO
9 drab
17 Brand#15 WRAP CAN

E.25 qp1.23

18 312
15 1994-05-01
9 cream
14 1995-07-01
12 MAIL RAIL 1995-01-01
2 5 TIN AMERICA
8 KENYA AFRICA SMALL BURNISHED
BRASS
11 EGYPT 0.0000001000
22 12 16 33 13 34 19
20
21 JAPAN
16 Brand#21 SMALL ANODIZED 21
28 3 11 43 36 8
49
1 74
6 1997-01-01 0.02 25
17 Brand#11 SM BOX
5 EUROPE 1997-01-01
10 1993-10-01
19 Brand#15 Brand#32 Brand#44
2 20 25
4 1994-11-01
20 slate 1995-01-01 ETHIOPIA
13 pending accounts
3 BUILDING 1995-03-12
7 ARGENTINA KENYA

E.26 qp1.24

7 CHINA FRANCE
3 HOUSEHOLD 1995-03-28
10 1994-07-01
14 1995-10-01
13 pending accounts
21 ETHIOPIA
18 314
6 1997-01-01 0.07 24
20 firebrick 1994-01-01 SAUDI ARABIA
4 1997-06-01
9 chartreuse
8 FRANCE EUROPE STANDARD
BRUSHED BRASS
22 22 31 11 20 16 25
33
15 1996-12-01
2 43 COPPER MIDDLE EAST
1 82
5 AFRICA 1997-01-01
12 TRUCK RAIL 1995-01-01
19 Brand#12 Brand#25 Brand#33
7 10 21
17 Brand#13 SM PACK
11 PERU 0.0000001000
16 Brand#51 LARGE PLATED 16
44 25 30 29 5 22
11

E.27 qp1.25

18 315
1 90
13 pending accounts
7 IRAN UNITED KINGDOM
16 Brand#41 PROMO POLISHED 33
47 7 21 43 4 29
42
10 1993-05-01
14 1996-01-01
2 31 STEEL ASIA
19 Brand#14 Brand#53 Brand#33
3 11 28
5 AMERICA 1997-01-01
21 RUSSIA
11 ETHIOPIA 0.0000001000
22 12 17 10 14 25 29
33
15 1994-08-01
8 UNITED KINGDOM EUROPE
STANDARD PLATED BRASS
17 Brand#15 SM CAN
20 pink 1997-01-01 IRAN
3 BUILDING 1995-03-14
4 1995-03-01
12 RAIL MAIL 1994-01-01
6 1997-01-01 0.05 25
9 blanched

E.28 qp1.26

13 pending accounts
2 19 BRASS MIDDLE EAST
22 34 20 27 28 15 18
23
5 ASIA 1993-01-01
11 CHINA 0.0000001000
21 KENYA

20 burlywood 1995-01-01 UNITED STATES
14 1996-04-01
7 BRAZIL MOROCCO
10 1994-02-01
4 1997-10-01
9 antique
19 Brand#21 Brand#35 Brand#32
8 12 24
18 313
6 1993-01-01 0.02 25
3 HOUSEHOLD 1995-03-30
1 98
8 MOROCCO AFRICA STANDARD ANODIZED STEEL
15 1997-03-01
12 AIR RAIL 1996-01-01
17 Brand#12 LG BOX
16 Brand#21 MEDIUM ANODIZED 16
7 44 50 22 36 37
46

E.29 qp1.27

14 1996-08-01
17 Brand#14 LG PACK
21 FRANCE
8 GERMANY EUROPE PROMO POLISHED STEEL
2 7 NICKEL ASIA
9 turquoise
6 1993-01-01 0.08 24
4 1995-07-01
5 EUROPE 1993-01-01
13 pending accounts
22 24 19 14 16 13 22
17
7 ROMANIA GERMANY
15 1994-12-01
3 AUTOMOBILE 1995-03-16
1 106
18 314
16 Brand#11 ECONOMY BURNISHED
47 27 14 30 15 43
3 29
11 FRANCE 0.0000001000
10 1994-11-01
12 SHIP TRUCK 1996-01-01
20 medium 1994-01-01 KENYA
19 Brand#23 Brand#23 Brand#21
3 13 20

E.30 qp1.28

10 1993-08-01
22 18 27 34 11 20 23
10
1 114
12 FOB TRUCK 1996-01-01
13 pending deposits
18 312
21 UNITED KINGDOM
20 turquoise 1997-01-01 EGYPT
2 44 COPPER AFRICA
14 1996-11-01
16 Brand#41 STANDARD POLISHED 35
12 13 25 10 37 46
11
7 IRAQ UNITED STATES
15 1997-07-01
3 HOUSEHOLD 1995-03-02
4 1993-03-01
17 Brand#11 LG CAN
5 MIDDLE EAST 1993-01-01
19 Brand#25 Brand#51 Brand#25
8 14 28
6 1993-01-01 0.05 25
8 UNITED STATES AMERICA PROMO BURNISHED STEEL
9 snow
11 ROMANIA 0.0000001000

E.31 qp1.29

10 1994-05-01
8 MOZAMBIQUE AFRICA ECONOMY BRUSHED STEEL
9 sandy
18 313
12 MAIL TRUCK 1997-01-01
6 1993-01-01 0.03 25
1 61
5 AFRICA 1993-01-01
20 grey 1996-01-01 CHINA
11 GERMANY 0.0000001000
17 Brand#13 MED BOX
22 25 20 29 11 22 12
28
16 Brand#21 MEDIUM BRUSHED 2
10 32 14 12 6 16
31
3 AUTOMOBILE 1995-03-18
13 unusual deposits
2 32 STEEL ASIA
15 1995-03-01
21 MOROCCO
14 1997-02-01
19 Brand#32 Brand#44 Brand#24
4 15 24
7 CANADA MOZAMBIQUE
4 1995-10-01

E.32 qp1.30

7 SAUDI ARABIA INDIA
17 Brand#15 MED PACK

22 18 15 25 31 12 14
20
5 AMERICA 1994-01-01
3 FURNITURE 1995-03-04
10 1993-03-01
13 unusual deposits
18 315
9 red
1 69
14 1997-05-01
15 1997-10-01
21 INDIA
19 Brand#34 Brand#22 Brand#14
9 16 20
16 Brand#11 PROMO BURNISHED 6
40 48 18 19 46 24
31
12 TRUCK SHIP 1997-01-01
8 INDIA ASIA ECONOMY PLATED STEEL
6 1994-01-01 0.08 24
11 SAUDI ARABIA 0.0000001000
20 royal 1994-01-01 INDIA
4 1993-07-01
2 20 BRASS AFRICA

E.33 qp1.31

2 8 NICKEL EUROPE
9 peru
21 ALGERIA
3 AUTOMOBILE 1995-03-20
4 1996-02-01
7 JAPAN ALGERIA
1 77
11 INDIA 0.0000001000
16 Brand#41 SMALL PLATED 31
11 29 47 9 25 22
35
5 ASIA 1994-01-01
20 cream 1993-01-01 UNITED KINGDOM
19 Brand#32 Brand#15 Brand#13
4 17 27
18 313
8 ALGERIA AFRICA ECONOMY
ANODIZED COPPER
17 Brand#12 MED CAN
13 unusual deposits
10 1993-12-01
12 RAIL MAIL 1997-01-01
15 1995-07-01
6 1994-01-01 0.05 24
14 1997-08-01
22 33 12 22 19 29 23
32

E.34 qp1.32

15 1993-04-01
12 REG AIR MAIL 1997-01-01
8 PERU AMERICA LARGE POLISHED
COPPER
4 1993-11-01
22 21 23 20 32 14 12
16
13 unusual deposits
16 Brand#21 LARGE BRUSHED 5
15 35 26 25 3 45
44
17 Brand#14 JUMBO BOX
18 314
3 FURNITURE 1995-03-06
7 EGYPT PERU
5 EUROPE 1994-01-01
6 1994-01-01 0.03 25
1 85
9 olive
11 VIETNAM 0.0000001000
21 PERU
10 1994-09-01
14 1997-12-01
20 olive 1996-01-01 JORDAN
19 Brand#44 Brand#43 Brand#12
9 18 23
2 46 TIN AFRICA

E.35 qp1.33

15 1995-10-01
16 Brand#11 STANDARD ANODIZED
4 3 21 47 48 14
41 23
2 33 STEEL EUROPE
11 INDIA 0.0000001000
17 Brand#11 JUMBO PACK
7 VIETNAM INDONESIA
5 MIDDLE EAST 1994-01-01
14 1993-03-01
20 azure 1994-01-01 BRAZIL
4 1996-06-01
21 INDONESIA
3 MACHINERY 1995-03-22
10 1993-06-01
9 midnight
12 SHIP MAIL 1993-01-01
8 INDONESIA ASIA LARGE BURNISHED
COPPER
13 unusual packages
6 1994-01-01 0.08 24
18 312
19 Brand#41 Brand#21 Brand#51
5 19 20
22 15 30 13 29 32 18
34
1 93

E.36 qp1.34

1 101
13 unusual packages
11 VIETNAM 0.0000001000
3 BUILDING 1995-03-08
4 1994-03-01
21 ARGENTINA
6 1995-01-01 0.06 24
14 1993-06-01
15 1993-07-01
22 10 31 16 19 23 32
27
18 313
9 lime
7 JAPAN ARGENTINA
5 AMERICA 1995-01-01
10 1994-03-01
20 lawn 1993-01-01 PERU
12 FOB MAIL 1993-01-01
16 Brand#41 MEDIUM PLATED 39
21 41 32 29 7 23
8
17 Brand#13 JUMBO CAN
8 ARGENTINA AMERICA MEDIUM
BRUSHED COPPER
19 Brand#43 Brand#14 Brand#51
10 20 27
2 21 BRASS AMERICA

E.37 qp1.35

14 1993-09-01
17 Brand#14 WRAP BOX
22 17 15 29 21 13 10
22
20 smoke 1996-01-01 GERMANY
8 CHINA ASIA MEDIUM PLATED COPPER
16 Brand#21 ECONOMY POLISHED 42
46 11 30 41 29 24
22
5 ASIA 1995-01-01
10 1995-01-01
1 109
13 unusual packages
2 9 NICKEL EUROPE
21 CHINA
12 MAIL FOB 1993-01-01
9 khaki
4 1996-10-01
18 315
3 MACHINERY 1995-03-24
7 EGYPT CHINA
6 1995-01-01 0.03 25
19 Brand#55 Brand#42 Brand#55
5 10 23
15 1996-02-01
11 INDONESIA 0.0000001000

E.37.1 qp1.36

9 green
17 Brand#11 WRAP PACK
7 VIETNAM IRAN
4 1994-07-01
5 EUROPE 1995-01-01
13 express packages
21 IRAQ
18 312
11 RUSSIA 0.0000001000
3 BUILDING 1995-03-10
22 13 16 23 15 32 30
33
1 117
6 1995-01-01 0.09 24
16 Brand#11 SMALL ANODIZED 7
1 27 50 25 42 28
8
20 floral 1995-01-01 RUSSIA
14 1993-12-01
15 1993-10-01
10 1993-10-01
8 IRAN MIDDLE EAST MEDIUM
BURNISHED TIN
2 47 TIN AMERICA
12 TRUCK FOB 1993-01-01
19 Brand#52 Brand#35 Brand#44
1 11 30

E.38 qp1.37

13 express requests
14 1994-04-01
5 MIDDLE EAST 1995-01-01
22 21 15 30 27 19 14
17
19 Brand#54 Brand#13 Brand#43
6 12 26
11 IRAN 0.0000001000
9 floral
6 1995-01-01 0.06 24
18 314
15 1996-05-01
8 BRAZIL AMERICA SMALL
BRUSHED TIN
10 1994-07-01
7 JORDAN BRAZIL
4 1997-02-01
17 Brand#13 WRAP CAN
16 Brand#41 LARGE BURNISHED 50
36 7 2 41 3 21
25
3 HOUSEHOLD 1995-03-26
1 64
12 RAIL FOB 1994-01-01
2 34 COPPER MIDDLE EAST
21 CANADA
20 plum 1993-01-01 IRAQ

E.39 qp1.38

20 burlywood 1997-01-01 ARGENTINA
5 AFRICA 1996-01-01
4 1994-10-01
14 1994-07-01
11 UNITED KINGDOM 0.0000001000
1 72
6 1996-01-01 0.03 25
16 Brand#21 PROMO POLISHED 2
7 41 6 40 21 14
17
8 ROMANIA EUROPE SMALL
PLATED TIN
22 11 16 20 14 33 17
29
7 ETHIOPIA ROMANIA
3 BUILDING 1995-03-12
2 22 BRASS AMERICA
12 REG AIR FOB 1994-01-01
21 SAUDI ARABIA
19 Brand#11 Brand#51 Brand#33
1 13 23
17 Brand#15 SM BOX
13 express requests
10 1993-04-01
15 1994-02-01
18 315
9 dark

E.40 qp1.39

3 HOUSEHOLD 1995-03-28
7 RUSSIA IRAQ
14 1994-10-01
15 1996-09-01
6 1996-01-01 0.09 24
5 AMERICA 1996-01-01
21 JAPAN
20 metallic 1995-01-01 MOZAMBIQUE
18 313
10 1994-01-01
4 1997-05-01
16 Brand#11 SMALL BRUSHED 6
14 38 33 27 13 30
22
19 Brand#13 Brand#34 Brand#32
6 14 30
1 80
13 express requests
9 chocolate
8 IRAQ MIDDLE EAST SMALL ANODIZED
TIN
17 Brand#12 SM PACK
11 IRAQ 0.0000001000
12 SHIP RAIL 1996-01-01
22 34 29 16 24 12 33
15
2 10 NICKEL MIDDLE EAST

E.41 qp1.40

13 express requests
15 1994-05-01
17 Brand#14 SM CAN
1 88
22 22 28 32 12 14 27
10
11 UNITED STATES 0.0000001000
3 AUTOMOBILE 1995-03-14
4 1995-02-01
7 KENYA CANADA
20 violet 1993-01-01 ETHIOPIA
14 1995-01-01
21 EGYPT
9 blush
8 CANADA AMERICA STANDARD
POLISHED TIN
2 48 TIN ASIA
18 314
16 Brand#41 ECONOMY BURNISHED
9 5 10 39 6 37
23 32
6 1996-01-01 0.06 24
10 1994-11-01
12 FOB SHIP 1995-01-01
5 ASIA 1996-01-01
19 Brand#15 Brand#12 Brand#31
2 15 26

E.42 qp1.41

14 1995-04-01
2 36 COPPER MIDDLE EAST
9 azure
20 honeydew 1997-01-01 SAUDI
ARABIA
6 1996-01-01 0.04 25
17 Brand#11 LG BOX
18 312
8 SAUDI ARABIA MIDDLE EAST STANDARD
BURNISHED NICKEL
21 VIETNAM
13 express requests
3 FURNITURE 1995-03-30
22 29 19 14 26 25 20
17
16 Brand#21 STANDARD PLATED 15
38 44 42 45 48 33
31
4 1997-09-01
11 JAPAN 0.0000001000
15 1996-12-01

1 96
10 1993-08-01
19 Brand#22 Brand#55 Brand#25
7 16 22
5 EUROPE 1996-01-01
7 FRANCE SAUDI ARABIA
12 MAIL SHIP 1995-01-01

E.43 qp1.42

21 KENYA
3 AUTOMOBILE 1995-03-16
18 313
5 MIDDLE EAST 1996-01-01
11 ALGERIA 0.0000001000
7 UNITED KINGDOM IRAQ
6 1996-01-01 0.09 24
20 saddle 1995-01-01 IRAN
17 Brand#13 LG PACK
12 TRUCK SHIP 1995-01-01
16 Brand#11 MEDIUM BRUSHED 16
41 29 21 1 40 9
33
15 1994-09-01
13 express accounts
10 1994-05-01
2 23 STEEL ASIA
8 IRAQ MIDDLE EAST PROMO BRUSHED NICKEL
14 1995-08-01
19 Brand#25 Brand#33 Brand#24
2 17 29
9 wheat
22 20 17 29 14 27 32
16
1 104
4 1995-06-01

E.44 qp1.43

6 1997-01-01 0.07 24
17 Brand#25 LG CAN
14 1995-11-01
16 Brand#42 PROMO ANODIZED 4
11 29 26 3 32 7
17
19 Brand#22 Brand#21 Brand#24
7 18 26
10 1993-02-01
9 steel
2 11 NICKEL AFRICA
15 1997-03-01
8 CANADA AMERICA PROMO PLATED NICKEL
5 AFRICA 1997-01-01
22 10 32 25 19 30 23
20
12 AIR REG AIR 1995-01-01
7 MOROCCO CANADA
13 special accounts
18 315
1 112
4 1993-03-01
20 cyan 1994-01-01 ALGERIA
3 FURNITURE 1995-03-01
11 JORDAN 0.0000001000
21 FRANCE

E.45 qp1.44

8 SAUDI ARABIA MIDDLE EAST PROMO ANODIZED NICKEL
5 AMERICA 1997-01-01
4 1995-10-01
6 1997-01-01 0.04 25
17 Brand#22 MED BOX
7 GERMANY SAUDI ARABIA
1 120
18 312
22 24 12 22 31 30 17
16
14 1996-02-01
9 sienna
10 1993-11-01
15 1994-12-01
11 ARGENTINA 0.0000001000
20 orange 1997-01-01 KENYA
2 49 TIN ASIA
21 UNITED KINGDOM
19 Brand#34 Brand#53 Brand#13
3 19 22
13 special accounts
16 Brand#32 SMALL PLATED 23
8 47 1 33 25 17
45
12 REG AIR MAIL 1995-01-01
3 MACHINERY 1995-03-18

E.46 qp1.45

5 EUROPE 1997-01-01
21 MOROCCO
14 1996-05-01
19 Brand#31 Brand#41 Brand#12
8 20 29
15 1997-07-01
17 Brand#24 MED PACK
12 SHIP REG AIR 1996-01-01
6 1997-01-01 0.09 25
4 1993-07-01
9 rosy
8 JAPAN ASIA ECONOMY POLISHED NICKEL
16 Brand#12 LARGE POLISHED 26
37 21 11 6 19 31
7

11 KENYA 0.0000001000
2 37 COPPER AFRICA
10 1994-09-01
18 314
1 68
13 special accounts
7 UNITED STATES JAPAN
22 14 27 25 28 34 31
21
3 FURNITURE 1995-03-03
20 beige 1996-01-01 EGYPT

E.47 qp1.46

21 GERMANY
15 1995-04-01
4 1996-02-01
6 1997-01-01 0.07 24
7 MOZAMBIQUE EGYPT
16 Brand#42 STANDARD ANODIZED
29 6 33 30 10 37
17 42
19 Brand#33 Brand#24 Brand#11
3 10 25
18 312
14 1996-09-01
22 32 12 13 18 29 15
26
11 BRAZIL 0.0000001000
13 special accounts
3 MACHINERY 1995-03-20
1 76
2 24 STEEL EUROPE
5 MIDDLE EAST 1997-01-01
8 EGYPT MIDDLE EAST ECONOMY
BURNISHED BRASS
20 lemon 1994-01-01 ROMANIA
12 FOB REG AIR 1996-01-01
17 Brand#21 MED CAN
10 1993-06-01
9 plum

E.48 qp1.47

10 1994-03-01
3 BUILDING 1995-03-05
15 1997-10-01
13 special deposits
6 1993-01-01 0.04 25
8 VIETNAM ASIA LARGE BRUSHED
BRASS
9 orchid
7 INDIA VIETNAM
4 1993-11-01
11 MOROCCO 0.0000001000
22 12 34 11 17 15 14
26
18 313
12 MAIL AIR 1996-01-01
1 84
5 AFRICA 1993-01-01
16 Brand#32 MEDIUM BURNISHED 33
4 42 19 28 45 41
17
2 12 BRASS AFRICA
14 1996-12-01
19 Brand#45 Brand#52 Brand#51
9 11 21
20 snow 1997-01-01 INDONESIA
17 Brand#22 JUMBO BOX
21 UNITED STATES

E.49 qp1.48

18 315
8 JORDAN MIDDLE EAST LARGE
PLATED BRASS
20 forest 1996-01-01 UNITED KINGDOM
21 PERU
2 50 TIN EUROPE
4 1996-05-01
22 33 28 31 12 17 13
22
17 Brand#24 JUMBO PACK
1 92
11 CANADA 0.0000001000
9 misty
19 Brand#42 Brand#45 Brand#55
4 12 29
3 MACHINERY 1995-03-22
13 special deposits
5 AMERICA 1993-01-01
7 ALGERIA JORDAN
10 1994-12-01
16 Brand#12 ECONOMY POLISHED 33
28 22 48 46 44 25
21
6 1993-01-01 0.02 25
14 1997-03-01
15 1995-07-01
12 RAIL AIR 1997-01-01

E.50 qp1.49

19 Brand#44 Brand#23 Brand#54
9 13 25
1 100
15 1993-04-01
17 Brand#21 JUMBO CAN
5 ASIA 1993-01-01
8 ETHIOPIA AFRICA LARGE
ANODIZED BRASS
9 magenta
12 AIR SHIP 1993-01-01
14 1997-06-01
7 PERU ETHIOPIA

4 1994-02-01
3 BUILDING 1995-03-07
20 powder 1994-01-01 JORDAN
16 Brand#42 STANDARD BRUSHED 39
37 13 27 35 48 17
1
6 1993-01-01 0.07 24
22 23 19 27 25 18 26
14
10 1993-09-01
13 special deposits
2 38 COPPER AMERICA
21 INDONESIA
18 312
11 MOZAMBIQUE 0.0000001000

E.51 qp1.50

8 RUSSIA EUROPE MEDIUM POLISHED
BRASS
13 special deposits
2 26 STEEL EUROPE
20 burnished 1993-01-01 CANADA
17 Brand#23 WRAP BOX
3 HOUSEHOLD 1995-03-24
6 1993-01-01 0.05 25
21 ARGENTINA
18 314
11 EGYPT 0.0000001000
19 Brand#51 Brand#11 Brand#43
4 14 21
10 1994-07-01
15 1995-11-01
4 1996-09-01
22 13 33 24 22 21 26
28
1 108
7 INDONESIA RUSSIA
12 REG AIR AIR 1997-01-01
9 lavender
14 1997-09-01
5 EUROPE 1993-01-01
16 Brand#32 LARGE BURNISHED 43
8 36 27 34 29 9
16

E.52 qp1.51

6 1994-01-01 0.02 25
15 1993-07-01
18 315
17 Brand#25 WRAP PACK
12 SHIP AIR 1993-01-01
1 116
7 ARGENTINA KENYA
2 13 BRASS AMERICA
22 27 28 20 21 16 19
11
13 pending packages
21 CHINA
10 1993-04-01
14 1993-01-01
9 honeydew
3 AUTOMOBILE 1995-03-09
16 Brand#12 PROMO PLATED 46
28 24 36 4 32 13
27
20 midnight 1996-01-01 PERU
19 Brand#53 Brand#44 Brand#43
10 15 28
11 PERU 0.0000001000
4 1994-06-01
8 KENYA AFRICA MEDIUM
BURNISHED STEEL
5 MIDDLE EAST 1994-01-01

E.53 qp1.52

15 1996-02-01
14 1993-04-01
18 313
17 Brand#22 WRAP DRUM
10 1994-01-01
20 wheat 1995-01-01 GERMANY
16 Brand#42 SMALL BRUSHED 40
29 9 16 14 37 3
25
11 ETHIOPIA 0.0000001000
1 63
8 FRANCE EUROPE SMALL
BRUSHED STEEL
4 1997-01-01
22 17 28 23 18 11 32
21
5 AFRICA 1994-01-01
12 FOB RAIL 1993-01-01
3 HOUSEHOLD 1995-03-26
9 frosted
21 IRAN
2 1 NICKEL MIDDLE EAST
13 pending packages
6 1994-01-01 0.07 24
19 Brand#55 Brand#32 Brand#42
5 16 24
7 CHINA FRANCE

E.54 qp1.53

1 71
7 IRAN UNITED KINGDOM
16 Brand#32 ECONOMY ANODIZED 10
15 6 36 13 28 49
37
17 Brand#24 SM BOX
18 314

22 21 23 19 34 25 26
33
12 MAIL RAIL 1993-01-01
6 1994-01-01 0.05 25
8 UNITED KINGDOM EUROPE
SMALL PLATED STEEL
9 dim
11 CHINA 0.0000001000
4 1994-10-01
2 39 COPPER AMERICA
5 AMERICA 1994-01-01
20 hot 1993-01-01 RUSSIA
21 BRAZIL
13 pending packages
10 1994-10-01
19 Brand#12 Brand#15 Brand#31
10 17 20
3 AUTOMOBILE 1995-03-11
14 1993-07-01
15 1993-11-01

E.55 qp1.54

21 SAUDI ARABIA
17 Brand#21 SM PACK
7 BRAZIL MOROCCO
3 FURNITURE 1995-03-28
1 79
10 1993-07-01
12 RAIL AIR 1996-01-01
22 22 21 13 11 26 32
20
9 cornflower
16 Brand#12 STANDARD PLATED 6
41 34 15 16 48 50
12
6 1994-01-01 0.02 25
11 FRANCE 0.0000001000
2 27 STEEL MIDDLE EAST
4 1997-05-01
5 ASIA 1994-01-01
14 1993-10-01
8 MOROCCO AFRICA SMALL
ANODIZED STEEL
20 salmon 1997-01-01 JAPAN
13 pending packages
18 312
15 1996-05-01
19 Brand#15 Brand#53 Brand#35
5 18 28

E.56 qp1.55

2 14 BRASS ASIA
9 burlywood
5 MIDDLE EAST 1995-01-01
4 1995-02-01
18 313
1 87
20 cyan 1995-01-01 ARGENTINA
15 1994-02-01
16 Brand#42 MEDIUM POLISHED 7
44 25 50 17 40 28
18
17 Brand#23 SM DRUM
7 ROMANIA GERMANY
21 JAPAN
13 pending packages
14 1994-01-01
19 Brand#12 Brand#31 Brand#34
1 19 24
8 GERMANY EUROPE STANDARD
POLISHED STEEL
22 13 20 23 34 26 19
30
11 ROMANIA 0.0000001000
10 1994-05-01
3 AUTOMOBILE 1995-03-13
12 AIR RAIL 1994-01-01
6 1995-01-01 0.08 24

E.57 qp1.56

16 Brand#32 PROMO ANODIZED 13
8 3 21 18 32 28
48
9 bisque
17 Brand#25 LG BOX
8 UNITED STATES AMERICA
STANDARD BURNISHED COPPER
14 1994-05-01
11 GERMANY 0.0000001000
10 1993-02-01
12 REG AIR TRUCK 1994-01-01
6 1995-01-01 0.05 25
21 EGYPT
7 IRAQ UNITED STATES
3 FURNITURE 1995-03-30
15 1996-09-01
5 AFRICA 1995-01-01
22 28 27 25 20 31 18
16
20 orchid 1993-01-01 MOZAMBIQUE
1 95
13 pending requests
19 Brand#24 Brand#14 Brand#24
6 20 20
2 2 NICKEL MIDDLE EAST
4 1997-09-01
18 315

E.58 qp1.57

1 103
3 MACHINERY 1995-03-15
6 1995-01-01 0.03 25

5 AMERICA 1995-01-01
2 40 COPPER ASIA
16 Brand#12 SMALL BURNISHED 16
4 44 3 8 42 13
2
14 1994-08-01
22 16 13 14 19 31 21
23
17 Brand#22 LG PACK
20 bisque 1997-01-01 FRANCE
4 1995-06-01
9 yellow
10 1993-11-01
11 SAUDI ARABIA 0.0000001000
15 1994-06-01
8 MOZAMBIQUE AFRICA PROMO
BRUSHED COPPER
12 SHIP TRUCK 1994-01-01
19 Brand#21 Brand#52 Brand#23
1 10 27
18 312
13 pending requests
7 CANADA MOZAMBIQUE
21 VIETNAM

E.59 qp1.58

3 BUILDING 1995-03-01
16 Brand#52 LARGE POLISHED 4
3 9 12 8 37 30
20
5 ASIA 1995-01-01
11 INDIA 0.0000001000
21 JORDAN
9 thistle
2 28 STEEL AFRICA
15 1996-12-01
10 1994-08-01
18 314
17 Brand#24 LG DRUM
7 SAUDI ARABIA INDIA
8 INDIA ASIA PROMO PLATED COPPER
19 Brand#23 Brand#35 Brand#22
6 11 23
14 1994-11-01
13 unusual requests
1 111
4 1993-02-01
22 34 13 27 20 17 12
21
20 light 1995-01-01 SAUDI ARABIA
6 1995-01-01 0.08 24
12 FOB TRUCK 1994-01-01

E.60 qp1.59

14 1995-02-01
4 1995-09-01
13 unusual requests
5 EUROPE 1995-01-01
21 ETHIOPIA
11 VIETNAM 0.0000001000
8 ALGERIA AFRICA PROMO
ANODIZED COPPER
6 1995-01-01 0.05 24
3 MACHINERY 1995-03-18
17 Brand#25 MED BOX
2 16 BRASS ASIA
20 spring 1994-01-01 IRAN
1 119
19 Brand#35 Brand#23 Brand#11
2 13 20
10 1993-05-01
9 slate
12 TRUCK RAIL 1995-01-01
18 315
15 1994-09-01
7 JAPAN ALGERIA
22 15 13 14 24 25 20
18
16 Brand#32 PROMO BRUSHED 6
45 12 22 44 9 4
20

E.61 qp1.60

4 1993-06-01
12 RAIL MAIL 1995-01-01
22 23 11 10 16 31 13
32
14 1995-05-01
5 MIDDLE EAST 1996-01-01
15 1997-04-01
16 Brand#12 MEDIUM BURNISHED 4
48 47 5 21 16 33
11
2 3 NICKEL AFRICA
8 PERU AMERICA ECONOMY
POLISHED COPPER
10 1994-03-01
17 Brand#22 MED PACK
9 saddle
21 UNITED KINGDOM
7 EGYPT PERU
3 BUILDING 1995-03-03
6 1996-01-01 0.03 25
13 unusual requests
18 313
11 INDONESIA 0.0000001000
20 forest 1997-01-01 ALGERIA
19 Brand#32 Brand#51 Brand#11
7 14 27
1 66

E.62 qp1.61

16 Brand#52 ECONOMY PLATED 29
37 31 10 35 4 27
23
15 1995-01-01
14 1995-09-01
13 unusual accounts
4 1996-01-01
22 25 23 31 26 19 10
30
18 315
19 Brand#34 Brand#44 Brand#55
2 15 23
7 VIETNAM INDONESIA
1 74
12 AIR MAIL 1995-01-01
17 Brand#24 MED DRUM
5 AFRICA 1996-01-01
10 1994-12-01
20 puff 1996-01-01 MOROCCO
3 HOUSEHOLD 1995-03-20
9 puff
21 MOROCCO
11 RUSSIA 0.0000001000
2 41 TIN EUROPE
6 1996-01-01 0.08 24
8 INDONESIA ASIA ECONOMY PLATED
TIN

E.63 qp1.62

20 chartreuse 1994-01-01 EGYPT
14 1995-12-01
21 GERMANY
12 REG AIR MAIL 1995-01-01
15 1997-07-01
17 Brand#21 JUMBO BOX
4 1993-10-01
19 Brand#41 Brand#21 Brand#54
8 16 30
13 unusual accounts
10 1993-09-01
11 IRAN 0.0000001000
1 82
16 Brand#32 STANDARD BRUSHED 33
8 7 10 47 36 17
28
5 AMERICA 1996-01-01
18 312
7 JORDAN ARGENTINA
8 ARGENTINA AMERICA ECONOMY
ANODIZED TIN
22 14 33 27 26 23 34
13
9 papaya
6 1996-01-01 0.06 24
3 BUILDING 1995-03-05
2 29 STEEL AFRICA

E.64 qp1.63

16 Brand#12 LARGE ANODIZED 27
29 50 40 7 15 12
33
14 1996-03-01
13 unusual accounts
2 17 BRASS EUROPE
21 UNITED STATES
10 1994-06-01
11 UNITED KINGDOM 0.0000001000
4 1996-05-01
1 90
22 33 31 18 15 20 12
26
18 314
12 SHIP MAIL 1996-01-01
19 Brand#43 Brand#54 Brand#53
3 17 26
5 ASIA 1996-01-01
7 ETHIOPIA CHINA
8 CHINA ASIA LARGE POLISHED TIN
6 1996-01-01 0.03 25
3 HOUSEHOLD 1995-03-22
15 1995-04-01
20 mint 1997-01-01 ROMANIA
9 navajo
17 Brand#23 JUMBO PACK

E.65 qp1.64

18 315
15 1993-01-01
9 medium
14 1996-06-01
12 FOB MAIL 1993-01-01
2 4 NICKEL AMERICA
8 IRAN MIDDLE EAST LARGE BURNISHED
TIN
11 IRAQ 0.0000001000
22 14 33 26 11 31 17
12
21 MOZAMBIQUE
16 Brand#52 PROMO PLATED 22
50 17 29 48 8 1
37
1 98
6 1997-01-01 0.09 24
17 Brand#25 JUMBO DRUM
5 EUROPE 1997-01-01
10 1993-03-01
19 Brand#45 Brand#42 Brand#43
8 18 23
4 1994-02-01
20 white 1996-01-01 INDONESIA
13 unusual accounts
3 AUTOMOBILE 1995-03-07
7 RUSSIA IRAN

E.66 qp2.0

```
14      1994-05-01
2       37      STEEL   AFRICA
9       powder
20      dodger  1996-01-01      MOZAMBIQUE
6       1997-01-01      0.05    25
17      Brand#52        MED JAR
18      313
8       UNITED KINGDOM  EUROPE
        ECONOMY BURNISHED BRASS
21      PERU
13      unusual requests
3       HOUSEHOLD       1995-03-04
22      18      32      16      26      30      20
        33
16      Brand#55        MEDIUM BURNISHED        45
        17      15      1       12      13      14
        43
4       1993-08-01
11      ETHIOPIA        0.0000001000
15      1993-06-01
1       72
10      1994-02-01
19      Brand#32        Brand#44        Brand#22
        1       19      24
5       EUROPE  1997-01-01
7       IRAN    UNITED KINGDOM
12      TRUCK AIR       1993-01-01
```

E.67 qp2.1

```
21      IRAN
3       BUILDING        1995-03-21
18      315
5       MIDDLE EAST     1997-01-01
11      CHINA   0.0000001000
7       BRAZIL  MOROCCO
6       1997-01-01      0.02    25
20      peach   1995-01-01      FRANCE
17      Brand#54        MED CAN
12      RAIL    TRUCK   1994-01-01
16      Brand#35        ECONOMY PLATED  29
        15      21      32      16      9       26
        44
15      1996-01-01
13      unusual requests
10      1994-12-01
2       24      BRASS   EUROPE
8       MOROCCO AFRICA  LARGE
BRUSHED BRASS
14      1994-08-01
19      Brand#34        Brand#32        Brand#11
        6       20      20
9       pale
22      20      14      22      24      33      17
        19
1       80
4       1996-03-01
```

E.68 qp2.2

```
6       1997-01-01      0.08    24
17      Brand#51        JUMBO BOX
14      1994-11-01
16      Brand#25        STANDARD BRUSHED        32
        33      9       19      7       48      2
        6
19      Brand#41        Brand#15        Brand#15
        1       10      28
10      1993-09-01
9       moccasin
2       12      NICKEL  AFRICA
15      1993-10-01
8       GERMANY EUROPE  LARGE
PLATED STEEL
5       AFRICA  1997-01-01
22      14      12      13      33      31      19
        29
12      AIR     MAIL    1994-01-01
7       ROMANIA GERMANY
13      unusual requests
18      312
1       88
4       1993-12-01
20      blush   1993-01-01      VIETNAM
3       HOUSEHOLD       1995-03-06
11      FRANCE  0.0000001000
21      BRAZIL
```

E.69 qp2.3

```
8       UNITED STATES   AMERICA
        LARGE ANODIZED STEEL
5       ASIA    1997-01-01
4       1996-07-01
6       1997-01-01      0.05    25
17      Brand#53        JUMBO JAR
7       IRAQ    UNITED STATES
1       97
18      314
22      32      21      29      14      25      31
        24
14      1995-03-01
9       maroon
10      1994-06-01
15      1996-05-01
11      ROMANIA 0.0000001000
20      magenta 1996-01-01      IRAQ
2       50      COPPER  EUROPE
21      ROMANIA
19      Brand#43        Brand#43        Brand#14
        7       11      24
13      unusual requests
```

```
16      Brand#55        LARGE ANODIZED  2
        41      39      23      26      40      1
        22
12      REG AIR         MAIL    1995-01-01
3       AUTOMOBILE      1995-03-23
```

E.70 qp2.4

```
5       EUROPE          1993-01-01
21      IRAQ
14      1995-06-01
19      Brand#45        Brand#31        Brand#54
        2       12      20
15      1994-01-01
17      Brand#55        JUMBO CAN
12      SHIP    MAIL    1995-01-01
6       1993-01-01      0.03    25
4       1994-04-01
9       lawn
8       MOZAMBIQUE      AFRICA          MEDIUM
POLISHED STEEL
16      Brand#35        PROMO PLATED    39
        13      9       10      41      37      48
        42
11      GERMANY         0.0000001000
2       38      STEEL   AMERICA
10      1993-03-01
18      315
1       105
13      unusual requests
7       CANADA          MOZAMBIQUE
22      10      21      30      13      19      34
        12
3       HOUSEHOLD       1995-03-08
20      tomato  1995-01-01      ALGERIA
```

E.71 qp2.5

```
21      CANADA
15      1996-08-01
4       1996-11-01
6       1993-01-01      0.08    24
7       SAUDI ARABIA    INDIA
16      Brand#25        SMALL POLISHED  20
        3       8       1       27      25      34
        47
19      Brand#52        Brand#14        Brand#53
        7       13      27
18      313
14      1995-09-01
22      19      32      18      26      17      27
        25
11      SAUDI ARABIA    0.0000001000
13      unusual accounts
3       AUTOMOBILE      1995-03-25
1       113
2       25      BRASS   EUROPE
5       MIDDLE EAST     1993-01-01
8       INDIA   ASIA    MEDIUM BURNISHED STEEL
20      goldenrod       1993-01-01      MOROCCO
12      MAIL    TRUCK   1996-01-01
17      Brand#52        WRAP BOX
10      1993-12-01
9       hot
```

E.72 qp2.6

```
10      1994-10-01
3       FURNITURE       1995-03-10
15      1994-05-01
13      unusual accounts
6       1993-01-01      0.06    24
8       ALGERIA         AFRICA          SMALL
BRUSHED STEEL
9       gainsboro
7       JAPAN   ALGERIA
4       1994-08-01
11      INDIA   0.0000001000
22      23      30      18      24      32      12
        13
18      314
12      TRUCK FOB       1995-01-01
1       60
5       AFRICA          1993-01-01
16      Brand#55        ECONOMY ANODIZED 6
        13      42      11      3       19      10
        9
2       13      NICKEL          AMERICA
14      1995-12-01
19      Brand#54        Brand#52        Brand#52
        2       14      23
20      rose    1997-01-01      ETHIOPIA
17      Brand#54        WRAP PACK
21      SAUDI ARABIA
```

E.73 qp2.7

```
18      312
8       PERU    AMERICA         SMALL PLATED
COPPER
20      cornflower      1995-01-01      SAUDI
ARABIA
21      JORDAN
2       1       TIN     MIDDLE EAST
4       1997-03-01
22      19      28      14      11      27      30
        21
17      Brand#51        WRAP CAN
1       68
11      VIETNAM         0.0000001000
9       dodger
19      Brand#51        Brand#35        Brand#41
        8       15      20
3       AUTOMOBILE      1995-03-27
13      express accounts
```

5 AMERICA 1993-01-01
7 EGYPT PERU
10 1993-07-01
16 Brand#35 STANDARD BURNISHED
14 13 27 41 38 9
3 25
6 1993-01-01 0.03 25
14 1996-03-01
15 1996-11-01
12 RAIL FOB 1996-01-01

E.74 qp2.8

19 Brand#14 Brand#22 Brand#41
3 16 27
1 76
15 1994-08-01
17 Brand#53 SM BOX
5 ASIA 1993-01-01
8 INDONESIA ASIA SMALL ANODIZED COPPER
9 cornsilk
12 AIR FOB 1996-01-01
14 1996-07-01
7 VIETNAM INDONESIA
4 1994-11-01
3 FURNITURE 1995-03-12
20 navajo 1994-01-01 INDONESIA
16 Brand#25 MEDIUM POLISHED 18
6 11 20 29 17 19
32
6 1993-01-01 0.08 24
22 33 27 19 25 28 22
21
10 1994-04-01
13 express accounts
2 39 STEEL AMERICA
21 ETHIOPIA
18 313
11 INDONESIA 0.0000001000

E.75 qp2.9

8 ARGENTINA AMERICA STANDARD POLISHED COPPER
13 express deposits
2 27 BRASS MIDDLE EAST
20 aquamarine 1997-01-01 UNITED STATES
17 Brand#55 SM PACK
3 MACHINERY 1995-03-29
6 1994-01-01 0.06 24
21 RUSSIA
18 315
11 RUSSIA 0.0000001000
19 Brand#11 Brand#55 Brand#45
8 17 23
10 1995-01-01
15 1997-03-01
4 1997-06-01
22 34 24 19 29 26 17
27
1 84
7 JORDAN ARGENTINA
12 REG AIR FOB 1996-01-01
9 burnished
14 1996-10-01
5 EUROPE 1994-01-01
16 Brand#55 ECONOMY BRUSHED 10
43 18 50 13 26 39
34

E.76 qp2.10

6 1994-01-01 0.03 25
15 1994-12-01
18 312
17 Brand#52 SM CAN
12 FOB SHIP 1997-01-01
1 92
7 ETHIOPIA CHINA
2 14 NICKEL ASIA
22 24 20 16 33 29 34
22
13 express deposits
21 KENYA
10 1993-10-01
14 1997-01-01
9 black
3 BUILDING 1995-03-14
16 Brand#35 SMALL BURNISHED 9
23 30 35 28 37 16
8
20 lace 1995-01-01 KENYA
19 Brand#13 Brand#33 Brand#34
4 18 30
11 IRAN 0.0000001000
4 1995-03-01
8 CHINA ASIA STANDARD BURNISHED COPPER
5 MIDDLE EAST 1994-01-01

E.77 qp2.11

15 1997-06-01
14 1997-04-01
18 314
17 Brand#53 LG BOX
10 1994-08-01
20 sky 1994-01-01 CANADA
16 Brand#25 LARGE PLATED 12
4 39 49 13 47 42
5
11 UNITED KINGDOM 0.0000001000
1 100

8 IRAN MIDDLE EAST PROMO BRUSHED COPPER
4 1997-10-01
22 11 21 19 10 31 33 14
5 AFRICA 1994-01-01
12 MAIL SHIP 1997-01-01
3 MACHINERY 1995-03-31
9 yellow
21 FRANCE
2 2 TIN MIDDLE EAST
13 express deposits
6 1994-01-01 0.09 24
19 Brand#25 Brand#21 Brand#33 9 19 26
7 RUSSIA IRAN

E.78 qp2.12

1 108
7 KENYA BRAZIL
16 Brand#55 PROMO BRUSHED 25 14 34 38 36 5 19 7
17 Brand#55 LG PACK
18 315
22 30 20 18 12 10 16 14
12 TRUCK SHIP 1997-01-01
6 1994-01-01 0.06 24
8 BRAZIL AMERICA PROMO POLISHED TIN
9 thistle
11 IRAQ 0.0000001000
4 1995-07-01
2 40 COPPER ASIA
5 AMERICA 1994-01-01
20 drab 1997-01-01 CHINA
21 UNITED KINGDOM
13 express deposits
10 1993-05-01
19 Brand#22 Brand#54 Brand#33 4 20 23
3 BUILDING 1995-03-16
14 1997-07-01
15 1995-03-01

E.79 qp2.13

21 MOZAMBIQUE
17 Brand#52 LG CAN
7 FRANCE ROMANIA
3 HOUSEHOLD 1995-03-02
1 116
10 1994-02-01
12 RAIL SHIP 1997-01-01
22 18 14 16 21 10 33 19
9 slate
16 Brand#45 MEDIUM ANODIZED 19 35 43 24 9 13 15 2
6 1995-01-01 0.04 25
11 UNITED STATES 0.0000001000
2 28 BRASS AFRICA
4 1993-04-01
5 EUROPE 1995-01-01
14 1997-11-01
8 ROMANIA EUROPE PROMO BURNISHED TIN
20 peru 1996-01-01 INDIA
13 express deposits
18 313
15 1997-10-01
19 Brand#24 Brand#42 Brand#22 9 10 30

E.80 qp2.14

2 15 NICKEL ASIA
9 saddle
5 MIDDLE EAST 1995-01-01
4 1995-11-01
18 314
1 63
20 brown 1994-01-01 UNITED KINGDOM
15 1995-07-01
16 Brand#25 ECONOMY PLATED 22 6 17 47 2 14 12 21
17 Brand#54 MED BOX
7 UNITED KINGDOM IRAQ
21 INDIA
13 special packages
14 1993-02-01
19 Brand#31 Brand#25 Brand#21 5 11 26
8 IRAQ MIDDLE EAST ECONOMY BRUSHED TIN
22 33 16 12 13 32 15 34
11 JAPAN 0.0000001000
10 1994-11-01
3 BUILDING 1995-03-18
12 AIR REG AIR 1993-01-01
6 1995-01-01 0.09 24

E.81 qp2.15

16 Brand#55 STANDARD POLISHED 3 30 37 1 47 4 9 12
9 puff
17 Brand#51 MED PACK
8 CANADA AMERICA ECONOMY PLATED TIN

```
14      1993-05-01
11      ALGERIA 0.0000001000
10      1993-08-01
12      REG AIR SHIP    1997-01-01
6       1995-01-01      0.06    24
21      ALGERIA
7       MOROCCO CANADA
3       HOUSEHOLD       1995-03-04
15      1993-03-01
5       AFRICA  1995-01-01
22      24      14      27      19      18      21
        31
20      maroon  1993-01-01      JAPAN
1       71
13      special packages
19      Brand#33        Brand#13        Brand#15
        10      12      22
2       3       TIN     AFRICA
4       1993-08-01
18      312
```

E.82 qp2.16

```
1       79
3       AUTOMOBILE      1995-03-20
6       1995-01-01      0.04    25
5       AMERICA 1995-01-01
2       41      COPPER  EUROPE
16      Brand#45        LARGE ANODIZED  41
        25      36      6       4       50      8
        22
14      1993-08-01
22      31      13      18      14      16      32
        11
17      Brand#53        MED CAN
20      tomato  1996-01-01      BRAZIL
4       1996-03-01
9       papaya
10      1994-06-01
11      JORDAN  0.0000001000
15      1995-10-01
8       SAUDI ARABIA    MIDDLE EAST     ECONOMY
ANODIZED NICKEL
12      FOB     REG AIR 1993-01-01
19      Brand#35        Brand#41        Brand#14
        5       13      29
18      314
13      special packages
7       GERMANY SAUDI ARABIA
21      PERU
```

E.83 qp2.17

```
3       FURNITURE       1995-03-06
16      Brand#21        PROMO BURNISHED 12
        6       25      2       20      18      9
        21
5       ASIA    1996-01-01
11      ARGENTINA       0.0000001000
21      INDONESIA
9       navajo
2       29      STEEL   AFRICA
15      1993-07-01
10      1993-03-01
18      315
17      Brand#15        JUMBO BOX
7       UNITED STATES   JAPAN
8       JAPAN   ASIA    LARGE POLISHED NICKEL
19      Brand#42        Brand#24        Brand#14
        10      14      26
14      1993-11-01
13      special packages
1       87
4       1993-12-01
22      18      11      24      13      20      23
        27
20      green   1994-01-01      PERU
6       1996-01-01      0.09    24
12      MAIL    REG AIR 1993-01-01
```

E.84 qp2.18

```
14      1994-03-01
4       1996-06-01
13      special packages
5       EUROPE  1996-01-01
21      ARGENTINA
11      KENYA   0.0000001000
8       EGYPT   MIDDLE EAST     LARGE BURNISHED
NICKEL
6       1996-01-01      0.07    24
3       AUTOMOBILE      1995-03-22
17      Brand#12        JUMBO PACK
2       17      NICKEL  EUROPE
20      rosy    1993-01-01      GERMANY
1       95
19      Brand#44        Brand#12        Brand#53
        6       15      22
10      1993-12-01
9       medium
12      TRUCK REG AIR   1994-01-01
18      313
15      1996-01-01
7       MOZAMBIQUE      EGYPT
22      17      34      22      10      25      30
        21
16      Brand#51        SMALL POLISHED  5
        40      4       15      50      25      9
        26
```

E.85 qp2.19

```
4       1994-03-01
12      RAIL    AIR     1994-01-01
22      31      13      18      32      19      10
        23
```

14 1994-06-01
5 MIDDLE EAST 1996-01-01
15 1993-10-01
16 Brand#41 LARGE BRUSHED 40
10 24 14 46 48 1
33
2 4 TIN AMERICA
8 VIETNAM ASIA MEDIUM BRUSHED
NICKEL
10 1994-09-01
17 Brand#14 JUMBO CAN
9 lemon
21 ROMANIA
7 INDIA VIETNAM
3 FURNITURE 1995-03-08
6 1996-01-01 0.04 25
13 special requests
18 314
11 BRAZIL 0.0000001000
20 cornsilk 1996-01-01 VIETNAM
19 Brand#41 Brand#45 Brand#52
1 16 29
1 103

E.86 qp2.20

16 Brand#21 STANDARD BURNISHED
18 11 20 38 6 9
39 35
15 1996-05-01
14 1994-09-01
13 special requests
4 1996-10-01
22 34 11 32 18 27 17
16
18 312
19 Brand#54 Brand#33 Brand#51
6 17 25
7 ALGERIA JORDAN
1 111
12 AIR RAIL 1996-01-01
17 Brand#11 WRAP BOX
5 AFRICA 1996-01-01
10 1993-07-01
20 navy 1995-01-01 IRAQ
3 MACHINERY 1995-03-24
9 indian
21 IRAQ
11 MOROCCO 0.0000001000
2 42 COPPER EUROPE
6 1996-01-01 0.02 25
8 JORDAN MIDDLE EAST MEDIUM
PLATED NICKEL

E.87 qp2.21

20 azure 1993-01-01 ARGENTINA
14 1994-12-01
21 CANADA
12 SHIP AIR 1994-01-01
15 1994-02-01
17 Brand#13 WRAP PACK
4 1994-07-01
19 Brand#51 Brand#11 Brand#41
2 18 21
13 special requests
10 1994-04-01
11 CANADA 0.0000001000
1 119
16 Brand#51 MEDIUM PLATED 46
8 17 7 43 31 16
5
5 AMERICA 1997-01-01
18 313
7 PERU ETHIOPIA
8 ETHIOPIA AFRICA MEDIUM
ANODIZED BRASS
22 12 29 13 11 15 10
17
9 ghost
6 1997-01-01 0.07 24
3 FURNITURE 1995-03-10
2 30 STEEL AMERICA

E.88 qp2.22

16 Brand#41 ECONOMY BRUSHED 45
16 42 1 31 37 4
6
14 1995-04-01
13 pending requests
2 18 BRASS MIDDLE EAST
21 SAUDI ARABIA
10 1995-01-01
11 MOZAMBIQUE 0.0000001000
4 1997-02-01
1 66
22 17 27 15 10 12 20
18
18 315
12 FOB AIR 1995-01-01
19 Brand#53 Brand#54 Brand#45
7 19 29
5 ASIA 1997-01-01
7 INDONESIA RUSSIA
8 RUSSIA EUROPE SMALL POLISHED
BRASS
6 1997-01-01 0.04 25
3 MACHINERY 1995-03-26
15 1996-08-01
20 lavender 1997-01-01 MOROCCO
9 drab
17 Brand#15 WRAP CAN

E.89 qp2.23

```
18  312
15  1994-05-01
9   cream
14  1995-07-01
12  MAIL RAIL 1995-01-01
2   5 TIN AMERICA
8   KENYA AFRICA SMALL BURNISHED
BRASS
11  EGYPT 0.0000001000
22  12 16 33 13 34 19
    20
21  JAPAN
16  Brand#21 SMALL ANODIZED 21
    28 3 11 43 36 8
    49
1   74
6   1997-01-01 0.02 25
17  Brand#11 SM BOX
5   EUROPE 1997-01-01
10  1993-10-01
19  Brand#15 Brand#32 Brand#44
    2 20 25
4   1994-11-01
20  slate 1995-01-01 ETHIOPIA
13  pending accounts
3   BUILDING 1995-03-12
7   ARGENTINA KENYA
```

E.90 qp2.24

```
7   CHINA FRANCE
3   HOUSEHOLD 1995-03-28
10  1994-07-01
14  1995-10-01
13  pending accounts
21  ETHIOPIA
18  314
6   1997-01-01 0.07 24
20  firebrick 1994-01-01 SAUDI ARABIA
4   1997-06-01
9   chartreuse
8   FRANCE EUROPE STANDARD
BRUSHED BRASS
22  22 31 11 20 16 25
    33
15  1996-12-01
2   43 COPPER MIDDLE EAST
1   82
5   AFRICA 1997-01-01
12  TRUCK RAIL 1995-01-01
19  Brand#12 Brand#25 Brand#33
    7 10 21
17  Brand#13 SM PACK
11  PERU 0.0000001000
16  Brand#51 LARGE PLATED 16
    44 25 30 29 5 22
    11
```

E.91 qp2.25

```
18  315
1   90
13  pending accounts
7   IRAN UNITED KINGDOM
16  Brand#41 PROMO POLISHED 33
    47 7 21 43 4 29
    42
10  1993-05-01
14  1996-01-01
2   31 STEEL ASIA
19  Brand#14 Brand#53 Brand#33
    3 11 28
5   AMERICA 1997-01-01
21  RUSSIA
11  ETHIOPIA 0.0000001000
22  12 17 10 14 25 29
    33
15  1994-08-01
8   UNITED KINGDOM EUROPE
    STANDARD PLATED BRASS
17  Brand#15 SM CAN
20  pink 1997-01-01 IRAN
3   BUILDING 1995-03-14
4   1995-03-01
12  RAIL MAIL 1994-01-01
6   1997-01-01 0.05 25
9   blanched
```

E.92 qp2.26

```
13  pending accounts
2   19 BRASS MIDDLE EAST
22  34 20 27 28 15 18
    23
5   ASIA 1993-01-01
11  CHINA 0.0000001000
21  KENYA
20  burlywood 1995-01-01 UNITED
STATES
14  1996-04-01
7   BRAZIL MOROCCO
10  1994-02-01
4   1997-10-01
9   antique
19  Brand#21 Brand#35 Brand#32
    8 12 24
18  313
6   1993-01-01 0.02 25
3   HOUSEHOLD 1995-03-30
1   98
8   MOROCCO AFRICA STANDARD
ANODIZED STEEL
15  1997-03-01
12  AIR RAIL 1996-01-01
17  Brand#12 LG BOX
```

16 Brand#21 MEDIUM ANODIZED 16
7 44 50 22 36 37
46

E.93 qp2.27

14 1996-08-01
17 Brand#14 LG PACK
21 FRANCE
8 GERMANY EUROPE PROMO
POLISHED STEEL
2 7 NICKEL ASIA
9 turquoise
6 1993-01-01 0.08 24
4 1995-07-01
5 EUROPE 1993-01-01
13 pending accounts
22 24 19 14 16 13 22
17
7 ROMANIA GERMANY
15 1994-12-01
3 AUTOMOBILE 1995-03-16
1 106
18 314
16 Brand#11 ECONOMY BURNISHED
47 27 14 30 15 43
3 29
11 FRANCE 0.0000001000
10 1994-11-01
12 SHIP TRUCK 1996-01-01
20 medium 1994-01-01 KENYA
19 Brand#23 Brand#23 Brand#21
3 13 20

E.94 qp2.28

10 1993-08-01
22 18 27 34 11 20 23
10
1 114
12 FOB TRUCK 1996-01-01
13 pending deposits
18 312
21 UNITED KINGDOM
20 turquoise 1997-01-01 EGYPT
2 44 COPPER AFRICA
14 1996-11-01
16 Brand#41 STANDARD POLISHED 35
12 13 25 10 37 46
11
7 IRAQ UNITED STATES
15 1997-07-01
3 HOUSEHOLD 1995-03-02
4 1993-03-01
17 Brand#11 LG CAN
5 MIDDLE EAST 1993-01-01
19 Brand#25 Brand#51 Brand#25
8 14 28
6 1993-01-01 0.05 25
8 UNITED STATES AMERICA
PROMO BURNISHED STEEL
9 snow
11 ROMANIA 0.0000001000

E.95 qp2.29

10 1994-05-01
8 MOZAMBIQUE AFRICA ECONOMY
BRUSHED STEEL
9 sandy
18 313
12 MAIL TRUCK 1997-01-01
6 1993-01-01 0.03 25
1 61
5 AFRICA 1993-01-01
20 grey 1996-01-01 CHINA
11 GERMANY 0.0000001000
17 Brand#13 MED BOX
22 25 20 29 11 22 12
28
16 Brand#21 MEDIUM BRUSHED 2
10 32 14 12 6 16
31
3 AUTOMOBILE 1995-03-18
13 unusual deposits
2 32 STEEL ASIA
15 1995-03-01
21 MOROCCO
14 1997-02-01
19 Brand#32 Brand#44 Brand#24
4 15 24
7 CANADA MOZAMBIQUE
4 1995-10-01

E.96 qp2.30

7 SAUDI ARABIA INDIA
17 Brand#15 MED PACK
22 18 15 25 31 12 14
20
5 AMERICA 1994-01-01
3 FURNITURE 1995-03-04
10 1993-03-01
13 unusual deposits
18 315
9 red
1 69
14 1997-05-01
15 1997-10-01
21 INDIA
19 Brand#34 Brand#22 Brand#14
9 16 20
16 Brand#11 PROMO BURNISHED 6
40 48 18 19 46 24
31
12 TRUCK SHIP 1997-01-01

8 INDIA ASIA ECONOMY PLATED STEEL
6 1994-01-01 0.08 24
11 SAUDI ARABIA 0.0000001000
20 royal 1994-01-01 INDIA
4 1993-07-01
2 20 BRASS AFRICA

E.97 qp2.31

2 8 NICKEL EUROPE
9 peru
21 ALGERIA
3 AUTOMOBILE 1995-03-20
4 1996-02-01
7 JAPAN ALGERIA
1 77
11 INDIA 0.0000001000
16 Brand#41 SMALL PLATED 31
11 29 47 9 25 22
35
5 ASIA 1994-01-01
20 cream 1993-01-01 UNITED KINGDOM
19 Brand#32 Brand#15 Brand#13
4 17 27
18 313
8 ALGERIA AFRICA ECONOMY
ANODIZED COPPER
17 Brand#12 MED CAN
13 unusual deposits
10 1993-12-01
12 RAIL MAIL 1997-01-01
15 1995-07-01
6 1994-01-01 0.05 24
14 1997-08-01
22 33 12 22 19 29 23
32

E.98 qp2.32

15 1993-04-01
12 REG AIR MAIL 1997-01-01
8 PERU AMERICA LARGE POLISHED
COPPER
4 1993-11-01
22 21 23 20 32 14 12
16
13 unusual deposits
16 Brand#21 LARGE BRUSHED 5
15 35 26 25 3 45
44
17 Brand#14 JUMBO BOX
18 314
3 FURNITURE 1995-03-06
7 EGYPT PERU
5 EUROPE 1994-01-01
6 1994-01-01 0.03 25
1 85
9 olive
11 VIETNAM 0.0000001000
21 PERU
10 1994-09-01
14 1997-12-01
20 olive 1996-01-01 JORDAN
19 Brand#44 Brand#43 Brand#12
9 18 23
2 46 TIN AFRICA

E.99 qp2.33

15 1995-10-01
16 Brand#11 STANDARD ANODIZED
4 3 21 47 48 14
41 23
2 33 STEEL EUROPE
11 INDIA 0.0000001000
17 Brand#11 JUMBO PACK
7 VIETNAM INDONESIA
5 MIDDLE EAST 1994-01-01
14 1993-03-01
20 azure 1994-01-01 BRAZIL
4 1996-06-01
21 INDONESIA
3 MACHINERY 1995-03-22
10 1993-06-01
9 midnight
12 SHIP MAIL 1993-01-01
8 INDONESIA ASIA LARGE BURNISHED
COPPER
13 unusual packages
6 1994-01-01 0.08 24
18 312
19 Brand#41 Brand#21 Brand#51
5 19 20
22 15 30 13 29 32 18
34
1 93

E.100 qp2.34

1 101
13 unusual packages
11 VIETNAM 0.0000001000
3 BUILDING 1995-03-08
4 1994-03-01
21 ARGENTINA
6 1995-01-01 0.06 24
14 1993-06-01
15 1993-07-01
22 10 31 16 19 23 32
27
18 313
9 lime
7 JAPAN ARGENTINA
5 AMERICA 1995-01-01
10 1994-03-01
20 lawn 1993-01-01 PERU

12 FOB MAIL 1993-01-01
16 Brand#41 MEDIUM PLATED 39
21 41 32 29 7 23
8
17 Brand#13 JUMBO CAN
8 ARGENTINA AMERICA MEDIUM
BRUSHED COPPER
19 Brand#43 Brand#14 Brand#51
10 20 27
2 21 BRASS AMERICA

E.101 qp2.35

14 1993-09-01
17 Brand#14 WRAP BOX
22 17 15 29 21 13 10
22
20 smoke 1996-01-01 GERMANY
8 CHINA ASIA MEDIUM PLATED COPPER
16 Brand#21 ECONOMY POLISHED 42
46 11 30 41 29 24
22
5 ASIA 1995-01-01
10 1995-01-01
1 109
13 unusual packages
2 9 NICKEL EUROPE
21 CHINA
12 MAIL FOB 1993-01-01
9 khaki
4 1996-10-01
18 315
3 MACHINERY 1995-03-24
7 EGYPT CHINA
6 1995-01-01 0.03 25
19 Brand#55 Brand#42 Brand#55
5 10 23
15 1996-02-01
11 INDONESIA 0.0000001000

E.102 qp2.36

9 green
17 Brand#11 WRAP PACK
7 VIETNAM IRAN
4 1994-07-01
5 EUROPE 1995-01-01
13 express packages
21 IRAQ
18 312
11 RUSSIA 0.0000001000
3 BUILDING 1995-03-10
22 13 16 23 15 32 30
33
1 117
6 1995-01-01 0.09 24
16 Brand#11 SMALL ANODIZED 7
1 27 50 25 42 28
8
20 floral 1995-01-01 RUSSIA
14 1993-12-01
15 1993-10-01
10 1993-10-01
8 IRAN MIDDLE EAST MEDIUM
BURNISHED TIN
2 47 TIN AMERICA
12 TRUCK FOB 1993-01-01
19 Brand#52 Brand#35 Brand#44
1 11 30

E.103 qp2.37

13 express requests
14 1994-04-01
5 MIDDLE EAST 1995-01-01
22 21 15 30 27 19 14
17
19 Brand#54 Brand#13 Brand#43
6 12 26
11 IRAN 0.0000001000
9 floral
6 1995-01-01 0.06 24
18 314
15 1996-05-01
8 BRAZIL AMERICA SMALL
BRUSHED TIN
10 1994-07-01
7 JORDAN BRAZIL
4 1997-02-01
17 Brand#13 WRAP CAN
16 Brand#41 LARGE BURNISHED 50
36 7 2 41 3 21
25
3 HOUSEHOLD 1995-03-26
1 64
12 RAIL FOB 1994-01-01
2 34 COPPER MIDDLE EAST
21 CANADA
20 plum 1993-01-01 IRAQ

E.104 qp2.38

20 burlywood 1997-01-01 ARGENTINA
5 AFRICA 1996-01-01
4 1994-10-01
14 1994-07-01
11 UNITED KINGDOM 0.0000001000
1 72
6 1996-01-01 0.03 25
16 Brand#21 PROMO POLISHED 2
7 41 6 40 21 14
17
8 ROMANIA EUROPE SMALL
PLATED TIN

22 11 16 20 14 33 17
29
7 ETHIOPIA ROMANIA
3 BUILDING 1995-03-12
2 22 BRASS AMERICA
12 REG AIR FOB 1994-01-01
21 SAUDI ARABIA
19 Brand#11 Brand#51 Brand#33
1 13 23
17 Brand#15 SM BOX
13 express requests
10 1993-04-01
15 1994-02-01
18 315
9 dark

E.105 qp2.39

3 HOUSEHOLD 1995-03-28
7 RUSSIA IRAQ
14 1994-10-01
15 1996-09-01
6 1996-01-01 0.09 24
5 AMERICA 1996-01-01
21 JAPAN
20 metallic 1995-01-01 MOZAMBIQUE
18 313
10 1994-01-01
4 1997-05-01
16 Brand#11 SMALL BRUSHED 6
14 38 33 27 13 30
22
19 Brand#13 Brand#34 Brand#32
6 14 30
1 80
13 express requests
9 chocolate
8 IRAQ MIDDLE EAST SMALL ANODIZED
TIN
17 Brand#12 SM PACK
11 IRAQ 0.0000001000
12 SHIP RAIL 1996-01-01
22 34 29 16 24 12 33
15
2 10 NICKEL MIDDLE EAST

E.106 qp2.40

13 express requests
15 1994-05-01
17 Brand#14 SM CAN
1 88
22 22 28 32 12 14 27
10
11 UNITED STATES 0.0000001000
3 AUTOMOBILE 1995-03-14
4 1995-02-01
7 KENYA CANADA
20 violet 1993-01-01 ETHIOPIA
14 1995-01-01
21 EGYPT
9 blush
8 CANADA AMERICA STANDARD
POLISHED TIN
2 48 TIN ASIA
18 314
16 Brand#41 ECONOMY BURNISHED
9 5 10 39 6 37
23 32
6 1996-01-01 0.06 24
10 1994-11-01
12 FOB SHIP 1995-01-01
5 ASIA 1996-01-01
19 Brand#15 Brand#12 Brand#31
2 15 26

E.107 qp2.41

14 1995-04-01
2 36 COPPER MIDDLE EAST
9 azure
20 honeydew 1997-01-01 SAUDI
ARABIA
6 1996-01-01 0.04 25
17 Brand#11 LG BOX
18 312
8 SAUDI ARABIA MIDDLE EAST STANDARD
BURNISHED NICKEL
21 VIETNAM
13 express requests
3 FURNITURE 1995-03-30
22 29 19 14 26 25 20
17
16 Brand#21 STANDARD PLATED 15
38 44 42 45 48 33
31
4 1997-09-01
11 JAPAN 0.0000001000
15 1996-12-01
1 96
10 1993-08-01
19 Brand#22 Brand#55 Brand#25
7 16 22
5 EUROPE 1996-01-01
7 FRANCE SAUDI ARABIA
12 MAIL SHIP 1995-01-01

E.108 qp2.42

21 KENYA
3 AUTOMOBILE 1995-03-16
18 313
5 MIDDLE EAST 1996-01-01
11 ALGERIA 0.0000001000
7 UNITED KINGDOM IRAQ
6 1996-01-01 0.09 24

20 saddle 1995-01-01 IRAN
17 Brand#13 LG PACK
12 TRUCK SHIP 1995-01-01
16 Brand#11 MEDIUM BRUSHED 16
41 29 21 1 40 9
33
15 1994-09-01
13 express accounts
10 1994-05-01
2 23 STEEL ASIA
8 IRAQ MIDDLE EAST PROMO BRUSHED
NICKEL
14 1995-08-01
19 Brand#25 Brand#33 Brand#24
2 17 29
9 wheat
22 20 17 29 14 27 32
16
1 104
4 1995-06-01

E.109 qp2.43

6 1997-01-01 0.07 24
17 Brand#25 LG CAN
14 1995-11-01
16 Brand#42 PROMO ANODIZED 4
11 29 26 3 32 7
17
19 Brand#22 Brand#21 Brand#24
7 18 26
10 1993-02-01
9 steel
2 11 NICKEL AFRICA
15 1997-03-01
8 CANADA AMERICA PROMO
PLATED NICKEL
5 AFRICA 1997-01-01
22 10 32 25 19 30 23
20
12 AIR REG AIR 1995-01-01
7 MOROCCO CANADA
13 special accounts
18 315
1 112
4 1993-03-01
20 cyan 1994-01-01 ALGERIA
3 FURNITURE 1995-03-01
11 JORDAN 0.0000001000
21 FRANCE

E.110 qp2.44

8 SAUDI ARABIA MIDDLE EAST PROMO
ANODIZED NICKEL
5 AMERICA 1997-01-01
4 1995-10-01
6 1997-01-01 0.04 25
17 Brand#22 MED BOX
7 GERMANY SAUDI ARABIA
1 120
18 312
22 24 12 22 31 30 17
16
14 1996-02-01
9 sienna
10 1993-11-01
15 1994-12-01
11 ARGENTINA 0.0000001000
20 orange 1997-01-01 KENYA
2 49 TIN ASIA
21 UNITED KINGDOM
19 Brand#34 Brand#53 Brand#13
3 19 22
13 special accounts
16 Brand#32 SMALL PLATED 23
8 47 1 33 25 17
45
12 REG AIR MAIL 1995-01-01
3 MACHINERY 1995-03-18

E.111 qp2.45

5 EUROPE 1997-01-01
21 MOROCCO
14 1996-05-01
19 Brand#31 Brand#41 Brand#12
8 20 29
15 1997-07-01
17 Brand#24 MED PACK
12 SHIP REG AIR 1996-01-01
6 1997-01-01 0.09 25
4 1993-07-01
9 rosy
8 JAPAN ASIA ECONOMY POLISHED
NICKEL
16 Brand#12 LARGE POLISHED 26
37 21 11 6 19 31
7
11 KENYA 0.0000001000
2 37 COPPER AFRICA
10 1994-09-01
18 314
1 68
13 special accounts
7 UNITED STATES JAPAN
22 14 27 25 28 34 31
21
3 FURNITURE 1995-03-03
20 beige 1996-01-01 EGYPT

E.112 qp2.46

21 GERMANY
15 1995-04-01
4 1996-02-01

6 1997-01-01 0.07 24
7 MOZAMBIQUE EGYPT
16 Brand#42 STANDARD ANODIZED
29 6 33 30 10 37
17 42
19 Brand#33 Brand#24 Brand#11
3 10 25
18 312
14 1996-09-01
22 32 12 13 18 29 15
26
11 BRAZIL 0.0000001000
13 special accounts
3 MACHINERY 1995-03-20
1 76
2 24 STEEL EUROPE
5 MIDDLE EAST 1997-01-01
8 EGYPT MIDDLE EAST ECONOMY
BURNISHED BRASS
20 lemon 1994-01-01 ROMANIA
12 FOB REG AIR 1996-01-01
17 Brand#21 MED CAN
10 1993-06-01
9 plum

E.113 qp2.47

10 1994-03-01
3 BUILDING 1995-03-05
15 1997-10-01
13 special deposits
6 1993-01-01 0.04 25
8 VIETNAM ASIA LARGE BRUSHED
BRASS
9 orchid
7 INDIA VIETNAM
4 1993-11-01
11 MOROCCO 0.0000001000
22 12 34 11 17 15 14
26
18 313
12 MAIL AIR 1996-01-01
1 84
5 AFRICA 1993-01-01
16 Brand#32 MEDIUM BURNISHED 33
4 42 19 28 45 41
17
2 12 BRASS AFRICA
14 1996-12-01
19 Brand#45 Brand#52 Brand#51
9 11 21
20 snow 1997-01-01 INDONESIA
17 Brand#22 JUMBO BOX
21 UNITED STATES

E.114 qp2.48

18 315
8 JORDAN MIDDLE EAST LARGE
PLATED BRASS
20 forest 1996-01-01 UNITED KINGDOM
21 PERU
2 50 TIN EUROPE
4 1996-05-01
22 33 28 31 12 17 13
22
17 Brand#24 JUMBO PACK
1 92
11 CANADA 0.0000001000
9 misty
19 Brand#42 Brand#45 Brand#55
4 12 29
3 MACHINERY 1995-03-22
13 special deposits
5 AMERICA 1993-01-01
7 ALGERIA JORDAN
10 1994-12-01
16 Brand#12 ECONOMY POLISHED 33
28 22 48 46 44 25
21
6 1993-01-01 0.02 25
14 1997-03-01
15 1995-07-01
12 RAIL AIR 1997-01-01

E.115 qp2.49

19 Brand#44 Brand#23 Brand#54
9 13 25
1 100
15 1993-04-01
17 Brand#21 JUMBO CAN
5 ASIA 1993-01-01
8 ETHIOPIA AFRICA LARGE
ANODIZED BRASS
9 magenta
12 AIR SHIP 1993-01-01
14 1997-06-01
7 PERU ETHIOPIA
4 1994-02-01
3 BUILDING 1995-03-07
20 powder 1994-01-01 JORDAN
16 Brand#42 STANDARD BRUSHED 39
37 13 27 35 48 17
1
6 1993-01-01 0.07 24
22 23 19 27 25 18 26
14
10 1993-09-01
13 special deposits
2 38 COPPER AMERICA
21 INDONESIA
18 312
11 MOZAMBIQUE 0.0000001000

E.116 qp2.50

```
8  RUSSIA EUROPE  MEDIUM POLISHED
BRASS
13 special deposits
2  26 STEEL EUROPE
20 burnished 1993-01-01 CANADA
17 Brand#23 WRAP BOX
3  HOUSEHOLD 1995-03-24
6  1993-01-01 0.05 25
21 ARGENTINA
18 314
11 EGYPT 0.0000001000
19 Brand#51 Brand#11 Brand#43
   4 14 21
10 1994-07-01
15 1995-11-01
4  1996-09-01
22 13 33 24 22 21 26
   28
1  108
7  INDONESIA RUSSIA
12 REG AIR AIR 1997-01-01
9  lavender
14 1997-09-01
5  EUROPE 1993-01-01
16 Brand#32 LARGE BURNISHED 43
   8 36 27 34 29 9
   16
```

E.117 qp2.51

```
6  1994-01-01 0.02 25
15 1993-07-01
18 315
17 Brand#25 WRAP PACK
12 SHIP AIR 1993-01-01
1  116
7  ARGENTINA KENYA
2  13 BRASS AMERICA
22 27 28 20 21 16 19
   11
13 pending packages
21 CHINA
10 1993-04-01
14 1993-01-01
9  honeydew
3  AUTOMOBILE 1995-03-09
16 Brand#12 PROMO PLATED 46
   28 24 36 4 32 13
   27
20 midnight 1996-01-01 PERU
19 Brand#53 Brand#44 Brand#43
   10 15 28
11 PERU 0.0000001000
4  1994-06-01
8  KENYA AFRICA MEDIUM
BURNISHED STEEL
5  MIDDLE EAST 1994-01-01
```

E.118 qp2.52

```
15 1996-02-01
14 1993-04-01
18 313
17 Brand#22 WRAP DRUM
10 1994-01-01
20 wheat 1995-01-01 GERMANY
16 Brand#42 SMALL BRUSHED 40
   29 9 16 14 37 3
   25
11 ETHIOPIA 0.0000001000
1  63
8  FRANCE EUROPE SMALL
BRUSHED STEEL
4  1997-01-01
22 17 28 23 18 11 32
   21
5  AFRICA 1994-01-01
12 FOB RAIL 1993-01-01
3  HOUSEHOLD 1995-03-26
9  frosted
21 IRAN
2  1 NICKEL MIDDLE EAST
13 pending packages
6  1994-01-01 0.07 24
19 Brand#55 Brand#32 Brand#42
   5 16 24
7  CHINA FRANCE
```

E.119 qp2.53

```
1  71
7  IRAN UNITED KINGDOM
16 Brand#32 ECONOMY ANODIZED 10
   15 6 36 13 28 49
   37
17 Brand#24 SM BOX
18 314
22 21 23 19 34 25 26
   33
12 MAIL RAIL 1993-01-01
6  1994-01-01 0.05 25
8  UNITED KINGDOM EUROPE
   SMALL PLATED STEEL
9  dim
11 CHINA 0.0000001000
4  1994-10-01
2  39 COPPER AMERICA
5  AMERICA 1994-01-01
20 hot 1993-01-01 RUSSIA
21 BRAZIL
13 pending packages
10 1994-10-01
19 Brand#12 Brand#15 Brand#31
   10 17 20
3  AUTOMOBILE 1995-03-11
14 1993-07-01
15 1993-11-01
```

E.120 qp2.54

```
21 SAUDI ARABIA
17 Brand#21 SM PACK
7 BRAZIL MOROCCO
3 FURNITURE 1995-03-28
1 79
10 1993-07-01
12 RAIL AIR 1996-01-01
22 22 21 13 11 26 32
20
9 cornflower
16 Brand#12 STANDARD PLATED 6
41 34 15 16 48 50
12
6 1994-01-01 0.02 25
11 FRANCE 0.0000001000
2 27 STEEL MIDDLE EAST
4 1997-05-01
5 ASIA 1994-01-01
14 1993-10-01
8 MOROCCO AFRICA SMALL
ANODIZED STEEL
20 salmon 1997-01-01 JAPAN
13 pending packages
18 312
15 1996-05-01
19 Brand#15 Brand#53 Brand#35
5 18 28
```

E.121 qp2.55

```
2 14 BRASS ASIA
9 burlywood
5 MIDDLE EAST 1995-01-01
4 1995-02-01
18 313
1 87
20 cyan 1995-01-01 ARGENTINA
15 1994-02-01
16 Brand#42 MEDIUM POLISHED 7
44 25 50 17 40 28
18
17 Brand#23 SM DRUM
7 ROMANIA GERMANY
21 JAPAN
13 pending packages
14 1994-01-01
19 Brand#12 Brand#31 Brand#34
1 19 24
8 GERMANY EUROPE STANDARD
POLISHED STEEL
22 13 20 23 34 26 19
30
11 ROMANIA 0.0000001000
10 1994-05-01
3 AUTOMOBILE 1995-03-13
12 AIR RAIL 1994-01-01
6 1995-01-01 0.08 24
```

E.122 qp2.56

```
16 Brand#32 PROMO ANODIZED 13
8 3 21 18 32 28
48
9 bisque
17 Brand#25 LG BOX
8 UNITED STATES AMERICA
STANDARD BURNISHED COPPER
14 1994-05-01
11 GERMANY 0.0000001000
10 1993-02-01
12 REG AIR TRUCK 1994-01-01
6 1995-01-01 0.05 25
21 EGYPT
7 IRAQ UNITED STATES
3 FURNITURE 1995-03-30
15 1996-09-01
5 AFRICA 1995-01-01
22 28 27 25 20 31 18
16
20 orchid 1993-01-01 MOZAMBIQUE
1 95
13 pending requests
19 Brand#24 Brand#14 Brand#24
6 20 20
2 2 NICKEL MIDDLE EAST
4 1997-09-01
18 315
```

E.123 qp2.57

```
1 103
3 MACHINERY 1995-03-15
6 1995-01-01 0.03 25
5 AMERICA 1995-01-01
2 40 COPPER ASIA
16 Brand#12 SMALL BURNISHED 16
4 44 3 8 42 13
2
14 1994-08-01
22 16 13 14 19 31 21
23
17 Brand#22 LG PACK
20 bisque 1997-01-01 FRANCE
4 1995-06-01
9 yellow
10 1993-11-01
11 SAUDI ARABIA 0.0000001000
15 1994-06-01
8 MOZAMBIQUE AFRICA PROMO
BRUSHED COPPER
12 SHIP TRUCK 1994-01-01
19 Brand#21 Brand#52 Brand#23
1 10 27
18 312
13 pending requests
7 CANADA MOZAMBIQUE
21 VIETNAM
```

E.124 qp2.58

```
3	BUILDING	1995-03-01
16	Brand#52	LARGE POLISHED	4
	3	9	12	8	37	30
	20
5	ASIA	1995-01-01
11	INDIA	0.0000001000
21	JORDAN
9	thistle
2	28	STEEL	AFRICA
15	1996-12-01
10	1994-08-01
18	314
17	Brand#24	LG DRUM
7	SAUDI ARABIA	INDIA
8	INDIA	ASIA	PROMO PLATED COPPER
19	Brand#23	Brand#35	Brand#22
	6	11	23
14	1994-11-01
13	unusual requests
1	111
4	1993-02-01
22	34	13	27	20	17	12
	21
20	light	1995-01-01	SAUDI ARABIA
6	1995-01-01	0.08	24
12	FOB	TRUCK	1994-01-01
```

E.125 qp2.59

```
14	1995-02-01
4	1995-09-01
13	unusual requests
5	EUROPE	1995-01-01
21	ETHIOPIA
11	VIETNAM	0.0000001000
8	ALGERIA	AFRICA	PROMO
ANODIZED COPPER
6	1995-01-01	0.05	24
3	MACHINERY	1995-03-18
17	Brand#25	MED BOX
2	16	BRASS	ASIA
20	spring	1994-01-01	IRAN
1	119
19	Brand#35	Brand#23	Brand#11
	2	13	20
10	1993-05-01
9	slate
12	TRUCK	RAIL	1995-01-01
18	315
15	1994-09-01
7	JAPAN	ALGERIA
22	15	13	14	24	25	20
	18
16	Brand#32	PROMO BRUSHED	6
	45	12	22	44	9	4
	20
```

E.126 qp2.60

```
4	1993-06-01
12	RAIL	MAIL	1995-01-01
22	23	11	10	16	31	13
	32
14	1995-05-01
5	MIDDLE EAST	1996-01-01
15	1997-04-01
16	Brand#12	MEDIUM BURNISHED	4
	48	47	5	21	16	33
	11
2	3	NICKEL	AFRICA
8	PERU	AMERICA	ECONOMY
POLISHED COPPER
10	1994-03-01
17	Brand#22	MED PACK
9	saddle
21	UNITED KINGDOM
7	EGYPT	PERU
3	BUILDING	1995-03-03
6	1996-01-01	0.03	25
13	unusual requests
18	313
11	INDONESIA	0.0000001000
20	forest	1997-01-01	ALGERIA
19	Brand#32	Brand#51	Brand#11
	7	14	27
1	66
```

E.127 qp2.61

```
16	Brand#52	ECONOMY PLATED	29
	37	31	10	35	4	27
	23
15	1995-01-01
14	1995-09-01
13	unusual accounts
4	1996-01-01
22	25	23	31	26	19	10
	30
18	315
19	Brand#34	Brand#44	Brand#55
	2	15	23
7	VIETNAM	INDONESIA
1	74
12	AIR	MAIL	1995-01-01
17	Brand#24	MED DRUM
5	AFRICA	1996-01-01
10	1994-12-01
20	puff	1996-01-01	MOROCCO
3	HOUSEHOLD	1995-03-20
9	puff
21	MOROCCO
11	RUSSIA	0.0000001000
2	41	TIN	EUROPE
6	1996-01-01	0.08	24
8	INDONESIA	ASIA	ECONOMY PLATED
TIN
```

E.128 qp2.62

```
20  chartreuse  1994-01-01  EGYPT
14  1995-12-01
21  GERMANY
12  REG AIR  MAIL  1995-01-01
15  1997-07-01
17  Brand#21  JUMBO BOX
4  1993-10-01
19  Brand#41  Brand#21  Brand#54
    8  16  30
13  unusual  accounts
10  1993-09-01
11  IRAN  0.0000001000
1  82
16  Brand#32  STANDARD BRUSHED  33
    8  7  10  47  36  17
    28
5  AMERICA  1996-01-01
18  312
7  JORDAN  ARGENTINA
8  ARGENTINA  AMERICA  ECONOMY
ANODIZED TIN
22  14  33  27  26  23  34
    13
9  papaya
6  1996-01-01  0.06  24
3  BUILDING  1995-03-05
2  29  STEEL  AFRICA
```

E.129 qp2.63

```
16  Brand#12  LARGE ANODIZED  27
    29  50  40  7  15  12
    33
14  1996-03-01
13  unusual  accounts
2  17  BRASS  EUROPE
21  UNITED STATES
10  1994-06-01
11  UNITED KINGDOM  0.0000001000
4  1996-05-01
1  90
22  33  31  18  15  20  12
    26
18  314
12  SHIP  MAIL  1996-01-01
19  Brand#43  Brand#54  Brand#53
    3  17  26
5  ASIA  1996-01-01
7  ETHIOPIA  CHINA
8  CHINA  ASIA  LARGE POLISHED TIN
6  1996-01-01  0.03  25
3  HOUSEHOLD  1995-03-22
15  1995-04-01
20  mint  1997-01-01  ROMANIA
9  navajo
17  Brand#23  JUMBO PACK
```

E.130 qp2.64

```
18  315
15  1993-01-01
9  medium
14  1996-06-01
12  FOB  MAIL  1993-01-01
2  4  NICKEL  AMERICA
8  IRAN  MIDDLE EAST  LARGE BURNISHED
TIN
11  IRAQ  0.0000001000
22  14  33  26  11  31  17
    12
21  MOZAMBIQUE
16  Brand#52  PROMO PLATED  22
    50  17  29  48  8  1
    37
1  98
6  1997-01-01  0.09  24
17  Brand#25  JUMBO DRUM
5  EUROPE  1997-01-01
10  1993-03-01
19  Brand#45  Brand#42  Brand#43
    8  18  23
4  1994-02-01
20  white  1996-01-01  INDONESIA
13  unusual  accounts
3  AUTOMOBILE  1995-03-07
7  RUSSIA IRAN
```

Appendix F Benchmark Scripts

F.1 dbtables.sql

```
set echo on
set numwidth 25
spool rdbtablest
SELECT /*+ full(A) */ COUNT(*) FROM LINEITEM A;

SELECT * FROM LINEITEM
WHERE L_ORDERKEY IN
 ( 4, 26598,  148577,  387431, 56704, 517442, 600000)
AND L_LINENUMBER = 1
ORDER BY L_ORDERKEY;



SELECT * FROM REGION;

SELECT COUNT(*) FROM NATION;

SELECT * FROM NATION
WHERE N_NATIONKEY IN (3,10,14,20)
ORDER BY N_NATIONKEY;



SELECT /*+ full(A) */ COUNT(*) FROM ORDERS A;

SELECT * FROM ORDERS
WHERE O_ORDERKEY IN ( 7, 44065, 287590, 411111,
483876, 599942 )
ORDER BY O_ORDERKEY;



SELECT COUNT(*) FROM PART;

SELECT * FROM PART
WHERE P_PARTKEY IN
(1,984,8743,9028,13876,17899,20000)
ORDER BY P_PARTKEY;



SELECT COUNT(*) FROM PARTSUPP;

SELECT* FROM PARTSUPP
  WHERE PS_PARTKEY = 3398
  AND PS_SUPPKEY = (SELECT MIN(PS_SUPPKEY)
    FROM PARTSUPP WHERE PS_PARTKEY = 3398);

SELECT* FROM PARTSUPP
  WHERE PS_PARTKEY =15873
  AND PS_SUPPKEY = (SELECT MIN(PS_SUPPKEY)
    FROM PARTSUPP WHERE PS_PARTKEY = 15873);

SELECT* FROM PARTSUPP
  WHERE PS_PARTKEY = 11394
  AND PS_SUPPKEY = (SELECT MIN(PS_SUPPKEY)
    FROM PARTSUPP WHERE PS_PARTKEY = 11394);

SELECT* FROM PARTSUPP
  WHERE PS_PARTKEY = 6743
  AND PS_SUPPKEY = (SELECT MIN(PS_SUPPKEY)
    FROM PARTSUPP WHERE PS_PARTKEY = 6743);

SELECT* FROM PARTSUPP
  WHERE PS_PARTKEY = 19763
  AND PS_SUPPKEY = (SELECT MIN(PS_SUPPKEY)
    FROM PARTSUPP WHERE PS_PARTKEY =19763);



SELECT COUNT(*) FROM SUPPLIER;

SELECT * FROM SUPPLIER
WHERE  S_SUPPKEY IN (83,265,492,784,901,1000)
ORDER BY S_SUPPKEY;



DROP TABLE MINMAX;

CREATE TABLE MINMAX
(TNAME CHAR(15),
KEYMIN INTEGER,
KEYMAX INTEGER);

INSERT INTO MINMAX
SELECT
'LINEITEM_ORD',MIN(L_ORDERKEY),MAX(L_ORDE
RKEY)
FROM LINEITEM ;

INSERT INTO MINMAX
SELECT
'LINEITEM_NBR',MIN(L_LINENUMBER),MAX(L_LIN
ENUMBER)
FROM LINEITEM;

INSERT INTO MINMAX
SELECT
'ORDERTBL',MIN(O_ORDERKEY),MAX(O_ORDERKE
Y)
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_PAR
TKEY)
FROM PARTSUPP;

INSERT INTO MINMAX
SELECT
'PARTSUPP_SUPP',MIN(PS_SUPPKEY),MAX(PS_SUPP
KEY)
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;
spool off
exit;
```

F.2 firstten.sql

```
set echo on
set numwidth 25
spool count.out
select * from lineitem where rownum < 11;
select * from orders where rownum < 11;
select * from part where rownum < 11;
select * from partsupp where rownum < 11;
select * from supplier where rownum < 11;
select * from customer where rownum < 11;
select * from nation where rownum < 11;
select * from region where rownum < 11;
spool off
exit;
```

F.3 gen_seed.sh

```
#!/bin/ksh

SEED_FILE=$1

#Generate the seed
echo "Setting the random number seed"
PSEED=`date +%m:%d:%H:%M:%S | sed -e 's/://g'`
echo "Using ${PSEED} as seed0"
echo ${PSEED} >  $SEED_FILE
echo "Done setting the random number seed"
```

F.4 gtime.c

```
/* Copyright (c) 2001, 2002, Oracle Corporation.  All rights
reserved.  */

/*

  NAME
    gtime.c - <one-line expansion of the name>

  DESCRIPTION
    <short description of facility this file declares/defines>

  EXPORT FUNCTION(S)
    <external functions defined for use outside package -
one-line descriptions>

  INTERNAL FUNCTION(S)
    <other external functions defined - one-line
descriptions>

  STATIC FUNCTION(S)
    <static functions defined - one-line descriptions>

  NOTES
    <other useful comments, qualifications, etc.>

  MODIFIED   (MM/DD/YY)
  mpoess      10/23/02 - mpoess_update_from_visa
  mpoess      08/29/01 - Creation

*/
#include<stdio.h>
#include<stdlib.h>

# include <sys/time.h>

main ()
{

  struct timeval tv;

       (void) gettimeofday (&tv, (struct timezone *) 0);

  printf ("%.2f\n", ((double) tv.tv_sec + (1.0e-6 * (double)
tv.tv_usec)) ) ;

}

/* end of file gtime.c */
```

F.5 qexecpl.c

```
#ifdef RCSID
```

```
static char *RCSid =
   "$Header: qexecpl.c 17-oct-2001.09:29:47 mpoess Exp $
";
#endif /* RCSID */

/* Copyright (c) 1999, 2001, Oracle Corporation.  All rights
reserved.  */

/*

   NAME
     qexecpl.c - <one-line expansion of the name>

   DESCRIPTION
     SQL Execution Engine, Oracle v8,  OCI version

   PRIVATE FUNCTION(S)
     <list of static functions defined in .c file - with one-line
descriptions>

   MODIFIED   (MM/DD/YY)
     mpoess    10/17/01 - add serialization level in SQLinit
     mpoess    02/22/01 - add linux changes
     mpoess    08/05/99 - make compile
     mpoess    11/13/98 - fix pddl statement
     pswong    02/19/97 - migrating to version 8
     pswong    04/02/96 - more polishing
     pswong    03/25/96 - polish up
     pswong    03/06/96 - created

*/

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

#include "qexecpl.h"

/* Function Prototypes */

extern double gettime();

/* function prototypes from gen.c */

int get_statement();

/* Declare error handling functions */

void sql_error();

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

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

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

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

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

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

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

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

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

sltype slist[MAX_SEL_LIST];  /* Array for describing
Select List         */
dltype *dlist[MAX_SEL_LIST]; /* Array of ptrs for
Defining Select List   */

char stmt[SQL_LEN];       /* The SQL statement or
comment line.  */
char qn[3];               /* Number of the query being executed
*/
char qnp[3];              /* Number of the previous query
executed  */
```

```
char cmnt[5000];          /* Buffer to save the comment.
*/
#ifdef LINUX
FILE *qtemp;     /* fd for query template          */
FILE *logfile;   /* log and report files           */
FILE *rep;
#else
FILE *qtemp = stdin;     /* fd for query template          */
FILE *logfile = stdout;  /* log and report files           */
FILE *rep = stdout;
#endif
void *defbuf;           /* Buffer pointer for ODEFIN         */
int deflen = 0;         /* Size of data type for ODEFIN      */
int deftype = 1;        /* Oracle type number for ODEFIN
*/

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

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

/* OCI handles */

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

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

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

void usage() {

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

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

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

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

  /* Rollback just in case */

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

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

```
  SQLexit();

  exit(1);
}

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

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

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

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

  strcpy(logname, argv[1]);

  /* Process  optional parameters */

  argc -= 1;
  argv += 1;

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

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

  SQLinit();

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

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

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

    switch (retcode) {

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

      /* if this is a set_row_fetch command */
    case SET_FETCHROW:
```

```
    fprintf(logfile,"Setting the number of rows to fetch to:
%ld\n\n",
                num_to_fetch);
    break;

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

    /* Executes the query */
    SQLexec();

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

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

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

  /* Get Timing for the last query */

  tr_end = gettime();

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

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

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

  /* fprintf(rep, "Query %s : Execution time %.2f\n",
qn,(tr_end - s_tr_start));*/
  fprintf(rep, "Query %s: Execution Time: %.2f started %.2f
ended %.2f\n",
                qn,(tr_end - s_tr_start),s_tr_start,tr_end);

  time(&tim);
  fprintf(logfile,"\nEnded Executing this Stream at %s\n",
ctime(&tim));
  fprintf(logfile,"\nStream Started at %.2f\n", tr_start);
  fprintf(logfile,"Stream Ended at %.2f\n", tr_end);
  fprintf(logfile,"Stream Processed in %.2f
seconds\n\n",(tr_end - tr_start));

  fprintf(rep,"\nEnded Executing this Stream at %s\n",
ctime(&tim));
  fprintf(rep,"\nStream Started at %.2f\n", tr_start);
  fprintf(rep,"Stream Ended at %.2f\n", tr_end);
  fprintf(rep,"Stream Processed in %.2f seconds\n\n",
                (tr_end - tr_start));

  fprintf(logfile, "\nSQL statements processed: %d\n",
stmt_cnt);
  /*fprintf(logfile, "Queries processed: %d\n", qry_cnt);*/

  fflush(rep);
  fflush(logfile);

  /* Close the query template file */

  fclose(qtemp);

  /*  Disconnect from ORACLE. */

  SQLexit();
  exit(0);
}


/* SQLinit(): Perform initialization tasks.
*/
/*          Logs on to Oracle, opens some files and open a
cursor for */
/*          later use.                                    */

void SQLinit() {

  int i;

  /* preallocate MAX_PREALLOC members of the dlist
array                */
  /* initializes others to NULL so that we can determine who
to free later */

  for (i=0; i<MAX_SEL_LIST; i++) {
    if (i < MAX_PREALLOC) {
      dlist[i] = (dltype *) memalloc (sizeof(dltype));
      dlist[i]->defhdl = NULL;
/*      OCIhalloc(curq,&(dlist[i]-
>defhdl),OCI_HTYPE_DEFINE); */
    }
    else
      dlist[i] = NULL;
  }

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

```
  (void) OCIInitialize(OCI_DEFAULT,(dvoid *)0,0,0,0);

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

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

  /* get username and password */

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

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


OCIaset(tpcsvc,OCI_HTYPE_SVCCTX,tpcsrv,0,OCI_ATT
R_SERVER,errhp);

OCIaset(tpcusr,OCI_HTYPE_SESSION,logname,strlen(log
name),OCI_ATTR_USERNAME,
              errhp);

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

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


OCIaset(tpcsvc,OCI_HTYPE_SVCCTX,tpcusr,0,OCI_ATT
R_SESSION,errhp);

/*
  if ((status=OCILogon((OCIEnv *)tpcenv,(OCIError
*)errhp,(OCISvcCtx *)tpcsvc,
                       (text *)logname, strlen(logname), (text
*)passwd,
                       strlen(passwd), (text *) 0, 0)) !=
OCI_SUCCESS)
    sql_error(errhp, status, 1);
*/
  printf("\nConnected to ORACLE as user: %s\n\n",
logname);
}



/* SQLexec()  Executes the SQL statement.
*/
/*          Parse the SQL statement.                    */
/*          If DDL or DML statements, execute right away.
*/
/*          Else describe and define select list outputs,
*/
/*               execute and fetch results.             */

void SQLexec()
{
  int i;
  ub2 stmttyp = OCI_STMT_SELECT;     /* default is a
SELECT statement */

  /* Clause 5.3.6.2: QI(i,s) is the time between the first
character */
  /*               of this query text is submitted and the first   */
  /*               character of the next query text is submitted.
*/

  if (qry_cnt) {
    time(&tim);
    s_tr_end = gettime();
    fprintf(logfile,"Query Processed in %.2f seconds.\n\n",
     (s_tr_end - s_tr_start));

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

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

    /*fprintf(rep, "Query %s : Execution time %.2f\n",
qnp,(s_tr_end - s_tr_start));*/
    fprintf(rep, "Query %s: Execution Time: %.2f started
%.2f ended %.2f\n",
              qnp,(s_tr_end - s_tr_start),s_tr_start,s_tr_end);

    /* Let's fflush stuff so that we can see what's going on */

    fflush(logfile);
    fflush(rep);
  }
  else
    tr_start = gettime();

  s_tr_start = gettime();

  /* prepare the statement */

  if ((status = OCIStmtPrepare(curq, errhp, (text*) stmt,
(ub4) strlen(stmt),
                               OCI_NTV_SYNTAX,
OCI_DEFAULT)) != OCI_SUCCESS)
    sql_error(errhp,status,1);
```

```
  /* Prints the query text and comment to the logfile */

  fprintf(logfile, "\n%s\n", cmnt);
  cmnt[0]=0;
  fprintf(logfile, "\n%s\n", stmt);

  /* if this is a DDL or DML statement, execute it right away
*/
  /* only worries about SELECT statements right now,
cannot   */
  /* execute a stored PL/SQL procedure in thie version
*/


OCIaget(curq,OCI_HTYPE_STMT,&stmttyp,NULL,OCI_
ATTR_STMT_TYPE,errhp);

  if (stmttyp != OCI_STMT_SELECT) {
    OCIsexec(tpcsvc,curq,errhp,1);
    return;
  }

  /* otherwise, this is a select statement */
  /* Describe and define output variables  */

  /* first let's execute it to get the select-list definition */

  OCIaset(curq, OCI_HTYPE_STMT, &pfmem, 0,
OCI_ATTR_PREFETCH_MEMORY, errhp);

  OCIsexec(tpcsvc,curq,errhp,0);

  num_sel_list = define_output_variables();

  /* Executes the query and fetches the rows */

  (void) process_select_list(num_sel_list);

  /* Need to get the number of rows fetched first   */
  /* since the following statments will screw it up */


OCIaget(curq,OCI_HTYPE_STMT,&rows_ret,NULL,OCI_
ATTR_ROW_COUNT,errhp);

  /* To control memory usage, let's free up the extra dlist
entries */
  /* that we have allocated.                          */

  i=MAX_PREALLOC;
  while(dlist[i] != NULL) {
    free(dlist[i]);
    dlist[i++] = NULL;
  }

  /* reset set_fetchrows */

  num_to_fetch = -1;
}


void SQLexit() {

  int i;

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

  /* free all memory */

  for (i=0; i<MAX_SEL_LIST; i++) {
    if (dlist[i] != NULL) {
      free(dlist[i]);
    }
  }

  /* Flush all output */

  fflush(rep);
  fflush(logfile);

}


/* define_output_variables(): Describe and define select-list
items for */
/*                    a query statement.                    */
/*                    Returns the number of select-list items
*/
/*                    for this query.                       */

int define_output_variables()
{

  int i;
  int retflag = 0;

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

    slist[i].buflen = MAX_COLNAME_SIZE;

    if (OCIParamGet(curq, OCI_HTYPE_STMT, errhp,
(dvoid **) &tpcpar,
                                POS(i)) != OCI_SUCCESS)
      break;


    /* dsize and nullok fields of dlist not used */

    OCIaget(tpcpar, OCI_DTYPE_PARAM,
&(slist[i].dbsize),
              NULL, OCI_ATTR_DATA_SIZE, errhp);
```

```
   OCIaget(tpcpar, OCI_DTYPE_PARAM,
&(slist[i].dbtype),
            NULL, OCI_ATTR_DATA_TYPE, errhp);
   OCIaget(tpcpar, OCI_DTYPE_PARAM, &(slist[i].buf),
            &(slist[i].buflen), OCI_ATTR_NAME, errhp);
   OCIaget(tpcpar, OCI_DTYPE_PARAM,
&(slist[i].precision),
            NULL, OCI_ATTR_PRECISION, errhp);
   OCIaget(tpcpar, OCI_DTYPE_PARAM, &(slist[i].scale),
            NULL, OCI_ATTR_SCALE, errhp);

   /* For formatting purpose, remove trailing blanks in
select-list name. */

/*
   if (slist[i].buflen < MAX_COLNAME_SIZE)
     (slist[i].buf)[slist[i].buflen] = '\0';
*/
   /* Well, we need to allocate for entries for dlist */

   if (i >= MAX_PREALLOC) {
     dlist[i] = (dltype *) memalloc(sizeof(dltype));
     dlist[i]->defhdl = NULL;
    }

   /* Let's check the sizes and types for this select list item
*/

   switch (slist[i].dbtype) {

   case OCI_TYPECODE_NUMBER:

     /* The odescr will not give a good estimate to the scale
if */
     /* no scale was given in the Oracle table definition.
*/

#ifdef HAVE_SCALE
     if (slist[i].scale != 0) {
           defbuf = (double *) dlist[i]->fbuf;
           deflen = FLT;
           deftype = OCI_TYPECODE_DOUBLE;
           slist[i].dbtype = OCI_TYPECODE_DOUBLE;
     } else {
           defbuf = (int *) dlist[i]->ibuf;
           deflen = INT;
           deftype = OCI_TYPECODE_INTEGER;
           slist[i].dbtype = OCI_TYPECODE_INTEGER;
     }
#else
     defbuf = (double *) dlist[i]->fbuf;
     deflen = FLT;
     deftype = OCI_TYPECODE_FLOAT;
     slist[i].dbtype = OCI_TYPECODE_FLOAT;
#endif /* HAVE_SCALE */

     break;

   default:
     /* default is character string */

     defbuf = (char **) dlist[i]->sbuf;
     deflen = MAX_STR_LEN;
     deftype = SQLT_STR;
/*     deftype = OCI_TYPECODE_CHAR; */
     break;
    }

   /* Define the column */

   if ((status=OCIDefineByPos(curq,&(dlist[i]-
>defhdl),errhp,POS(i),

defbuf,deflen,deftype,NULL,
                                        dlist[i]-
>rlen,NULL,OCI_DEFAULT))!=OCI_SUCCESS)
     sql_error(errhp,status,1);
  }
  return i;
}


/* process_select_list(): Fetch rows from a query.
*/

void process_select_list(num)
    int num;       /* number of select list items */
{

  int i,j;
  int ntf;
  int num_so_far;
  sword stats = OCI_SUCCESS;

  /* Print the headers for the query execution result */

  print_header(num);

  /* See if we need to limit the rows to fetch */

  ntf = (num_to_fetch >= 0) ? num_to_fetch :
MAX_ARRAY;

  /* Fetch the rows and print them out */

  if ((ntf > MAX_ARRAY) || (num_to_fetch == -1)) {

    stats = OCIStmtFetch(curq, errhp, MAX_ARRAY,
OCI_FETCH_NEXT, OCI_DEFAULT);


OCIaget(curq,OCI_HTYPE_STMT,&rows_ret,NULL,OCI_
ATTR_ROW_COUNT,errhp);

    print_rows(num,rows_ret);

    /* To avoid 1022 from OFEN */
```

```
   /* More rows to fetch...   */

   if (stats != OCI_NO_DATA) {
     if (num_to_fetch == -1) {
           while ((stats =
OCIStmtFetch(curq,errhp,MAX_ARRAY,OCI_FETCH_N
EXT,
                                          OCI_DEFAULT))
== OCI_SUCCESS) {

OCIaget(curq,OCI_HTYPE_STMT,&num_so_far,NULL,
                          OCI_ATTR_ROW_COUNT,errhp);
             print_rows(num,(num_so_far-rows_ret));
             rows_ret = num_so_far;
           }
           /* Print the final rows */
           OCIaget(curq,OCI_HTYPE_STMT,&num_so_far,
NULL,
                          OCI_ATTR_ROW_COUNT,errhp);
           print_rows(num,(num_so_far-rows_ret));
           rows_ret = num_so_far;
     } else {
           ntf -= MAX_ARRAY;

           while ((stats = OCIStmtFetch(curq,errhp,

((ntf>MAX_ARRAY) ? MAX_ARRAY:ntf),

OCI_FETCH_NEXT, OCI_DEFAULT)) ==
                  OCI_SUCCESS) {
             ntf -= MAX_ARRAY;

OCIaget(curq,OCI_HTYPE_STMT,&num_so_far,NULL,
                          OCI_ATTR_ROW_COUNT,errhp);
             print_rows(num,(num_so_far-rows_ret));
             rows_ret = num_so_far;
             if (ntf <= 0) break;
           }
           OCIaget(curq,OCI_HTYPE_STMT,&num_so_far,
NULL,
                          OCI_ATTR_ROW_COUNT,errhp);
           print_rows(num,(num_so_far-rows_ret));
           rows_ret = num_so_far;
     }
   }
  } else {
    OCIStmtFetch(curq, errhp, ntf, OCI_FETCH_NEXT,
OCI_DEFAULT);

OCIaget(curq,OCI_HTYPE_STMT,&rows_ret,NULL,OCI_
ATTR_ROW_COUNT,errhp);
    print_rows(num,rows_ret);
  }

  fprintf(logfile,"\n\n%d row%c processed.\n", rows_ret,
           rows_ret == 1 ? '\0' : 's');

}
```

```
int get_statement()
{

  char line[128];
  char *pos, *str;

  /* Reset statement buffer */

  stmt[0] = '\0';

  while (fgets(line, 127, qtemp) != NULL) {

    /* skip blank lines */
    if (line[0] == '\n')
      continue;

    /* remove blanks */

    str = line;

    while (*str == ' ') str++;

    /* Let's get the line together first */

    strcat(stmt, str);

    /* if this is a comment line */
    if ((str[0] == '-') && (str[1] == '-'))
      return COMMENT;

    /* see if this is a set_fetchrows line */
    if (strncmp(str, "set_fetchrows", 13) == 0) {
      pos = strchr(str, ';');
      *pos = '\0';
      pos = strchr(str, '=');
      num_to_fetch = atol(++pos);
      return SET_FETCHROW;
    }

    /* if this is the end of the current statement */
    if ((pos = strchr(stmt, ';')) != NULL) {
      *pos = '\0';
      return SQL_STMT;
    }
  }
  return END_OF_FILE;
}


/* memalloc(): Allocates memory, exit program if we have a
problem. */

void *memalloc(size)
     int size;
{

  void *tmp;
```

```
  if ((tmp = (void *) malloc(size)) == NULL) {
    fprintf(stderr, "Error in malloc\n");
    SQLexit();
    return NULL;       /* should never reach here */
  } else {
    return tmp;
  }
}



void print_header(nsel)
     int nsel;          /* Number of select list items */
{

  int i, diff;
  char colname[MAX_COLNAME_SIZE];
  int len = 0;          /* Running column length */
  int cwid = 0;

  fprintf(logfile, "\n");

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

    /* extract the column name */

    strncpy((char *)colname, (char *)slist[i].buf,
slist[i].buflen);
    colname[slist[i].buflen] = '\0';

    /* format the output a little */

    cwid = MAX(slist[i].dbsize, slist[i].buflen);

    /* do a little bit of formatting */

    if (cwid > 80) {
      fprintf(logfile,"\n");
      len = 0;
    } else if ((len += cwid) > 80) {
      fprintf(logfile,"\n");
      len = cwid;
    }
#ifdef FORMAT1
    if ((slist[i].dbtype == INT_TYPE) || (slist[i].dbtype ==
FLT_TYPE))
      fprintf(logfile, "%*s ", cwid, slist[i].buf);
    else  /* string type */
      fprintf(logfile, "%*s ", -cwid, slist[i].buf);
#else
      fprintf(logfile, "%*s ", -cwid, colname);
#endif /* FORMAT1 */
  }

  fprintf(logfile,"\n");
}


void print_rows(ncol, nrow)
     int ncol;
     int nrow;
{

  int i,j;
  int len;
  int diff;
  int cwid;

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

    len = 0;

    for (j=0;j<ncol;j++) {

      cwid = MAX(slist[j].dbsize, slist[j].buflen);

      /* do a little bit of formatting */

      if (cwid > 80) {
            fprintf(logfile,"\n");
            len = 0;
      } else if ((len += cwid) > 80) {
            fprintf(logfile,"\n");
            len = cwid;
      }

      switch(slist[j].dbtype) {
      case INT_TYPE:
#ifdef HAVE_SCALE
            fprintf(logfile, "%*ld|", cwid,          (dlist[j]-
>ibuf)[i]);
            break;
#endif /* HAVE_SCALE */
      case FLT_TYPE:
#ifdef FORMAT1
            fprintf(logfile,"%*.2f ", cwid, (dlist[j]->fbuf)[i]);
#else
            fprintf(logfile,"%*.2f ", -cwid, (dlist[j]->fbuf)[i]);
#endif /* FORMAT1 */
            break;
      default:
            fprintf(logfile, "%*s ", -(cwid), (dlist[j]->sbuf)[i]);

            break;
      }
    }
    fprintf(logfile, "\n");
  }
}


/* remove_newline(): Remove newline character from str. */

void remove_newline(str)
     char *str;
{

  char *p;
```

```
  while ((p = strchr(str,'\n')) != NULL)
    *p = ' ';
}
```

F.6 qexecpl.h

```
/*
 * $Header: qexecpl.h 13-nov-2001.17:52:35 mpoess Exp $
 */

/* Copyright (c) 1999, 2001, Oracle Corporation.  All rights
reserved.  */

/* NOTE:  See 'header_template.doc' in the 'doc' dve under
the 'forms'
     directory for the header file template that includes
instructions.
*/

/*
  NAME
    qexecpl.h

  DESCRIPTION
    SQL statement execution front-end header file.

  PUBLIC FUNCTION(S)
    <list of external functions declared/defined - with one-
line descriptions>

  PRIVATE FUNCTION(S)
    <list of static functions defined in .c file - with one-line
descriptions>

  EXAMPLES

  NOTES
    <other useful comments, qualifications, etc.>

  MODIFIED   (MM/DD/YY)
  mpoess      11/13/01 - change DOP to 84 for DML and
DDL
  mpoess      02/22/01 - add linux changes
  mpoess      08/05/99 - make compile
  mpoess      07/15/99 - Creation
  mpoess      07/15/99 - Creation

*/

/*
# ifndef S_ORACLE
#  include <s.h>
# endif
*/
#ifndef QSTREAMPL_H

#define QSTREAMPL_H

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

#include <oratypes.h>

#include <oratypes.h>

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

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

/* some basic definitions */

#define UNAME_LEN 64
#define MAX_FILE_PATH_LEN 128

#ifndef TRUE
#define TRUE 1
#endif /* TRUE */

#ifndef FALSE
#define FALSE 1
#endif /* FALSE */
#ifndef LINUX
#define MAX(x,y) ((x >= y) ? x : y)
#define MIN(x,y) ((x <= y) ? x : y)
#endif
/* defines and typedefs for parsing */

#define CRT_TBL  1
#define INS_STMT 3
#define SEL_STMT 4
#define UPD_STMT 5
#define DRP_VIEW 7
#define DRP_TBL  8
#define DEL_STMT 9
#define CRT_VIEW 10

/* defines and typedefs for query description */

#define MAX_COLNAME_SIZE 32   /* Maximum length
of Column name  */
```

```
#define MAX_SEL_LIST 16      /* Maximum items on a
select list */

#define END_OF_LIST 1007     /* Error code when we
reach the end of the */
                     /* select list.                    */

/* types for describe */

#define CHAR_TYPE 1
#define NUM_TYPE  2
#define INT_TYPE  3
#define FLT_TYPE  4
#define STR_TYPE  5
#define DATE_TYPE 12

#define NUMWIDTH 16          /* Width of the numeric
fields    */

#define POS(i) (i+1)         /* The position is 1...n instead  */
#define IND(i) (i-1)         /* of 0..n-1 as in an array.      */

typedef struct des
{
  ub2 dbsize;
  ub4 buflen;
/*  sb2 dsize;  */
  sb4 scale;
/*  sb2 nullok; */
  OCITypeCode dbtype;
/*  text buf[MAX_COLNAME_SIZE]; */
  text *buf;
  ub1 precision;
} sltype;


/* defines and typedefs for query select list definition */

#define MAX_ARRAY 50      /* Maximum array size for
array fetch */
#define PFMEMSIZE 65536   /* Memory size of prefetch
buffer     */

#define MAX_STR_LEN 256   /* Maximum size for string
variables         */
#define MAX_PREALLOC 8    /* Maximum number of
preallocated select list */
                     /* definitions.                    */

#define INT sizeof(long)
#define STR sizeof(char)
#define FLT sizeof(double)

#define FLTP (double *)
#define INTP (long *)
#define STRP (char **)

typedef struct def
{
  long ibuf[MAX_ARRAY];
  double fbuf[MAX_ARRAY];
  char sbuf[MAX_ARRAY][MAX_STR_LEN];
  ub2 rlen[MAX_ARRAY];       /* return length     */
  OCIDefine *defhdl;
} dltype;

extern int errno;

#define SQL_LEN 2048

#ifndef NULL
#define NULL 0
#endif

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

#ifndef DISCARD
# define DISCARD (void)
#endif

#ifndef sword
# define sword int
#endif

#ifndef ub1
#define ub1 unsigned char
#endif

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

#define ADR(object) ((ub1 *)&(object))
#define SIZ(object) ((sword)sizeof(object))
#define SID(sid) ((sid == -1) ? 0 : sid)

/* For get_statement */

#define END_OF_FILE -1
#define COMMENT 1
#define SQL_STMT   2
#define SET_FETCHROW 3


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

#define OCIhfree(hndl,htyp) \
   if((status=OCIHandleFree((dvoid *)hndl,htyp)) ==
OCI_SUCCESS) \
```

```
      fprintf(stderr, "Error freeing handle of type %d\n",
htyp)

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

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

#define OCIsexec(svch,stmh,errh,iter) \

if((status=OCIStmtExecute(svch,stmh,errh,iter,0,NULL,NU
LL,OCI_DEFAULT)) != OCI_SUCCESS) \
      sql_error(errh,status,1); \
   else \
      DISCARD 0


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

#endif /* QSTREAMPL_H */
```

F.7 refdata_check.doit

```
#!/sbin/sh

set -x

sqlplus /NOLOG <<! >refdata_queries.out
connect tpch/tpch
@refdata_queries.sql
!
```

F.8 Refdata_check.ksh

```
#!/bin/ksh

#set -x

. $KIT_DIR/env

RANDOM=`cat seed`;
echo seeded random number generator with `cat seed`;

ifs=$IFS
numlines=5
sql_output=refdata_queries.sql
correct_output=refdata_excerpt.txt

echo "" > $sql_output
echo "" > $correct_output


# function: getrandom
# usage: getrandom <min> <max>
# ---------------------------
function getrandom {

#set -x

  min=$1
  max=`expr $2 + 1`
  diff=`expr $max - $min`
  #rand=$[ $RANDOM % $diff ]
  #rand=`expr $min + $rand`
  rand2=$RANDOM
  rand1=`expr $rand2 % $diff`
  rand=`expr $min + $rand1`
}


# function: getlines
# usage: getlines <tablename> <key1> <keypos1> [<key2>
<keypos2>]
# ----------------------------------------------------------------
function getlines {

#set -x

  table=$1

  shift
  #keys=($*)
  keys_1=$*
  #numkeys=${#keys[*]}
  numkeys=$#

  ####
  (( z = 0 ))
  for k in $keys_1
  do
    keys[$z]=$k
    echo "keys[$z] = ${keys[$z]}"
    (( z = $z + 1 ))
  done

  ####

  getrandom 1 `ls $REF_DATA_SET_DIR/${table}.* | wc -
l`
```

```
  file=`ls $REF_DATA_SET_DIR/${table}.* | head -n
$rand | tail -n 1`

  echo "### $table ($file) ###"
  #for ((i=1;i<=$numlines;i++)); do
   (( i = 1 ))
   while (( $i <= $numlines ))
   do
    IFS=$ifs
    getrandom 1 `cat $file | wc -l`
    line=`head -n $rand $file | tail -n 1`
    echo $line >> $correct_output

    IFS='|'; set $line
    #line=($*)
    line_1=$*

    ####
    #numlines=$#

    (( z = 0 ))
    for k in $line_1
    do
      line[$z]=$k
      echo "line[$z] = ${line[$z]}"
      (( z = $z + 1 ))
    done

    ####

    #for ((k=0;k<$numkeys;k++)); do
     (( k = 0 ))
     while (( $k < $numkeys ))
     do
      if [ $k -eq 0 ]; then
        #echo -n "SELECT $col_order FROM $table WHERE
" >> $sql_output
        echo "SELECT $col_order FROM $table WHERE "
>> $sql_output
      elif [ $k -gt 1 ]; then
        #echo -n " AND " >> $sql_output
        echo " AND " >> $sql_output
      fi
      (( v = $k + 1 ))
      #echo -n "${keys[$k]}='${line[${keys[$v]}]}'" >>
$sql_output
      echo  "${keys[$k]}='${line[${keys[$v]}]}'" >>
$sql_output

      ###
      #k=$[$k + 1]
      (( k = $k + 1 ))
      ###

     (( k = $k + 1 ))
    done
    echo ";" >> $sql_output

  (( i = $i + 1 ))
   done
}
echo set linesize 500 >> $sql_output
echo set pagesize 500 >> $sql_output
echo set numwidth 30  >> $sql_output
echo spool refdata_queries >> $sql_output
echo " " >> $sql_output
echo " " >> $sql_output

col_order="l_orderkey,l_partkey,
l_suppkey,l_linenumber,l_quantity,l_extendedprice,l_discou
nt,l_tax,l_returnflag,l_linestatus,l_shipdate,l_commitdate,l_r
eceiptdate,l_shipinstruct,l_shipmode,l_comment"
getlines lineitem l_orderkey 0 l_linenumber 3
col_order="o_orderkey,
o_custkey,o_orderstatus,o_totalprice,o_orderdate,o_orderpri
ority,o_clerk,o_shippriority,o_comment"
getlines orders o_orderkey 0 o_custkey 1
col_order="c_custkey, c_name, c_address, c_nationkey,
c_phone, c_acctbal, c_mktsegment, c_comment"
getlines customer c_custkey 0
col_order="n_nationkey, n_name,n_regionkey,n_comment"
getlines nation n_nationkey 0
col_order="p_partkey,
p_name,p_mfgr,p_brand,p_type,p_size,p_container,p_retail
price,p_comment"
getlines part p_partkey 0
col_order="ps_partkey,ps_suppkey,ps_availqty,ps_supplyco
st,ps_comment"
getlines partsupp ps_partkey 0 ps_suppkey 1
col_order="r_regionkey, r_name,r_comment"
getlines region r_regionkey 0
col_order="s_suppkey,
s_name,s_address,s_nationkey,s_phone,s_acctbal,s_comme
nt"
getlines supplier s_suppkey 0



echo " " >> $sql_output
echo " " >> $sql_output
echo "spool off" >> $sql_output
echo "exit;" >> $sql_output

#sqlplus /NOLOG <<! >refdata_queries.out
#connect tpch/tpch
#@refdata_queries.sql
#!
```

F.9 refdata_check.ksh.refresh

```
#!/bin/ksh

set -x

. $KIT_DIR/env
REF_DATA_SET_DIR="/flat1/sf1000_reference/updates"

RANDOM=`cat seed`;
```

```
echo seeded random number generator with `cat seed`;

ifs=$IFS
numlines=5
grep_output=refdata_grep.sh.refresh
correct_output=refdata_excerpt.txt.refresh

echo "" > $correct_output
echo "#!/sbin/sh" > $grep_output
echo "set -x" >> $grep_output
echo "" >> $grep_output


# function: getrandom
# usage: getrandom <min> <max>
# ----------------------------
function getrandom {

set -x

  min=$1
  max=`expr $2 + 1`
  diff=`expr $max - $min`
  #rand=$[ $RANDOM % $diff ]
  #rand=`expr $min + $rand`
  rand2=$RANDOM
  rand1=`expr $rand2 % $diff`
  rand=`expr $min + $rand1`
}


# function: getlines
# usage: getlines <tablename>
# ---------------------------------------------------------------
function getlines {

set -x

  table=$1

  getrandom 1 `ls $REF_DATA_SET_DIR/${table}.* | wc -
l`
  file=`ls $REF_DATA_SET_DIR/${table}.* | head -n
$rand | tail -n 1`

  echo "### $table ($file) ###"

   (( i = 1 ))
   while (( $i <= $numlines ))
   do
    IFS=$ifs
    getrandom 1 `cat $file | wc -l`
    line=`head -n $rand $file | tail -n 1`
    echo $line >> $correct_output

    IFS='|'; set $line
    #line=($*)
    line_1=$*
    ####
    #numlines=$#
    (( z = 0 ))
    for k in $line_1
    do
      line[$z]=$k
      echo "line[$z] = ${line[$z]}"
      (( z = $z + 1 ))
    done


    if [[ "${table}" != "delete" ]]
    then
      echo "grep \"${line[0]}$IFS${line[1]}$IFS${line[2]}\"
${table}.tbl.u1" >> $grep_output
    else
      echo "grep \"${line[0]}$IFS\"  ${table}.1" >>
$grep_output
    fi


   (( i = $i + 1 ))

  done

}
getlines lineitem
getlines orders
getlines delete

echo "" >> $grep_output
echo "exit" >> $grep_output
```

F.10 refdata_grep.sh.refresh

```
#!/sbin/sh
set -x

grep "899580040|63892733|6392740"  lineitem.tbl.u1
grep "899580077|129528028|7028065"  lineitem.tbl.u1
grep "899580075|23739361|6239364"  lineitem.tbl.u1
grep "899580079|111677545|1677546"  lineitem.tbl.u1
grep "899580072|123040603|3040604"  lineitem.tbl.u1
grep "4560105|5374885|F"  orders.tbl.u1
grep "4560047|68938004|F"  orders.tbl.u1
grep "4560492|47293255|F"  orders.tbl.u1
grep "4560360|124899628|O"  orders.tbl.u1
grep "4560265|90714439|O"  orders.tbl.u1
grep "898140709|"  delete.1
grep "898140453|"  delete.1
grep "898140704|"  delete.1
grep "898140645|"  delete.1
grep "898140455|"  delete.1

exit
```

F.11 refdata_queries.sql

```
set linesize 500
set pagesize 500
set numwidth 30
spool refdata_queries


SELECT l_orderkey,l_partkey,
l_suppkey,l_linenumber,l_quantity,l_extendedprice,l_discou
nt,l_tax,l_returnflag,l_linestatus,l_shipdate,l_commitdate,l_r
eceiptdate,l_shipinstruct,l_shipmode,l_comment FROM
lineitem WHERE
l_orderkey='5999999907'
 AND
l_linenumber='4'
;
SELECT l_orderkey,l_partkey,
l_suppkey,l_linenumber,l_quantity,l_extendedprice,l_discou
nt,l_tax,l_returnflag,l_linestatus,l_shipdate,l_commitdate,l_r
eceiptdate,l_shipinstruct,l_shipmode,l_comment FROM
lineitem WHERE
l_orderkey='5999999905'
 AND
l_linenumber='3'
;
SELECT l_orderkey,l_partkey,
l_suppkey,l_linenumber,l_quantity,l_extendedprice,l_discou
nt,l_tax,l_returnflag,l_linestatus,l_shipdate,l_commitdate,l_r
eceiptdate,l_shipinstruct,l_shipmode,l_comment FROM
lineitem WHERE
l_orderkey='5999999911'
 AND
l_linenumber='5'
;
SELECT l_orderkey,l_partkey,
l_suppkey,l_linenumber,l_quantity,l_extendedprice,l_discou
nt,l_tax,l_returnflag,l_linestatus,l_shipdate,l_commitdate,l_r
eceiptdate,l_shipinstruct,l_shipmode,l_comment FROM
lineitem WHERE
l_orderkey='5999999936'
 AND
l_linenumber='2'
;
SELECT l_orderkey,l_partkey,
l_suppkey,l_linenumber,l_quantity,l_extendedprice,l_discou
nt,l_tax,l_returnflag,l_linestatus,l_shipdate,l_commitdate,l_r
eceiptdate,l_shipinstruct,l_shipmode,l_comment FROM
lineitem WHERE
l_orderkey='5999999905'
 AND
l_linenumber='6'
;
SELECT o_orderkey,
o_custkey,o_orderstatus,o_totalprice,o_orderdate,o_orderpri
ority,o_clerk,o_shippriority,o_comment FROM orders
WHERE
o_orderkey='97'
 AND
o_custkey='21059945'
;
SELECT o_orderkey,
o_custkey,o_orderstatus,o_totalprice,o_orderdate,o_orderpri
ority,o_clerk,o_shippriority,o_comment FROM orders
WHERE
o_orderkey='257'
 AND
o_custkey='122692442'
;
SELECT o_orderkey,
o_custkey,o_orderstatus,o_totalprice,o_orderdate,o_orderpri
ority,o_clerk,o_shippriority,o_comment FROM orders
WHERE
o_orderkey='290'
 AND
o_custkey='117950323'
;
SELECT o_orderkey,
o_custkey,o_orderstatus,o_totalprice,o_orderdate,o_orderpri
ority,o_clerk,o_shippriority,o_comment FROM orders
WHERE
o_orderkey='352'
 AND
o_custkey='106455751'
;
SELECT o_orderkey,
o_custkey,o_orderstatus,o_totalprice,o_orderdate,o_orderpri
ority,o_clerk,o_shippriority,o_comment FROM orders
WHERE
o_orderkey='39'
 AND
o_custkey='81762487'
;
SELECT c_custkey, c_name, c_address, c_nationkey,
c_phone, c_acctbal, c_mktsegment, c_comment FROM
customer WHERE
c_custkey='49999812'
;
SELECT c_custkey, c_name, c_address, c_nationkey,
c_phone, c_acctbal, c_mktsegment, c_comment FROM
customer WHERE
c_custkey='49999848'
;
SELECT c_custkey, c_name, c_address, c_nationkey,
c_phone, c_acctbal, c_mktsegment, c_comment FROM
customer WHERE
c_custkey='49999807'
;
SELECT c_custkey, c_name, c_address, c_nationkey,
c_phone, c_acctbal, c_mktsegment, c_comment FROM
customer WHERE
c_custkey='49999896'
;
SELECT c_custkey, c_name, c_address, c_nationkey,
c_phone, c_acctbal, c_mktsegment, c_comment FROM
customer WHERE
c_custkey='49999850'
```

```
;
SELECT n_nationkey, n_name,n_regionkey,n_comment
FROM nation WHERE
n_nationkey='24'
;
SELECT n_nationkey, n_name,n_regionkey,n_comment
FROM nation WHERE
n_nationkey='17'
;
SELECT n_nationkey, n_name,n_regionkey,n_comment
FROM nation WHERE
n_nationkey='18'
;
SELECT n_nationkey, n_name,n_regionkey,n_comment
FROM nation WHERE
n_nationkey='14'
;
SELECT n_nationkey, n_name,n_regionkey,n_comment
FROM nation WHERE
n_nationkey='13'
;
SELECT p_partkey,
p_name,p_mfgr,p_brand,p_type,p_size,p_container,p_retail
price,p_comment FROM part WHERE
p_partkey='66666542'
;
SELECT p_partkey,
p_name,p_mfgr,p_brand,p_type,p_size,p_container,p_retail
price,p_comment FROM part WHERE
p_partkey='66666511'
;
SELECT p_partkey,
p_name,p_mfgr,p_brand,p_type,p_size,p_container,p_retail
price,p_comment FROM part WHERE
p_partkey='66666510'
;
SELECT p_partkey,
p_name,p_mfgr,p_brand,p_type,p_size,p_container,p_retail
price,p_comment FROM part WHERE
p_partkey='66666552'
;
SELECT p_partkey,
p_name,p_mfgr,p_brand,p_type,p_size,p_container,p_retail
price,p_comment FROM part WHERE
p_partkey='66666519'
;
SELECT
ps_partkey,ps_suppkey,ps_availqty,ps_supplycost,ps_comm
ent FROM partsupp WHERE
ps_partkey='3'
 AND
ps_suppkey='7500004'
;
SELECT
ps_partkey,ps_suppkey,ps_availqty,ps_supplycost,ps_comm
ent FROM partsupp WHERE
ps_partkey='9'
 AND
ps_suppkey='2500010'
;
SELECT
ps_partkey,ps_suppkey,ps_availqty,ps_supplycost,ps_comm
ent FROM partsupp WHERE
ps_partkey='2'
 AND
ps_suppkey='5000003'
;
SELECT
ps_partkey,ps_suppkey,ps_availqty,ps_supplycost,ps_comm
ent FROM partsupp WHERE
ps_partkey='12'
 AND
ps_suppkey='5000013'
;
SELECT
ps_partkey,ps_suppkey,ps_availqty,ps_supplycost,ps_comm
ent FROM partsupp WHERE
ps_partkey='3'
 AND
ps_suppkey='2500004'
;
SELECT r_regionkey, r_name,r_comment FROM region
WHERE
r_regionkey='3'
;
SELECT r_regionkey, r_name,r_comment FROM region
WHERE
r_regionkey='2'
;
SELECT r_regionkey, r_name,r_comment FROM region
WHERE
r_regionkey='4'
;
SELECT r_regionkey, r_name,r_comment FROM region
WHERE
r_regionkey='3'
;
SELECT r_regionkey, r_name,r_comment FROM region
WHERE
r_regionkey='0'
;
SELECT s_suppkey,
s_name,s_address,s_nationkey,s_phone,s_acctbal,s_comme
nt FROM supplier WHERE
s_suppkey='9999502'
;
SELECT s_suppkey,
s_name,s_address,s_nationkey,s_phone,s_acctbal,s_comme
nt FROM supplier WHERE
s_suppkey='9999596'
;
SELECT s_suppkey,
s_name,s_address,s_nationkey,s_phone,s_acctbal,s_comme
nt FROM supplier WHERE
s_suppkey='9999592'
;
```

```
SELECT s_suppkey,
s_name,s_address,s_nationkey,s_phone,s_acctbal,s_comme
nt FROM supplier WHERE
s_suppkey='9999563'
;
SELECT s_suppkey,
s_name,s_address,s_nationkey,s_phone,s_acctbal,s_comme
nt FROM supplier WHERE
s_suppkey='9999565'
;


spool off
exit;
```

F.12 ri_check.sql

```
set echo on
set numwidth 30
spool ri_check

select count(*) from partsupp left outer join part on
(ps_partkey=p_partkey) where p_partkey is null;

select count(*) from partsupp left outer join supplier on
(ps_suppkey=s_suppkey) where s_suppkey is null;

select count(*) from customer left outer join nation on
(c_nationkey=n_nationkey) where n_nationkey is null;

select count(*) from supplier left outer join nation on
(s_nationkey=n_nationkey) where n_nationkey is null;

select count(*) from region left outer join nation on
(r_regionkey=n_regionkey) where n_nationkey is null;

select count(*) from lineitem left outer join partsupp on
(l_partkey=ps_partkey and l_suppkey=ps_suppkey) where
ps_partkey is null and l_suppkey is null;

select count(*) from lineitem left outer join orders on
(l_orderkey=o_orderkey) where o_orderkey is null;

select count(*) from orders left outer join customer on
(o_custkey=c_custkey) where c_custkey is null;

spool off

exit;
```

F.13 runTPCHall

```
#!/bin/ksh

export ORACLE_SID=tpch

. $KIT_DIR/env

ECHO=echo

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

RUN_ID_FILE=${KIT_DIR}/audit/r_id

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

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

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

SCRIPT_LOG_FILE=${OUT_DIR}/main.out
RDB_TABLES=${OUT_DIR}/rdbtablest
RI_CHECK=${OUT_DIR}/ri_check
FIRST_TEN=${OUT_DIR}/firstten

LD0LOADASM=${OUT_DIR}/Ld0loadasm
LD1DBCRE=${OUT_DIR}/Ld1dbcre
LD2SCTSO=${OUT_DIR}/Ld2sctso
LD3DAPOP=${OUT_DIR}/Ld3dapop
LD4IXCRE=${OUT_DIR}/Ld4ixcre
LD5ANLYZ=${OUT_DIR}/Ld5anlyz


echo Start TPC-H Benchmark SEQUENCE NUMBER:
$RUN_ID > $SCRIPT_LOG_FILE
echo >> $SCRIPT_LOG_FILE
echo "Starting a new Oracle log file:
$ORACLE_HOME/log/diag/rdbms/1tb/tpch/trace/alert_${
ORACLE_SID}.log" >> $SCRIPT_LOG_FILE
echo >> $SCRIPT_LOG_FILE

mv
$ORACLE_HOME/log/diag/rdbms/1tb/tpch/trace/alert_${
ORACLE_SID}.log
$ORACLE_HOME/log/diag/rdbms/1tb/tpch/trace/alert_${
ORACLE_SID}.log.preAudit.$RUN_ID

mv
$ORACLE_HOME/log/diag/asm/+asm/ASM/trace/alert_A
SM.log
$ORACLE_HOME/log/diag/asm/+asm/ASM/trace/alert_A
SM.log.preAudit.$RUN_ID
touch
$ORACLE_HOME/log/diag/rdbms/1tb/tpch/trace/alert_${
ORACLE_SID}.log
```

```
touch
$ORACLE_HOME/log/diag/asm/+asm/ASM/trace/alert_A
SM.log


echo "Start: load database `date`" >> $SCRIPT_LOG_FILE
loadasm > $LD0LOADASM
dbcre.sh > $LD1DBCRE
sctso.sh > $LD2SCTSO
STIME=`$GTIME`
echo "Start: timed load portion `date`" >>
$SCRIPT_LOG_FILE
dapop.sh > $LD3DAPOP
ixcre.sh > $LD4IXCRE
anl.sh > $LD5ANLYZ
echo "End: timed load portion `date`" >>
$SCRIPT_LOG_FILE

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

echo "Start: ri_check.sql " >> $SCRIPT_LOG_FILE
$sqlplus ${DATABASE_USER}
@$KIT_DIR/audit/ri_check > ${RI_CHECK} 2>&1
refdata_check.ksh
refdata_check.do_it

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

runTPCHpt ${SCALE_FACTOR} 1 ${RUN_ID}

runTPCHpt ${SCALE_FACTOR} 2 ${RUN_ID}

sleep 600
# call the auditor: don't tshut >> $SCRIPT_LOG_FILE
# do reference data check for updates
#refdata_check.ksh.refresh
#refdata_grep.sh.refresh

cp
$ORACLE_HOME/log/diag/rdbms/1tb/tpch/trace/alert_${
ORACLE_SID}.log $OUT_DIR

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

F.14 runTPCHpt

```
#!/bin/ksh
. $KIT_DIR/env
#set -x
#ECHO=/bin/echo
SCRIPT_DIR=${KIT_DIR}/scripts
UPD_DIR=${KIT_DIR}/update
SRC_DIR=${KIT_DIR}/utils
QRY_DIR=${KIT_DIR}/queries # this is the location of the
query template file
QGEN_DIR=${KIT_DIR}/dbgen
QGEN=${QGEN_DIR}/qgen
QEXEC=${SRC_DIR}

DSS_QUERY=${KIT_DIR}/queries
export DSS_QUERY

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

TPCD_BIN=${KIT_DIR}/audit/bin

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

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

# The defaults

QPROG=${QEXEC}/qexec

usage () {

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

```
while :
do
  case "$1" in
  -u1) shift; U1PROG=$1;;
  -u2) shift; U2PROG=$1;;
  -p) shift; QPROG=$1;;
# not needed ?    -o) OSTAT=1;;
# not needed ?   -s) SSTAT=1;;
  -h) usage; exit 0;;
  --) shift; break;;
  esac
  shift;
done


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

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

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

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

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

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

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

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

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

# Execute UF1

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

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

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

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

echo "End UF1 $UF1_END, ${E1DATE}" >>
$SCRIPT_LOG_FILE
echo UF1: Execution Time: $UF1_TIME >>
$SCRIPT_LOG_FILE
echo >> $SCRIPT_LOG_FILE

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

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

# Execute UF2

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

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

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

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


echo "End UF2 $UF2_END, $EDATE" >>
$SCRIPT_LOG_FILE
echo UF2: Execution Time: $UF2_TIME >>
$SCRIPT_LOG_FILE
echo >>  $SCRIPT_LOG_FILE

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

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

i=$START_SET
PSEED=`cat $SEED_FILE`

while [ $i -le $STOP_SET ]; do

TPCD_LOG_FILE=${TPCD_LOG}/mt${RUN_ID}_${i}.l
og

TPCD_RPT_FILE=${TPCD_RPT}/mt${RUN_ID}_${i}.rp
t
        QUERY_PARAMETER=${TPCD_LOG}/qp${PA
RA}.${i}
  QRY_FILE=${TPCD_RPT}/qtemp.${PARA}s${i}

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

  i=`expr $i + 1`
done

TH_START_D=`date`
TH_START_T=`${GTIME}`
echo >> $SCRIPT_LOG_FILE
rm -f /tmp/th_pipe1
mknod /tmp/th_pipe1 p
rm -f /tmp/th_pipe2
mknod /tmp/th_pipe2 p
i=$START_SET

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

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

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

(${KIT_DIR}/audit/runTPCHus $RUN_ID
$START_SET_UPDATE $STOP_SET_UPDATE ${SF}
$PARA >> $SCRIPT_LOG_FILE 2>&1 &)

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

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

i=$START_SET
while [ $i -le $STOP_SET ]; do
        TPCD_LOG_FILE=${TPCD_LOG}/m${PARA}s
${i}
```

```
  #${KIT_DIR}/audit/abridge.pl ${TPCD_LOG_FILE}
        i=`expr $i + 1`
done
PIDS=`ps -fu oracle | grep scnt.sh | grep -v grep | awk '{print
$2}'`
kill -9 $PIDS
#calculate the metric
#analyze_streams.pl -f p -n $RUN_ID >
${TPCD_RPT}/tpch_metric.${RUN_ID}.${HID}.rpt
```

F.15 runTPCHus

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

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

DSS_QUERY=${KIT_DIR}/queries
export DSS_QUERY

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

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


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

GTIME=${SRC_DIR}/gtime
HID=1

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


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

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

  # Execute UF1

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

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

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

  # Execute UF2

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

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

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

print > /tmp/th_pipe2
```

F.16 runuf1.sh

```
#!/bin/ksh
#
# $Header: runuf1.sh 25-oct-2001.15:56:04 mpoess Exp $
#
# runuf1.sh
#
# Copyright (c) 1999, 2001, Oracle Corporation.  All rights
reserved.
#
#    NAME
#      runuf1.sh - <one-line expansion of the name>
#
# DESCRIPTION
```

```
#    runuf1.sh -l [<path name for reports>] -u
[<uid/passwd>]
#            -p [<program>] <run_id> <scale factor> <pair
number>
#            <parallelism>
# USAGE
#    To execute UF1.
#
#    NOTES
#      <other useful comments, qualifications, etc.>
#
#    MODIFIED   (MM/DD/YY)
#
#
. $KIT_DIR/env
O=${ORACLE_HOME}
UPDATE_DIR=${KIT_DIR}/update
SCRIPT_DIR=${UPDATE_DIR}/scripts
UTILS_DIR=${KIT_DIR}/utils
LOG_DIR=${UPDATE_DIR}/log
GTIME=${UTILS_DIR}/gtime
SF=${SCALE_FACTOR}
PAR_HINT=${UPDATE_1_DOP}

LOGPATH=.
PASSWD=${DATABASE_USER}

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

# perform the update function 1

START=`$GTIME`

# first create the temp tables

sqlplus /NOLOG << !

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

drop directory data_dir;
create directory data_dir as '/flat3/updates';

drop table temp_l_et;
create table temp_l_et(
   l_orderkey          number ,
   l_partkey           number ,
   l_suppkey           number ,
   l_linenumber        number ,
   l_quantity          number ,
   l_extendedprice     number ,
   l_discount          number ,
   l_tax               number ,
   l_returnflag        char(1) ,
   l_linestatus        char(1) ,
   l_shipdate          date ,
   l_commitdate        date ,
   l_receiptdate       date ,
   l_shipinstruct      char(25) ,
   l_shipmode          char(10) ,
   l_comment           varchar(44)
)
organization external (
type ORACLE_LOADER
default directory data_dir
access parameters
(
        records delimited by newline
        nobadfile
        nologfile
        fields terminated by '|'
        missing field values are null
    )
    location (
    'lineitem.tbl.u${SETNUM}'
))
reject limit unlimited  parallel  ${PAR_HINT};

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


alter session force parallel dml parallel (degree
${PAR_HINT});
```

```
alter session set isolation_level = serializable;
alter session set  optimizer_index_cost_adj=10;



insert into orders
select
   o_orderdate        ,
   o_orderkey         ,
   o_custkey          ,
   o_orderpriority    ,
   o_shippriority     ,
   o_clerk            ,
   o_orderstatus      ,
   o_totalprice       ,
   o_comment
from temp_o_et;


insert into  lineitem
select
   l_shipdate         ,
   l_orderkey         ,
   l_discount         ,
   l_extendedprice    ,
   l_suppkey          ,
   l_quantity         ,
   l_returnflag       ,
   l_partkey          ,
   l_linestatus       ,
   l_tax              ,
   l_commitdate       ,
   l_receiptdate      ,
   l_shipmode         ,
   l_linenumber       ,
   l_shipinstruct     ,
   l_comment
from temp_l_et;

commit;

rem drop table temp_l_et;
rem drop table temp_o_et;

exit;
!

END=`$GTIME`

# Done

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

F.17 runuf2.sh

```
#!/bin/ksh
#
# $Header: runuf2.sh 25-oct-2001.15:56:05 mpoess Exp $
#
# runuf2.sh
#
# Copyright (c) 1999, 2001, Oracle Corporation.  All rights
reserved.
#
#    NAME
#      runuf2.sh - <one-line expansion of the name>
#
# DESCRIPTION
#    runuf2.sh [-u <uid/passwd to login>] [-p <program>]
<run_id>
#              <scale factor> <pair number> <parallelism>
# USAGE
#    To execute UF2.
#
#    NOTES
#      <other useful comments, qualifications, etc.>
#
#
. $KIT_DIR/env
UPDATE_DIR=${KIT_DIR}/update
SCRIPT_DIR=${UPDATE_DIR}/scripts
UTILS_DIR=${KIT_DIR}/utils
GTIME=${UTILS_DIR}/gtime
LOG_DIR=${UPDATE_DIR}/log
PAR_HINT=${UPDATE_2_DOP}
SF=${SCALE_FACTOR}
PASSWD=${DATABASE_USER}

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

SETNUM=$1

i=1
PID=""

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

sqlplus /NOLOG << !

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

drop directory data_dir;
create directory data_dir as '/flat3/updates';
```

```
drop table temp_okey_et;
drop table temp_okey;

create table temp_okey_et(
   t_orderkey          number
)
organization external (
type ORACLE_LOADER
default directory data_dir
access parameters
(
            records delimited by newline
            nobadfile
            nologfile
            fields terminated by '|'
            missing field values are null
      )
      location (
      'delete.${SETNUM}'))
reject limit unlimited parallel 16;


create table temp_okey (t_orderkey, constraint tokey1
primary key(t_orderkey))
organization index parallel  16 nologging as select * from
temp_okey_et;
execute dbms_stats.gather_table_stats('tpch' , 'temp_okey',
estimate_percent => 1, degree => 16)


alter session  force parallel dml parallel ${PAR_HINT};
alter session set isolation_level=serializable;
alter session set optimizer_index_cost_adj=1;
rem alter session set "_px_trace" = high, tq, execution, time;
rem alter session set events '14525 trace name context
forever, level 4';


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


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

commit;
rem select DFO_NUMBER, tq_id, SERVER_TYPE,
NUM_ROWS, INSTANCE, PROCESS
rem from V\$PQ_TQSTAT order by 1,2,3,5,6;


drop table temp_okey;
drop table temp_okey_et;
exit;
!

END=`$GTIME`

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

F.18 scnt.sh

```
#!/bin/ksh

echo Process count for TPC-H RUN:$1 SEQUENCE:$2
while [ 1 = 1 ]; do
  cnt=`ps -ef | egrep "qexec|runTPCHus" | grep -v grep | wc -
l`
            echo
       echo `date` : $cnt
            ps -ef | egrep "qexec|runTPCHus" | grep -v grep
            sleep 30
done
```

F.19 set_queue

```
#!/sbin/sh

#set -x

#
# set queue_depth
#

for i in `ls -1 /dbms/links/roradsk*`
do
  scsimgr set_attr  -D $i -a max_q_depth=128 > /dev/null 2>
/dev/null
done


exit
```

F.20 tshut

```
#!/bin/ksh


export ORACLE_SID=$ORACLE_SID


if [ "$1" = "abort" ]; then
sqlplus /NOLOG<< !
connect / as sysdba
shutdown abort
exit
!
else
sqlplus /NOLOG<< !
connect / as sysdba
```

```
shutdown abort
exit
!
fi

sleep 5

exit
```

F.21 tshut.asm

```
#!/bin/ksh


export ORACLE_SID=ASM


sqlplus /NOLOG<< !
connect / as sysdba;
shutdown normal;
exit
!

sleep 5

exit
```

F.22 tstart

```
#!/bin/ksh

export ORACLE_SID=$ORACLE_SID

sqlplus /NOLOG << !
connect / as sysdba
startup pfile=$O/dbs/1TB_init.ora
!
sleep 5
/Lvm/set_queue;
exit
```

F.23 tstart.asm

```
#!/bin/ksh

export ORACLE_SID=ASM

sqlplus /NOLOG <<!
connect / as sysdba
startup pfile=/oracle/dbs/initasm.ora mount
!

exit
```

Appendix G Price Quotes

Sharada Bose
Performance Manager BCS
Hewlett-Packard
Pruneridge Avenue, MS4105
Cupertino, CA 95014
April 29, 2009

HP Unix Sales Development
19111 Pruneridge Avenue
Cupertino, CA 950014
(408) 447-2320

Description	Part Number		Reference Price	Qty	Extended Price	3 yr Maint Price
Server Hardware						
Superdome left chassis	A9834A, Opt 429		235,950	1	235,950	
Superdome sx2000 Cell Board	A9837A		19,250	8	154,000	
24x7x4hr - 3 Year Svc & Support Price (Hardware and Software)						702,536
Superdome 256GB Memory Bundle (128x2GB dimms)	A9856A		519,888	1	519,888	
Superdome 16GB Memory Group (8x2GB dimms)	A9846A		35,611	8	284,888	
12-Slot PCI-X I/O Chassis	A9836A		16,950	8	135,600	
Dual-Core Intel Itanium 9140N/1.6GHz/18MB L3	AD371A		23,000	32	736,000	
PCI-X 2 port 1000Base-SX Gigabit Adapter	A7011A		1,995	1	1,995	
PCI-X 4GB Fibre Channel Adapter (dual port)	AB379B		3,495	64	223,680	
PCI Dual Channel Ultra320 SCSI Adapter	A7173A		795	1	795	
HPDisk System 2120	A7382A		995	1	995	
HP INT no S/W 73G 15K 80U4 HDD	A7529A		1,495	4	5,980	
HP Universal Rack 10642 G2 Pallet Rack	AF001A		1,249	1	1,249	
HP 24A High Voltage US/JP Modular PDU	252663-D72		299	1	299	
HP Tape Array 5300	C7508B		729	1	729	
HP DVD + RW Array Field Module	Q1592B		649	1	649	
HP rx2660 Server (inc mem/disk/monitor/keyboard/mouse)	AB419A		8,557	1	8,557	
I/O Chassis Enclsoure for 12-Slot PCI-X Chassis	A9852A		25,750	2	51,500	
Graphite I/O expansion power subsystem	A5861D		34,860	1	34,860	
				Subtotal	**2,397,614**	**702,536**
Server Software						
HP-UX 11i v3 Integrity 16+ Skt PCL LTU	BA927AC, Opt 0	1	2,370	64	151,680	
HP-UX 11i v3 Integrity BOE Media	BA927AA, Opt A	1	565	1	565	
				Subtotal	**152,245**	**0**
Storage						
5m Fibre Channel Cables	221692-B22	1	95	128	12,160	
EVA4400 146GB HDD Starter Kit (8 HDD) (32+4 spare)**	AJ693B	1	15,000	36	540,000	
3 Yr Support Price for EVA4400 and disks						Included
M6412 Fibre Channel Drive Enclosure (32+4 spare)	AG638B	1	4,325	36	155,700	
146GB 15K FC EVA M6412 Enc HDD (512+52 spare)**	AG556B	1	1,190	564	671,160	
ProCurve Switch 2510 Series 48 port	J9020A	1	759	1	759	
Universal Rack 10642 G2 Pallet Rack	AF001A	1	1,249	6	7,494	
24A High Voltage US/JP Modular PDU	252663-D72	1	299	12	3,588	
				Subtotal	**1,387,273**	**0**
				Total	**3,937,132**	**702,536**
54 % Large Configuration Discount and Support Prepayment*					(2,114,480)	(379,369)
				Grand Total	**1,822,652**	**323,167**

*All discounts are based on US list prices and for similar quantities and configurations

From: MaryBeth Pierantoni [mary.beth.pierantoni@oracle.com]
Sent: Friday, April 24, 2009 12:03 PM
To: Shirley, John David
Subject: Pricing

Product	Price	Qty	Extended Price
Oracle Database 11g Enterprise Edition, Named User Plus for 3 years	$11,875	32*	$380,000
Partitioning, Named User Plus for 3 years	$2,875	32*	$92,000
Database Server Support Package for 3 years	$6,900	1	$6,900
Oracle Mandatory E-Business Discount			<$95,780>
Oracle TOTAL			$383,120

(* 32 = 0.50 * 64). Explanation: For the purposes of counting the number of processors which require licensing, an Intel multicore chip with "n" cores shall be determined by multiplying "n" cores by a factor of 0.50.
Contact: MaryBeth Pierantoni, mary.beth.pierantoni@oracle.com, 916-315-5081