



TPC Benchmark™ H  
Full Disclosure Report

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Sun SPARC Enterprise M9000

*Using*

*Oracle Database 11g Release 2 Enterprise Edition  
with Partitioning*

*Submitted for Review*

*October 5, 2010*

*First Revision*

*December 9, 2010*

*Second Revision*

*September 14, 2011*

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First Printing    October 5, 2010

Second Printing    December 9, 2010

Third Printing    September 14, 2011

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# Sun SPARC Enterprise M9000 Server with Oracle Database 11g Release 2

TPC-H 2.11.0  
TPC-Pricing 1.5.0

Report Date: October 5, 2010  
First Revision: December 9, 2010  
Second Revision: September 14, 2011

**Total System Cost**

**Composite Query per Hour Metric**

**Price / Performance**

**\$3,037,900 USD**

**198,907.5 QphH@3000GB**

**\$15.27/QphH@3000GB**

Database Size

Database Manager

Operating System

Other Software

Availability Date

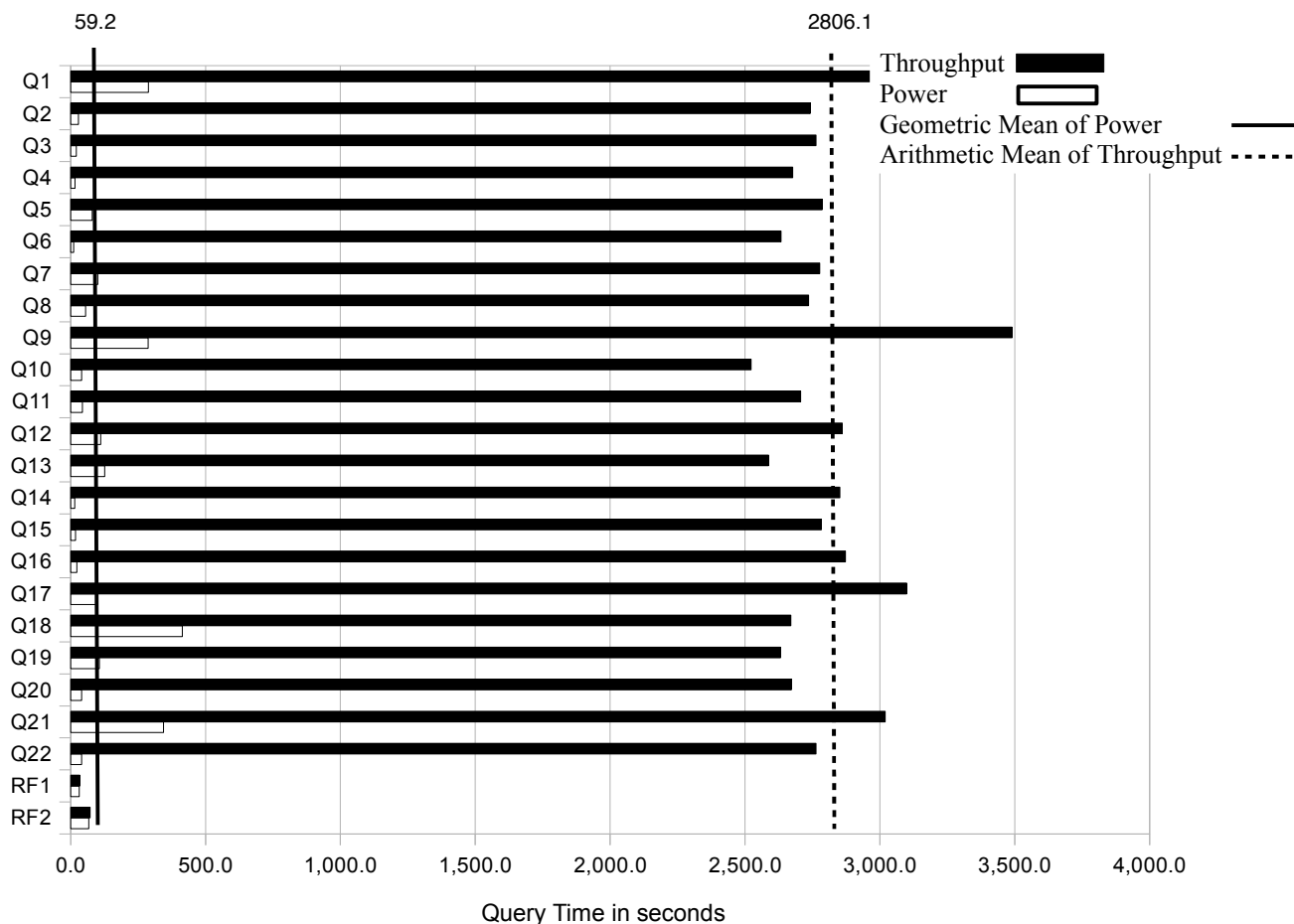
3000GB

Oracle Database 11g Release 2  
Enterprise Edition with  
Partitioning

Solaris 10

None

December 9, 2010



Database Load Time = 3:40:11  
Load Includes Backup: N  
Total Data Storage / Database Size = 26.0  
Memory to Database Size Percentage = 17.1

Storage Redundancy Levels:  
Base Tables: Level Three  
Auxiliary Data Structures: Level Three  
DBMS Temporary Space: Level Zero  
OS and DBMS Software: Level One

**System Configuration:**

Processors:  
Memory:  
Disks:  
Total Storage:

Sun SPARC Enterprise M9000 Server  
32 SPARC64 VII 2880 MHz Processors, 128 cores, 256 threads  
512GB  
16 Sun Storage 6180 Arrays w/ 16 300GB 15K RPM disks each  
4 300GB 10K SAS Internal  
78,000GB (GB = 1024\*1024\*1024 bytes)



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TPC-H Rev. 2.11.0  
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Description	Part Number	Source	Unit Price	Qty	Ext. Price	3 Yr. Maint.
<b>Server Hardware</b>						
Sun SE M9000-32 Base 1ph	SEHASY11Z-N	1	616,629	1	616,629	
SE_CMU:4*SPARCVII@2.8GHz w/64GB	SEMY4HE1Z-N	1	184,512	8	1,476,096	
SE_PCI_E IO Unit: 8*slots	SEMY61Z-N	1	43,970	8	351,760	
PWR Cord 1PHs M8000-9000 USA (included)	SEMXP31Z-N	1	3,039	5	15,195	
PCI-E Base IO Card	SEMY7BS1Z-N	1	3,840	2	7,680	
300GB 10K RPM 2.5" SAS	SEMY3C11Z-N	1	1,100	4	4,400	
8GB PCIe FC Dual Host Bus Adapter, qllogic	SG-XPCIE2FC-QF8-N	1	2,399	32	76,768	
Sun Fire X4170-M2	X4170M2-H1-AA	1	2,699	1	2,699	
Oracle Solaris 10 Pre-Install	5894A-N	1	0	1	0	
US PC Peripheral Kit (Keyboard/Mouse)	3701A-PC	1	50	1	50	
Express Slide Rail Kit	6326A	1	150	1	150	
4GB (1x4GB) DDR3-1333	4910A	1	255	2	510	
300GB 10K RPM 2.5" SAS Disk	RB-SS2CF-300G10K-N	1	689	1	689	
6Gb/s SAS HBA, Internal ATO	SG-SAS6-INT-Z	1	419	1	419	
DVD+/-RW SATA-based drive ATO	8325A-N	1	145	1	145	
1 x Intel Xeon E5620 ATO	5924A	1	599	1	599	
DIMM slot filler panel	5879A-N	1	0	15	0	
17" TFT Monitor	X7204A-N	1	219	1	219	
<b>Server Hardware Subtotal</b>					<b>2,554,008</b>	<b>0</b>
<b>Storage</b>						
Sun Storage 6180 4GB cache 4 FC ports	TB6180R11A2-0-N	1	15,595	16	313,520	
300GB 15K RPM FC-AL Disk	XTC-FC1CF-300G15KZ	1	2,095	256	536,320	
Sun Storage 6180 Rack Rail Kit	XTA6000-RK2-RAIL	1	175	16	2,800	
Jumper Cable Kit: 1 x 1m C13	XSR-JUMP-1MC13	1	23	32	736	
15M Fibre Channel Cable	X9734A-Z-N	1	105	32	3,360	
Sun Rack II 42U	XSR-1242E	1	2,849	2	5,698	
PDU 15kVA, Single Phase, LV	XSR-15K-L630	1	1,200	4	4,800	
<b>Storage Subtotal</b>					<b>867,234</b>	<b>0</b>
<b>Server Software</b>						
Oracle Solaris 10 Pre-install	SOLZS-10LC9A9S-IP	1	0	1	0	
Oracle Solaris Studio 12	SSSM9-121-T9DM	1	10	1	10	
Oracle Database 11g Release 2 Enterprise Edition, Named User Plus for 3 years (for 96 processors)		1	11,875	96	1,140,000	
Partitioning, Named User Plus for 3 years (for 96 processors)		1	2,875	96	276,000	
Incident Server Support for 3 years		1	2,300	3		6,900
<b>Server Software Subtotal</b>					<b>1,416,010</b>	<b>6,900</b>
Oracle Premier Hardware Support	Q-PREM-SPRT-SYS	1	410,549	3		1,231,647
<b>Total</b>					<b>4,837,252</b>	<b>1,238,547</b>
Total Oracle Software, Hardware and Hardware Maintenance Discount		1			(3,037,900)	
<b>Notes (Source):</b>					<b>3 Yr. Cost</b>	<b>\$3,037,900</b>
1. Oracle Corp.					<b>QpH @3000GB</b>	<b>198,907.5</b>
					<b>\$/QpH @3000GB</b>	<b>\$15.27</b>

**Audited by Francois Raab of InfoSizing, Inc.**

Oracle's discounts are based upon US list prices and for similar quantities and configurations. A discount of 50% has been applied to all Oracle hardware, software and services based on the total value and quantities of the components of the configuration, including full payment of all components and maintenance.

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



# Sun SPARC Enterprise M9000 Server with Oracle Database 11g Release 2

TPC-H Rev. 2.11.0  
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Report Date: October 5, 2010  
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## Numerical Quantities

### Measurement Results:

Database Scale Factor	= 3000GB
Total Data Storage / Database Size	= 26.0
Start of database load time	= 09-14-2010 18:22:14
End of database load time	= 09-14-2010 22:02:25
Database Load Time	= 3:40:11
Query Streams for Throughput Test	= 64
TPC-H Power	= 182,350.7
TPC-H Throughput	= 216,967.7
TPC-H Composite Query-per-Hour Rating (QphH@3000GB)	= 198,907.5
Total System Price Over 3 Years	= \$3,037,900
TPC-H Price/Performance Metric (\$/QphH@3000GB)	= \$15.27

### Measurement Intervals:

Measurement Interval in Throughput Test (Ts)	= 70,086.00 seconds
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### Duration of Stream Execution:

Power Run	Seed	RF1 Start RF1 End	Query Start Query End	RF2 Start RF2 End	Duration
	0914220225	09/15/2014 22:29:33	09/15/2014 22:30:05	09/15/2014 23:08:39	00:40:13
		09/15/2014 22:30:05	09/15/2014 23:08:39	09/15/2014 23:09:46	

Throughput Stream	Seed	Query Start Query End	Duration	RF1 Start RF1 End	RF2 Start RF2 End
1	0914220226	09/15/2014 23:09:56	17:03:00	09/16/2014 16:44:37	09/16/2014 16:45:05
		09/16/2014 16:12:56		09/16/2014 16:45:05	09/16/2014 16:46:01
2	0914220227	09/15/2014 23:09:56	16:51:31	09/16/2014 16:46:01	09/16/2014 16:46:30
		09/16/2014 16:01:26		09/16/2014 16:46:30	09/16/2014 16:47:36
3	0914220228	09/15/2014 23:09:56	16:44:12	09/16/2014 16:47:36	09/16/2014 16:48:10
		09/16/2014 15:54:08		09/16/2014 16:48:10	09/16/2014 16:49:18
4	0914220229	09/15/2014 23:09:56	16:37:43	09/16/2014 16:49:18	09/16/2014 16:49:50
		09/16/2014 15:47:39		09/16/2014 16:49:50	09/16/2014 16:50:53
5	0914220230	09/15/2014 23:09:56	16:43:14	09/16/2014 16:50:53	09/16/2014 16:51:23
		09/16/2014 15:53:10		09/16/2014 16:51:23	09/16/2014 16:52:32
6	0914220231	09/15/2014 23:09:56	16:34:08	09/16/2014 16:52:32	09/16/2014 16:53:06
		09/16/2014 15:44:04		09/16/2014 16:53:05	09/16/2014 16:54:13
7	0914220232	09/15/2014 23:09:56	17:17:31	09/16/2014 16:54:13	09/16/2014 16:54:47
		09/16/2014 16:27:27		09/16/2014 16:54:47	09/16/2014 16:55:57
8	0914220233	09/15/2014 23:09:56	16:35:14	09/16/2014 16:55:57	09/16/2014 16:56:33
		09/16/2014 15:45:10		09/16/2014 16:56:33	09/16/2014 16:57:47

Throughput Stream	Seed	Query Start Query End	Duration	RF1 Start RF1 End	RF2 Start RF2 End
9	0914220234	09/15/2014 23:09:56	17:14:47	09/16/2014 16:57:47	09/16/2014 16:58:23
		09/16/2014 16:24:44		09/16/2014 16:58:23	09/16/2014 16:59:45
10	0914220235	09/15/2014 23:09:56	17:32:58	09/16/2014 16:59:45	09/16/2014 17:00:20
		09/16/2014 16:42:54		09/16/2014 17:00:20	09/16/2014 17:01:29
11	0914220236	09/15/2014 23:09:56	16:54:50	09/16/2014 17:01:29	09/16/2014 17:02:06
		09/16/2014 16:04:46		09/16/2014 17:02:06	09/16/2014 17:03:12
12	0914220237	09/15/2014 23:09:56	16:27:11	09/16/2014 17:03:12	09/16/2014 17:03:46
		09/16/2014 15:37:07		09/16/2014 17:03:46	09/16/2014 17:04:50
13	0914220238	09/15/2014 23:09:57	16:40:14	09/16/2014 17:04:50	09/16/2014 17:05:25
		09/16/2014 15:50:11		09/16/2014 17:05:25	09/16/2014 17:06:33
14	0914220239	09/15/2014 23:09:57	16:48:35	09/16/2014 17:06:33	09/16/2014 17:07:11
		09/16/2014 15:58:32		09/16/2014 17:07:10	09/16/2014 17:08:16
15	0914220240	09/15/2014 23:09:57	16:35:42	09/16/2014 17:08:16	09/16/2014 17:08:49
		09/16/2014 15:45:39		09/16/2014 17:08:49	09/16/2014 17:09:57
16	0914220241	09/15/2014 23:09:57	17:31:48	09/16/2014 17:09:57	09/16/2014 17:10:29
		09/16/2014 16:41:45		09/16/2014 17:10:29	09/16/2014 17:11:45
17	0914220242	09/15/2014 23:09:57	16:48:35	09/16/2014 17:11:46	09/16/2014 17:12:19
		09/16/2014 15:58:32		09/16/2014 17:12:19	09/16/2014 17:13:30
18	0914220243	09/15/2014 23:09:57	17:28:41	09/16/2014 17:13:30	09/16/2014 17:14:02
		09/16/2014 16:38:38		09/16/2014 17:14:02	09/16/2014 17:15:10
19	0914220244	09/15/2014 23:09:57	16:34:22	09/16/2014 17:15:11	09/16/2014 17:15:42
		09/16/2014 15:44:19		09/16/2014 17:15:42	09/16/2014 17:16:45
20	0914220245	09/15/2014 23:09:57	17:05:43	09/16/2014 17:16:45	09/16/2014 17:17:16
		09/16/2014 16:15:40		09/16/2014 17:17:16	09/16/2014 17:18:25
21	0914220246	09/15/2014 23:09:57	16:57:50	09/16/2014 17:18:25	09/16/2014 17:19:00
		09/16/2014 16:07:47		09/16/2014 17:19:00	09/16/2014 17:20:11
22	0914220247	09/15/2014 23:09:57	17:12:41	09/16/2014 17:20:11	09/16/2014 17:20:48
		09/16/2014 16:22:39		09/16/2014 17:20:48	09/16/2014 17:22:08
23	0914220248	09/15/2014 23:09:57	17:03:31	09/16/2014 17:22:08	09/16/2014 17:22:46
		09/16/2014 16:13:28		09/16/2014 17:22:46	09/16/2014 17:23:58
24	0914220249	09/15/2014 23:09:57	17:13:36	09/16/2014 17:23:58	09/16/2014 17:24:33
		09/16/2014 16:23:33		09/16/2014 17:24:33	09/16/2014 17:25:47
25	0914220250	09/15/2014 23:09:57	16:53:44	09/16/2014 17:25:47	09/16/2014 17:26:27
		09/16/2014 16:03:41		09/16/2014 17:26:27	09/16/2014 17:27:38
26	0914220251	09/15/2014 23:09:57	16:45:08	09/16/2014 17:27:38	09/16/2014 17:28:15
		09/16/2014 15:55:05		09/16/2014 17:28:15	09/16/2014 17:29:19
27	0914220252	09/15/2014 23:09:57	16:57:29	09/16/2014 17:29:19	09/16/2014 17:29:50
		09/16/2014 16:07:27		09/16/2014 17:29:50	09/16/2014 17:31:05
28	0914220253	09/15/2014 23:09:57	17:06:14	09/16/2014 17:31:05	09/16/2014 17:31:37
		09/16/2014 16:16:11		09/16/2014 17:31:37	09/16/2014 17:32:58
29	0914220254	09/15/2014 23:09:57	16:58:21	09/16/2014 17:32:58	09/16/2014 17:33:29
		09/16/2014 16:08:19		09/16/2014 17:33:29	09/16/2014 17:34:31
30	0914220255	09/15/2014 23:09:58	16:57:16	09/16/2014 17:34:31	09/16/2014 17:35:03
		09/16/2014 16:07:13		09/16/2014 17:35:03	09/16/2014 17:36:20
31	0914220256	09/15/2014 23:09:58	17:27:23	09/16/2014 17:36:20	09/16/2014 17:36:54
		09/16/2014 16:37:21		09/16/2014 17:36:54	09/16/2014 17:38:09
32	0914220257	09/15/2014 23:09:58	17:18:28	09/16/2014 17:38:09	09/16/2014 17:38:40
		09/16/2014 16:28:26		09/16/2014 17:38:40	09/16/2014 17:39:55

Throughput Stream	Seed	Query Start Query End	Duration	RF1 Start RF1 End	RF2 Start RF2 End
33	0914220258	09/15/2014 23:09:58	16:59:56	09/16/2014 17:39:55	09/16/2014 17:40:25
		09/16/2014 16:09:54		09/16/2014 17:40:25	09/16/2014 17:41:42
34	0914220259	09/15/2014 23:09:58	17:06:52	09/16/2014 17:41:42	09/16/2014 17:42:14
		09/16/2014 16:16:50		09/16/2014 17:42:14	09/16/2014 17:43:37
35	0914220260	09/15/2014 23:09:58	17:21:27	09/16/2014 17:43:37	09/16/2014 17:44:08
		09/16/2014 16:31:25		09/16/2014 17:44:08	09/16/2014 17:45:34
36	0914220261	09/15/2014 23:09:58	17:11:07	09/16/2014 17:45:34	09/16/2014 17:46:08
		09/16/2014 16:21:05		09/16/2014 17:46:08	09/16/2014 17:47:25
37	0914220262	09/15/2014 23:09:58	17:08:44	09/16/2014 17:47:25	09/16/2014 17:47:57
		09/16/2014 16:18:42		09/16/2014 17:47:57	09/16/2014 17:49:10
38	0914220263	09/15/2014 23:09:58	17:14:51	09/16/2014 17:49:10	09/16/2014 17:49:43
		09/16/2014 16:24:50		09/16/2014 17:49:43	09/16/2014 17:50:52
39	0914220264	09/15/2014 23:09:58	16:59:18	09/16/2014 17:50:52	09/16/2014 17:51:24
		09/16/2014 16:09:16		09/16/2014 17:51:24	09/16/2014 17:52:41
40	0914220265	09/15/2014 23:09:58	17:17:08	09/16/2014 17:52:41	09/16/2014 17:53:16
		09/16/2014 16:27:06		09/16/2014 17:53:16	09/16/2014 17:54:27
41	0914220266	09/15/2014 23:09:58	17:02:13	09/16/2014 17:54:27	09/16/2014 17:55:04
		09/16/2014 16:12:11		09/16/2014 17:55:04	09/16/2014 17:56:20
42	0914220267	09/15/2014 23:09:58	17:32:55	09/16/2014 17:56:20	09/16/2014 17:56:51
		09/16/2014 16:42:54		09/16/2014 17:56:51	09/16/2014 17:58:01
43	0914220268	09/15/2014 23:09:58	17:34:11	09/16/2014 17:58:01	09/16/2014 17:58:39
		09/16/2014 16:44:10		09/16/2014 17:58:39	09/16/2014 17:59:45
44	0914220269	09/15/2014 23:09:59	17:12:07	09/16/2014 17:59:46	09/16/2014 18:00:17
		09/16/2014 16:22:05		09/16/2014 18:00:17	09/16/2014 18:01:35
45	0914220270	09/15/2014 23:09:59	16:59:33	09/16/2014 18:01:35	09/16/2014 18:02:15
		09/16/2014 16:09:31		09/16/2014 18:02:15	09/16/2014 18:03:25
46	0914220271	09/15/2014 23:09:59	17:16:57	09/16/2014 18:03:25	09/16/2014 18:03:57
		09/16/2014 16:26:56		09/16/2014 18:03:57	09/16/2014 18:05:09
47	0914220272	09/15/2014 23:09:59	17:11:07	09/16/2014 18:05:09	09/16/2014 18:05:41
		09/16/2014 16:21:05		09/16/2014 18:05:41	09/16/2014 18:06:56
48	0914220273	09/15/2014 23:09:59	17:25:48	09/16/2014 18:06:56	09/16/2014 18:07:26
		09/16/2014 16:35:47		09/16/2014 18:07:26	09/16/2014 18:08:43
49	0914220274	09/15/2014 23:09:59	17:34:38	09/16/2014 18:08:43	09/16/2014 18:09:25
		09/16/2014 16:44:37		09/16/2014 18:09:25	09/16/2014 18:10:40
50	0914220275	09/15/2014 23:09:59	17:34:36	09/16/2014 18:10:40	09/16/2014 18:11:11
		09/16/2014 16:44:35		09/16/2014 18:11:11	09/16/2014 18:12:25
51	0914220276	09/15/2014 23:09:59	17:33:52	09/16/2014 18:12:25	09/16/2014 18:12:58
		09/16/2014 16:43:51		09/16/2014 18:12:58	09/16/2014 18:14:09
52	0914220277	09/15/2014 23:09:59	16:58:10	09/16/2014 18:14:09	09/16/2014 18:14:43
		09/16/2014 16:08:09		09/16/2014 18:14:43	09/16/2014 18:15:52
53	0914220278	09/15/2014 23:09:59	17:31:45	09/16/2014 18:15:52	09/16/2014 18:16:25
		09/16/2014 16:41:44		09/16/2014 18:16:25	09/16/2014 18:17:55
54	0914220279	09/15/2014 23:09:59	17:32:33	09/16/2014 18:17:55	09/16/2014 18:18:31
		09/16/2014 16:42:32		09/16/2014 18:18:31	09/16/2014 18:19:52
55	0914220280	09/15/2014 23:09:59	17:17:27	09/16/2014 18:19:52	09/16/2014 18:20:24
		09/16/2014 16:27:27		09/16/2014 18:20:24	09/16/2014 18:21:53
56	0914220281	09/15/2014 23:09:59	17:18:26	09/16/2014 18:21:53	09/16/2014 18:22:26
		09/16/2014 16:28:26		09/16/2014 18:22:26	09/16/2014 18:23:40
57	0914220282	09/15/2014 23:09:59	17:25:57	09/16/2014 18:23:40	09/16/2014 18:24:15
		09/16/2014 16:35:57		09/16/2014 18:24:14	09/16/2014 18:25:29
58	0914220283	09/15/2014 23:10:00	17:19:55	09/16/2014 18:25:29	09/16/2014 18:26:13
		09/16/2014 16:29:54		09/16/2014 18:26:13	09/16/2014 18:27:29
59	0914220284	09/15/2014 23:10:00	17:32:48	09/16/2014 18:27:29	09/16/2014 18:28:01
		09/16/2014 16:42:47		09/16/2014 18:28:01	09/16/2014 18:29:17
60	0914220285	09/15/2014 23:10:00	17:21:25	09/16/2014 18:29:17	09/16/2014 18:29:49
		09/16/2014 16:31:25		09/16/2014 18:29:49	09/16/2014 18:31:05

Throughput Stream	Seed	Query Start Query End	Duration	RF1 Start RF1 End	RF2 Start RF2 End
61	0914220286	09/15/2014 23:10:00	17:34:35	09/16/2014 18:31:05	09/16/2014 18:31:39
		09/16/2014 16:44:34		09/16/2014 18:31:39	09/16/2014 18:32:47
62	0914220287	09/15/2014 23:10:00	17:20:37	09/16/2014 18:32:47	09/16/2014 18:33:19
		09/16/2014 16:30:37		09/16/2014 18:33:19	09/16/2014 18:34:28
63	0914220288	09/15/2014 23:10:00	17:24:43	09/16/2014 18:34:28	09/16/2014 18:35:04
		09/16/2014 16:34:44		09/16/2014 18:35:04	09/16/2014 18:36:18
64	0914220289	09/15/2014 23:10:00	17:32:47	09/16/2014 18:36:18	09/16/2014 18:36:53
		09/16/2014 16:42:47		09/16/2014 18:36:53	09/16/2014 18:38:01

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

Stream ID	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
0	288.2	29.3	21.1	16.2	80.1	11.1	100.5	55.7	287.7	40.2	43.4	111.1
1	2,050.6	2,134.9	4,399.8	3,284.0	3,476.0	3,561.9	2,416.4	2,258.5	2,559.8	2,723.9	3,049.1	2,802.4
2	2,733.1	3,529.2	2,387.0	2,200.4	2,376.5	28.1	2,005.6	2,903.4	4,329.4	2,912.0	2,163.6	2,528.0
3	4,124.6	1,683.7	3,081.3	3,431.2	5,136.9	3,252.2	2,655.9	157.6	3,600.9	3,444.8	2,135.3	2,210.0
4	2,802.9	2,704.9	2,169.0	2,081.2	286.5	3,536.0	1,928.9	2,484.7	3,138.5	2,079.2	2,910.3	3,718.7
5	2,827.7	2,107.7	2,795.7	3,066.5	2,220.1	3,449.3	2,914.0	2,840.2	3,234.3	2,261.7	2,823.1	1,571.9
6	2,228.2	2,164.6	4,907.7	2,081.2	2,490.6	2,888.0	3,661.7	2,451.4	3,940.8	409.7	2,299.0	2,941.8
7	3,049.2	2,780.9	2,684.4	2,645.2	2,214.8	2,154.2	2,759.8	4,549.9	3,397.2	1,976.2	2,565.2	3,592.4
8	5,198.8	1,724.7	2,969.8	2,297.3	2,735.4	2,306.3	2,720.8	2,542.7	4,132.5	2,827.7	2,695.3	3,596.1
9	1,618.7	3,046.8	2,989.5	1,983.8	2,260.8	3,619.4	2,894.0	1,075.6	2,780.0	3,351.6	2,372.8	2,310.8
10	3,042.3	3,589.1	2,032.9	2,303.8	3,340.0	983.4	3,851.0	2,838.4	3,259.7	3,202.9	2,527.6	3,038.3
11	2,003.1	2,032.2	2,584.9	2,369.3	2,534.5	2,352.0	3,321.9	2,990.8	2,403.2	2,680.7	3,605.2	2,338.8
12	1,607.3	2,842.5	2,495.0	2,822.0	2,637.4	3,368.0	4,618.1	2,225.6	3,004.3	1,988.6	2,548.2	3,743.1
13	2,870.4	2,548.2	3,724.1	1,984.2	2,500.6	2,709.4	3,163.1	2,747.3	2,525.7	2,739.2	3,351.6	3,533.1
14	3,441.7	1,397.6	2,169.2	3,706.8	3,018.4	3,112.0	2,289.0	1,830.3	5,123.3	1,785.8	2,029.0	2,389.8
15	2,593.7	2,373.5	2,897.1	2,209.9	2,589.2	1,915.2	2,760.3	3,726.0	5,124.8	3,614.2	3,011.8	3,727.9
16	2,007.2	2,403.0	4,633.0	2,458.7	3,869.6	2,914.1	2,376.1	2,295.5	4,191.9	2,335.1	2,805.4	2,631.2
17	3,144.4	3,465.8	1,704.2	2,025.0	2,838.8	1,970.0	3,504.8	2,719.4	3,348.1	2,082.3	3,739.9	3,214.8
18	3,098.9	2,332.9	2,089.7	4,648.0	3,897.7	3,560.2	2,470.6	3,493.9	2,996.4	2,197.4	2,686.3	2,296.1
19	2,833.8	3,475.7	2,342.3	1,734.7	2,292.7	1,881.8	2,263.0	2,179.1	3,486.9	2,669.9	1,817.8	4,681.7
20	3,320.7	2,450.6	1,706.5	2,265.0	2,339.7	2,107.8	2,342.8	3,448.6	3,495.4	2,161.7	2,044.1	2,561.2
21	3,374.4	3,321.3	1,995.1	3,630.6	2,561.2	2,513.1	2,065.3	2,808.8	2,776.2	2,357.7	2,814.7	3,756.8
22	2,482.1	3,748.7	2,045.1	3,552.2	1,961.4	2,819.6	2,807.4	1,740.3	3,045.9	2,745.0	3,488.2	3,473.5
23	2,999.5	2,944.2	2,074.4	1,837.8	2,234.1	2,470.4	3,350.5	3,780.3	4,206.7	2,207.4	3,010.5	2,851.0
24	2,171.4	2,044.9	4,559.0	2,476.1	2,258.7	2,925.8	2,125.8	3,147.1	3,395.3	2,975.2	2,293.8	2,090.8
25	5,333.0	3,728.7	2,029.4	1,728.9	3,050.4	1,976.5	3,130.0	2,457.9	3,654.6	2,673.1	3,574.8	2,328.9
26	2,745.2	4,473.0	1,853.5	2,531.4	3,778.7	2,293.7	1,871.0	2,170.7	3,469.1	2,702.5	2,704.8	2,727.7
27	2,898.1	2,865.5	1,951.0	2,940.7	2,267.6	3,500.2	3,313.1	3,389.8	3,381.9	1,869.5	2,065.6	2,500.0
28	3,413.9	2,343.9	1,998.9	2,538.6	2,887.2	1,857.0	3,163.8	2,442.1	2,709.0	2,223.4	3,286.2	3,493.0
29	3,970.8	2,319.0	2,746.3	3,293.5	3,131.2	2,650.6	1,922.0	4,574.2	3,650.1	2,296.2	2,363.8	3,095.8
30	2,918.8	3,290.6	2,884.5	1,989.2	3,449.5	1,917.4	2,456.9	2,426.0	2,512.9	2,711.9	1,838.6	2,244.2
31	4,812.6	2,335.6	2,743.1	2,805.6	3,069.8	2,175.3	3,316.8	2,289.3	5,376.2	2,158.7	2,122.6	1,859.7
32	2,562.1	3,429.1	2,911.3	3,203.0	3,691.0	2,552.0	2,609.3	3,219.2	3,051.9	1,688.4	2,797.4	4,688.9
33	3,688.2	3,224.3	3,532.3	2,854.4	3,492.9	2,036.2	2,782.2	2,292.0	2,698.7	2,730.0	3,249.1	2,386.6
34	3,026.2	3,273.6	3,181.3	2,933.0	1,997.7	3,143.4	2,589.3	2,720.2	3,963.6	2,539.1	3,372.2	3,114.6
35	2,922.2	2,971.1	2,159.1	1,723.3	3,707.6	2,296.6	1,574.9	2,950.3	3,492.4	3,013.0	3,298.1	2,344.3
36	3,653.8	2,388.8	2,510.3	2,932.9	2,567.5	2,068.7	3,925.0	2,185.9	3,145.1	1,987.6	2,308.7	2,349.9
37	2,578.8	2,088.6	2,257.7	1,957.1	3,246.6	2,601.3	2,575.0	2,812.6	4,651.4	3,249.1	2,714.7	2,364.4



Stream ID	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
38	3,388.2	2,527.0	3,030.5	3,204.1	4,475.6	3,473.1	2,680.7	2,620.3	4,031.7	2,159.3	2,992.5	2,717.3
39	2,933.5	3,233.3	3,032.0	2,490.6	2,794.3	2,700.5	4,500.3	2,449.9	2,578.7	2,674.1	2,050.8	2,354.9
40	3,632.4	2,068.7	4,324.5	2,255.1	2,259.4	1,963.1	2,331.7	2,152.5	2,945.1	2,259.6	3,221.7	2,265.2
41	2,221.4	4,476.1	2,680.2	2,532.5	2,781.0	2,772.7	2,127.4	3,074.7	3,896.9	2,011.1	2,244.2	3,273.2
42	3,200.9	1,991.3	3,656.6	2,662.0	2,828.3	3,498.2	3,084.6	2,365.6	3,124.4	2,672.0	2,787.0	2,536.4
43	2,352.0	2,237.3	2,280.3	1,955.8	2,995.4	3,080.0	2,146.5	2,867.1	4,667.7	3,109.3	2,147.0	2,728.3
44	4,206.0	2,180.2	3,309.5	3,049.9	4,240.9	3,193.8	3,070.2	3,291.4	3,506.3	3,111.0	2,542.1	2,336.1
45	2,424.8	2,803.0	2,049.5	2,339.9	3,528.9	2,938.2	1,801.3	2,719.8	3,062.6	1,947.5	2,291.1	3,931.2
46	2,518.9	2,204.7	2,595.0	3,555.7	2,251.2	2,769.5	2,931.4	2,358.4	4,124.2	2,048.6	2,868.5	2,052.5
47	2,794.0	2,433.5	4,043.3	2,366.8	1,950.9	2,755.9	3,107.8	2,815.8	3,946.4	3,619.7	2,424.9	2,652.3
48	2,725.3	2,960.6	2,161.7	3,685.3	1,682.2	2,458.4	2,738.1	3,480.6	3,618.6	2,158.7	2,496.7	3,088.5
49	4,314.5	2,224.6	3,039.2	2,862.2	2,615.6	2,122.2	2,707.0	3,151.9	4,432.0	2,312.2	2,765.4	2,358.9
50	2,704.3	3,564.0	3,109.4	2,391.4	3,282.4	4,300.7	2,223.8	4,204.6	2,977.1	2,626.1	2,555.5	1,956.9
51	3,161.7	2,400.4	1,693.3	2,023.5	2,604.5	4,115.3	3,990.3	3,253.6	3,099.7	2,873.9	2,249.9	2,889.8
52	2,266.7	1,917.5	2,190.3	2,822.2	2,468.5	2,426.1	3,454.6	2,505.5	2,385.3	2,786.3	2,921.5	2,477.4
53	4,736.6	2,364.0	2,144.8	2,806.2	2,490.5	2,167.7	3,667.2	2,488.5	3,185.6	1,778.6	2,971.6	4,097.9
54	2,894.0	2,592.5	2,581.5	2,329.0	1,918.2	2,757.2	3,863.6	2,294.5	3,037.9	3,610.4	2,832.4	3,561.2
55	3,888.8	4,610.5	2,291.3	2,960.0	2,993.2	3,312.9	2,892.8	2,249.0	4,106.2	2,228.2	1,991.0	2,513.2
56	2,999.9	2,234.6	3,267.2	2,400.3	2,695.4	2,333.2	2,571.6	2,987.2	4,008.8	4,304.5	3,336.2	2,212.1
57	5,274.8	2,369.2	3,553.3	3,022.2	2,936.6	3,436.1	2,695.3	2,783.9	3,766.8	2,084.6	2,350.5	2,358.5
58	2,827.6	3,866.4	4,820.1	1,699.2	3,490.4	2,361.2	2,776.4	2,339.4	3,662.4	2,425.6	3,124.9	3,355.8
59	2,557.9	2,834.8	2,468.6	3,673.0	3,008.0	1,978.9	2,049.4	3,440.1	3,264.6	2,040.6	3,666.5	2,113.5
60	3,072.5	1,974.9	1,957.9	4,847.6	2,526.6	2,717.2	2,350.4	2,686.2	3,549.9	2,665.4	2,483.7	3,802.5
61	3,020.0	2,086.6	2,844.9	2,331.8	2,664.2	3,040.4	2,297.3	2,936.7	2,874.7	2,066.5	2,349.8	3,129.5
62	3,731.9	3,370.0	2,392.3	4,325.1	2,412.9	2,067.2	2,171.6	2,398.9	2,965.3	2,346.2	2,792.8	3,062.9
63	2,297.5	2,915.1	2,033.5	2,290.8	2,343.3	2,327.0	2,097.3	2,331.4	2,917.3	3,201.8	4,192.8	2,906.3
64	3,437.5	3,462.5	3,082.1	1,872.2	1,682.2	2,048.8	2,918.3	3,711.3	4,419.7	2,738.2	2,048.5	3,222.6
Min	288.2	29.3	21.1	16.2	80.1	11.1	100.5	55.7	287.7	40.2	43.4	111.1
Avg	3,046.5	2,700.2	2,720.8	2,635.3	2,744.8	2,593.7	2,736.1	2,695.1	3,441.5	2,484.2	2,665.0	2,817.9
Max	5,333.0	4,610.5	4,907.7	4,847.6	5,136.9	4,300.7	4,618.1	4,574.2	5,376.2	4,304.5	4,192.8	4,688.9

Stream ID	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	RF1	RF2
0	126.5	15.4	18.4	22.7	100.0	414.3	106.5	40.4	344.7	40.6	31.9	66.9
1	2,775.1	2,772.8	2,734.4	2,632.0	2,485.9	3,366.6	2,493.4	3,922.6	959.4	2,520.2	27.8	55.8
2	2,312.4	3,512.5	1,953.7	3,558.0	5,185.9	1,837.3	3,151.6	1,872.5	3,635.5	3,575.0	29.4	65.5
3	1,821.6	2,386.3	2,545.0	2,173.6	3,034.0	3,346.4	2,492.8	2,567.8	2,656.3	2,314.4	33.6	68.4
4	2,111.4	2,938.4	2,777.3	2,827.9	2,572.8	1,985.8	3,616.4	2,819.5	5,692.4	2,680.4	31.4	62.9
5	2,993.8	2,209.3	4,692.5	2,436.0	2,532.3	3,790.0	3,708.5	2,248.0	1,081.8	2,389.5	30.2	68.8
6	3,471.1	2,308.2	3,408.1	2,086.0	2,423.9	2,944.7	2,218.1	2,322.9	3,100.5	2,899.5	33.8	67.0
7	2,145.0	2,229.5	2,174.1	1,785.1	3,839.2	1,322.2	3,166.0	3,070.8	4,712.0	3,438.0	34.3	69.9
8	2,293.8	2,075.2	3,051.8	2,763.2	3,657.6	2,127.5	647.1	2,956.3	2,335.7	2,058.2	36.2	73.4
9	4,659.0	2,263.5	2,581.5	3,429.9	3,139.2	2,309.3	2,775.4	3,539.6	4,442.3	2,644.0	36.3	82.2
10	2,833.8	2,518.0	4,458.8	2,309.0	3,458.9	3,283.1	2,175.1	2,434.0	3,527.7	2,169.8	34.3	69.4
11	1,728.6	4,667.1	1,099.2	3,327.4	3,744.5	4,090.1	2,351.5	2,728.8	2,347.1	3,589.0	36.7	66.5
12	2,692.5	2,261.9	2,308.9	2,738.0	3,842.9	2,563.0	1,979.1	2,151.4	2,135.2	2,657.8	33.5	63.8
13	1,810.0	1,603.4	2,083.0	2,431.8	4,750.5	2,114.9	2,972.2	2,330.4	1,848.8	3,672.5	35.3	68.3
14	2,629.9	2,118.5	3,640.6	2,092.9	2,998.8	2,201.2	2,625.5	3,394.6	3,494.9	3,025.5	37.0	65.8
15	2,158.6	2,243.2	2,845.7	1,445.5	2,927.6	2,723.5	1,804.1	1,854.5	2,702.5	2,493.4	32.7	67.5
16	2,149.7	3,401.2	1,992.1	2,951.8	2,256.4	2,128.9	2,173.1	2,956.6	4,449.9	3,727.9	32.0	76.7

Stream ID	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	RF1	RF2
17	1,571.0	2,514.5	3,646.7	4,625.6	2,676.9	2,706.3	2,292.9	2,301.7	2,460.6	1,961.6	33.1	71.1
18	2,929.9	1,628.8	2,324.9	3,190.1	2,985.2	1,626.5	2,906.9	3,690.6	3,099.4	2,771.0	31.8	68.8
19	2,745.2	3,860.7	2,970.7	3,636.9	2,713.2	1,976.2	2,381.9	2,313.5	2,539.3	2,865.3	31.8	62.7
20	3,894.6	2,680.4	4,738.5	1,790.4	3,684.5	3,637.9	3,586.1	2,528.3	1,995.6	2,762.9	31.1	69.0
21	2,030.3	4,649.8	2,434.7	2,859.3	2,801.7	2,096.8	3,543.5	1,852.5	2,675.0	2,151.0	34.8	70.8
22	2,982.8	4,686.8	1,923.7	1,901.7	3,475.7	2,518.6	2,647.6	2,337.7	2,982.0	2,595.6	36.7	80.5
23	2,282.7	2,681.5	4,553.0	2,787.8	2,744.8	2,694.4	2,511.2	2,172.3	2,431.2	2,585.9	37.3	72.1
24	2,489.8	3,612.5	2,731.0	3,359.3	2,493.2	3,764.4	2,337.7	2,359.9	3,854.4	2,549.8	34.6	74.5
25	3,195.8	3,348.8	2,026.4	2,714.1	1,914.5	1,900.7	2,182.2	2,967.0	2,443.6	2,464.5	39.6	70.6
26	2,269.6	3,597.6	1,654.9	3,010.5	2,405.4	2,186.0	2,821.8	3,416.9	2,621.6	3,002.2	37.6	63.3
27	2,338.8	2,037.5	2,495.5	2,223.0	4,815.6	2,279.9	3,347.1	2,100.4	3,720.1	2,748.6	31.5	74.7
28	3,056.4	2,397.3	2,495.5	2,878.1	1,863.2	2,620.4	2,176.7	3,112.1	4,025.9	4,591.1	31.8	80.7
29	1,971.9	1,874.3	2,341.2	2,541.7	3,032.5	3,143.3	2,660.6	2,409.0	1,917.5	3,195.8	31.6	61.3
30	3,853.6	2,754.7	3,039.5	1,997.7	4,697.4	2,925.8	2,711.5	2,566.5	2,521.6	3,327.0	32.0	77.2
31	2,679.0	2,694.1	2,317.5	2,434.2	2,161.6	2,462.7	3,104.7	2,865.3	3,892.6	3,166.3	33.9	75.1
32	2,690.2	2,182.6	2,448.2	3,340.4	3,919.8	1,856.8	2,345.3	2,348.4	1,976.1	2,796.9	31.4	74.3
33	2,222.4	3,330.9	2,468.9	4,735.9	2,865.2	1,899.5	2,333.4	2,010.9	2,289.0	2,072.7	30.4	76.9
34	4,247.3	3,608.0	1,883.3	2,032.9	2,007.0	2,357.6	2,311.9	1,799.6	2,638.0	2,872.0	32.1	82.8
35	2,828.4	2,499.4	2,296.0	2,958.8	4,913.1	2,733.1	2,432.7	3,302.0	2,800.4	3,270.4	30.8	86.3
36	3,116.6	2,244.0	2,352.4	2,764.5	4,626.8	2,023.0	3,451.7	2,011.0	4,366.6	2,886.6	33.5	77.0
37	2,919.2	4,354.1	2,338.8	2,220.5	2,773.0	2,229.9	2,975.1	3,385.8	2,204.1	3,226.2	31.6	73.0
38	1,737.3	3,191.6	2,286.1	2,997.4	2,531.2	2,074.5	2,499.0	3,000.0	1,960.7	2,513.7	33.3	69.1
39	2,326.6	3,081.6	3,156.6	2,849.9	2,132.3	1,939.8	3,058.6	3,636.7	3,190.5	1,992.8	31.9	76.7
40	3,329.8	2,792.8	4,335.7	2,352.6	3,316.3	2,253.2	3,572.0	2,777.5	3,072.4	2,746.4	34.8	71.6
41	2,338.8	3,057.6	2,211.7	2,587.2	2,995.7	3,754.0	1,974.9	2,648.1	2,242.2	3,431.4	36.4	75.8
42	2,787.9	2,413.9	3,040.9	2,831.5	2,454.4	3,681.6	2,343.2	3,008.8	4,091.7	2,114.3	31.7	69.5
43	1,985.8	3,704.6	2,357.5	2,889.8	4,673.3	2,206.9	3,011.8	2,393.7	4,567.0	2,894.4	37.9	66.6
44	2,262.4	2,450.6	2,312.7	2,161.8	2,982.3	2,653.5	2,164.7	2,107.9	2,413.3	2,380.3	31.8	77.5
45	1,917.5	3,070.6	2,786.6	3,199.2	2,842.7	2,105.4	3,383.7	3,365.6	4,057.2	2,606.8	39.7	70.0
46	3,089.0	2,268.5	3,713.1	3,125.1	2,550.8	2,654.3	3,719.5	2,138.9	4,219.2	2,460.0	32.0	72.2
47	3,146.7	2,050.1	3,015.9	2,335.8	2,396.7	3,453.5	2,217.6	2,423.0	3,339.0	2,577.1	32.2	74.5
48	2,285.6	2,303.1	2,661.7	1,607.7	2,271.5	4,546.4	2,781.7	3,579.8	3,838.3	3,617.9	30.2	77.2
49	1,809.0	2,323.3	3,402.0	2,771.0	2,969.0	3,158.9	3,886.5	2,188.4	3,590.4	2,274.5	41.5	75.2
50	3,762.4	2,023.3	2,438.2	2,208.8	3,040.1	2,761.9	3,046.0	2,904.4	3,058.2	2,137.0	31.1	73.5
51	2,700.7	2,569.7	3,796.7	2,708.8	2,854.6	3,540.0	2,081.8	2,414.1	3,500.9	2,708.7	33.2	70.3
52	1,801.2	3,577.9	4,229.1	3,578.2	2,847.5	3,645.0	2,058.5	3,116.9	2,424.6	3,188.9	34.0	69.3
53	2,200.1	2,768.7	3,205.8	3,262.5	3,087.2	2,442.7	2,578.7	2,193.7	3,214.3	3,252.4	32.6	90.0
54	2,295.2	2,784.6	2,835.2	2,545.1	3,946.0	2,127.5	3,302.0	1,922.2	4,976.7	2,145.8	36.2	80.6
55	2,314.1	2,570.5	2,131.9	2,336.5	2,866.4	2,526.3	2,207.7	3,943.8	2,879.0	2,434.3	32.2	89.3
56	1,717.8	2,303.9	2,295.6	4,656.5	3,307.8	3,297.7	2,472.0	2,283.0	2,519.1	2,101.8	32.3	74.5
57	2,127.5	3,768.9	1,891.5	3,588.3	2,593.6	2,121.7	1,937.5	2,747.0	3,046.7	2,302.9	34.3	74.3
58	2,231.3	1,968.6	2,243.4	3,690.8	3,147.1	2,691.5	2,589.5	2,388.8	2,406.4	2,287.9	43.7	76.2
59	3,518.1	4,756.8	2,256.1	3,094.5	2,971.3	1,796.9	2,344.8	3,047.8	3,379.2	2,906.4	32.3	76.2
60	2,158.6	2,833.1	3,284.3	4,351.1	2,776.3	1,533.8	2,493.2	2,274.0	2,960.2	3,185.9	31.3	75.9
61	2,963.6	3,482.3	3,850.6	4,904.0	2,999.5	4,266.1	2,199.8	2,068.2	1,792.0	3,106.2	34.1	68.2
62	2,372.4	3,717.6	2,423.3	2,334.5	3,341.0	1,988.3	2,167.6	4,960.4	3,031.3	2,064.0	31.6	69.4
63	3,470.6	3,685.9	2,283.6	5,036.2	3,495.8	2,922.4	2,429.8	2,152.7	2,424.2	2,928.5	35.6	74.4
64	2,045.6	2,259.2	3,810.7	2,825.3	2,576.9	4,975.7	2,499.9	2,279.5	2,471.8	2,778.1	34.3	68.3
Min	126.5	15.4	18.4	22.7	100.0	414.3	106.5	40.4	344.7	40.6	27.8	55.8
Avg	2,549.6	2,808.3	2,740.0	2,828.4	3,053.7	2,635.5	2,592.9	2,631.2	2,978.3	2,721.5	33.7	72.4
Max	4,659.0	4,756.8	4,738.5	5,036.2	5,185.9	4,975.7	3,886.5	4,960.4	5,692.4	4,591.1	43.7	90.0

Benchmark Sponsor: Brad Carlile  
 Dir. Strategic Applications Engineering (SAE)  
 Sun Microsystems  
 3295 NW 211th Terrace  
 Hillsboro OR 97124

September 18, 2010

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

Platform: **Sun SPARC Enterprise M9000 Server**  
 Database Manager: **Oracle Database 11g R2 Enterprise Edition with Partitioning**  
 Operating System: **Oracle Solaris 10**

The results were:

CPU (Speed)	Memory	Disks	QphH@3,000GB
<b>Sun SPARC Enterprise M9000 Server</b>			
32 x SPARC64 VII (2.88GHz)	512GB	256 x 300GB 15Krpm 4 x 300GB 10Krpm int.	<b>198,907.5</b>

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

- The database records were defined with the proper layout and size
- The database population was generated using DBGEN
- The database was properly scaled to 3,000GB 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 one 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 no 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 system pricing was verified for major components and maintenance
- The major pages from the FDR were verified for accuracy

Additional Audit Notes:

None.

Respectfully Yours,

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

François Raab  
President

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## TPC Benchmark H Overview

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

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

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

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

---

## 0 General Items

### 0.1 Benchmark Sponsor

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

Oracle Corporation is the sponsor of this TPC-H benchmark.

### 0.2 Parameter Settings

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

- *Database Tuning Options*
- *Optimizer/Query execution options*
- *Query processing tool/language configuration parameters*
- *Recovery/commit options*
- *Consistency/locking options*
- *Operating system and configuration parameters*
- *Configuration parameters and options for any other software component incorporated into the pricing structure*
- *Compiler optimization options*

The Supporting Files Archive contains the system and Oracle parameters used in this benchmark.

### 0.3 Configuration Diagram

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

Measured Configuration:

Sun SPARC Enterprise M9000 Server, was configured with:

- 32 SPARC64 VII 2880 MHz processors
- 512 GB memory
- 1 Ethernet controller
- 4 300GB internal SAS disk drives
- 16 Sun Storage 6180 Arrays, each containing 16 300GB 15K RPM disk drives

Priced Configuration:

Sun SPARC Enterprise M9000 Server, was configured with:

- 32 SPARC64 VII 2880 MHz processors
- 512 GB memory
- 1 Ethernet controller
- 4 300GB internal SAS disk drives
- 16 Sun Storage 6180 Arrays, each containing 16 300GB 15K RPM disk drives
- Sun Fire X4170-M2 Server

Differences in Configurations:

Priced Configuration includes 1 Sun Fire X4170-M2 Server as the system console.

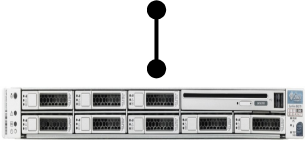


# System Under Test

Sun SPARC Enterprise M9000 Server  
32 x SPARC64 VII 2880 MHz processors  
512 GB Memory  
4 300GB SAS Internal disks



16 Sun Storage 6180 Arrays  
- 16x ( 16 300 GB 15K RPM)  
- 32 ports to host



1 Sun Fire X4170-M2 Server

---

# 1 Clause 1 Logical Database Design

## 1.1 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.*

The Supporting Files Archive contains the programs and scripts that create and analyze the tables and indexes for the TPC-H database.

## 1.2 Physical Organization

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

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

## 1.3 Horizontal Partitioning

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

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

## 1.4 Replication

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

No replication was used.

---

## 2 Clause 2 Queries and Refresh Functions

### 2.1 Query Language

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

SQL was the query language used to implement all queries.

### 2.2 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 2.11.0 of DBGEN and QGEN were used for the random number generation.

### 2.3 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.*

TPC QGEN 2.11.0 was used for query parameter substitution.

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

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

The Supporting Files Archive contains the qualification query text and query output.

### 2.5 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.*

The Supporting Files Archive contains the seed and query substitution parameters.

### 2.6 Query Isolation Level

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

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

### 2.7 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 functions are in Clause8/RF\_source in the Supporting Files Archive.

---

## 3 Clause 3 Database System Properties

### 3.1 ACID Properties

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

Source code for the ACID test is included in the Supporting Files Archive.

### 3.2 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.*

#### 3.2.1 Completed Transaction

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

1. The total price from the ORDERS table and the extended price from the LINEITEM table were retrieved for a randomly selected order key.
2. The ACID Transaction was performed using the order key from step 1.
3. The ACID Transaction committed.
4. The total price from the ORDERS table and the extended price from the LINEITEM table were retrieved for the same order key. It was verified that the appropriate rows had been changed.

#### 3.2.2 Aborted Transaction

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

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

### 3.3 Consistency

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

#### 3.3.1 Consistency Test

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

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

3. The consistency of the ORDERS and LINEITEM tables was re-verified.

## 3.4 Isolation

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

### 3.4.1 Read-Write Conflict with Commit

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

1. An ACID Transaction was started for a randomly selected O\_KEY, L\_KEY, and DELTA. The ACID Transaction was suspended prior to COMMIT.
2. An ACID Query was started for the same O\_KEY used in step 1. The ACID Query blocked and did not see the uncommitted changes made by the ACID Transaction.
3. The ACID Transaction was resumed and COMMITTED.
4. The ACID Query completed. It returned the data as committed by the ACID Transaction.

### 3.4.2 Read-Write Conflict with Rollback

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

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

### 3.4.3 Write-Write Conflict with Commit

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

1. An ACID Transaction, T1, was started for a randomly selected O\_KEY, L\_KEY, and DELTA. T1 was suspended prior to COMMIT.
2. Another ACID Transaction, T2, was started using the same O\_KEY and L\_KEY and a randomly selected DELTA.
3. T2 waited.
4. T1 was allowed to COMMIT and T2 completed.
5. It was verified that  $T2.L\_EXTENDEDPRICE = T1.L\_EXTENDEDPRICE + (DELTA1 * (T1.L\_EXTENDEDPRICE / T1.L\_QUANTITY))$

### 3.4.4 Write-Write Conflict with Rollback

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

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

### 3.4.5 Concurrent Progress of Read and Write Transactions

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

1. An ACID Transaction, T1, was started for a randomly selected O\_KEY, L\_KEY, and DELTA. T1 was suspended prior to ROLLBACK.
2. Another Transaction, T2, was started which did the following:

For random values of PS\_PARTKEY and PS\_SUPPKEY, all columns of the PARTSUPP table for which PS\_PARTKEY and PS\_SUPPKEY are equal, are returned.

3. T2 completed.
4. T1 was allowed to COMMIT.
5. It was verified that appropriate rows in ORDERS, LINEITEM and HISTORY tables were changed.

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

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

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

## 3.5 Durability

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

### 3.5.1 Failure of a Durable Medium

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

The disks containing the TPC-H tables, indexes and log files were on the 6180 arrays using Solaris Volume Manager (SVM) mirroring across the arrays. Write-cache was enabled on the 6180s. There were two separate tests performed serially.

Test 1: An array controller failure test

The following steps were performed to simulate an array controller failure.

1. The ORDERS and LINEITEM tables were verified to be consistent.
2. 65 streams of the ACID transactions were started.
3. After more than 100 transactions from each stream completed, the connection between the host and the controller in the array was disconnected to simulate a controller failure. That caused the failure to the disks associated with the controller.
4. Because SVM mirroring was used across the arrays the transactions continued without any interruption.
5. A sample from the durability success file was matched against the contents for the HISTORY table and it was verified that no committed transactions had been lost.
6. The ORDERS and LINEITEM tables were verified to be consistent.

Test 2: A disk failure test containing the tables, indexes and log files

The following steps were performed to simulate a disk failure.

1. The ORDERS and LINEITEM tables were verified to be consistent.
2. 65 streams of the ACID transactions were started.
3. After more than 100 transactions from each stream completed, a disk was removed from the 6180 array, thus causing its failure.
4. Because SVM mirroring was used the transactions continued without any interruption.
5. A sample from the durability success file was matched against the contents for the HISTORY table and it was verified that no committed transactions had been lost.
6. The ORDERS and LINEITEM tables were verified to be consistent.

### 3.5.2 System Crash / Memory Failure / Loss of External Power

*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.*

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

*Loss of External Power: Guarantee the database and committed updates are preserved during the loss of all external power for an indefinite time period*

Each of these requirements were satisfied in a single test. The following steps were performed.

1. The ORDERS and LINEITEM tables are verified to be consistent.
2. 65 streams of the ACID transactions are started
3. After more than 100 transactions from each stream has completed, the power breakers to the SUT are turned off thus halting processing immediately and indefinitely.
4. Power was restored to the SUT, the system was started, along with the database.
5. A sample from the durability success file was matched against the contents for the HISTORY table and it was verified that no committed transactions had been lost.
6. The ORDERS and LINEITEM tables were verified to be consistent.

---

## 4 Clause 4 Scaling and Database Population

### 4.1 Ending Cardinality of Tables

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

Table	Rows
Lineitem	18,000,048,306
Orders	4,500,000,000
Partsupp	2,400,000,000
Part	600,000,000
Customer	450,000,000
Supplier	30,000,000
Nation	25
Region	5

### 4.2 Distribution of Tables and Logs Across Media

*The distribution of tables and logs across all media must be explicitly described.*

All of the TPC-H tables/indexes/log files were on the Sun Storage 6180 arrays mirrored using Solaris Volume Manager (SVM). The TPC-H temporary file was not mirrored. A 128-way striped volume using 8 Sun Storage 6180 arrays (128 disks) was mirrored across another 128-way striped volume on 8 Sun Storage 6180 arrays (128 disks) for the tables/indexes/log files. The temporary file was striped across the 16 Sun Storage 6180 Arrays using SVM. Disk slice s0 was used for the tables/indexes/log files and Disk slice s1 was used for the temporary file.

### 4.3 Database partition/replication mapping

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

The database was not replicated.

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

### 4.4 Data redundancy mechanisms

*Implementations may use data redundancy mechanism(s). The type of data redundancy mechanisms(s) and any configuration parameters, i.e., RAID level must be disclosed for each device.*



Items	Storage Redundancy Levels
Base Tables	Level Three
Auxiliary Data Structures	Level Three
DBMS Temporary Space	Level Zero
OS and DBMS Software	Level One
Oracle Redo Logs	Level Three

#### 4.5 Modifications to the DBGEN

*Any modifications to the DBGEN (see Clause 4.2.1) source code must be disclosed. In the event that a program other than DBGEN was used to populate the database, it must be disclosed in its entirety.*

No modifications were made to TPC DBGEN 2.11.0

#### 4.6 Database Load Time

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

The database load time was 3:40:11.

#### 4.7 Data Storage Ratio

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

The data storage ratio is computed from the following information:

Disk Type	# Of Disks	Space Per Disk*	Sub-Total Disk Space**
ST6180	256	300GB	76,800 GB
Internal SAS	4	300GB	1,200 GB
		<b>Total Space</b>	<b>78,000</b>
		<b>Data Storage Ratio</b>	<b>26.0</b>

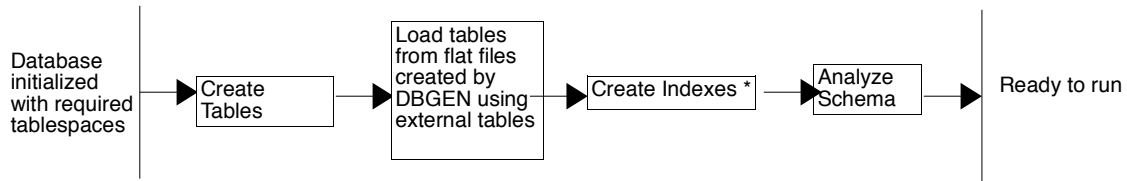
\* Disk manufacturer definition of one GB is  $10^9$  bytes

\*\*In this calculation one GB is defined as  $2^{30}$  bytes

#### 4.8 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 stored on flat files that are all on the tested and priced configurations. Oracle created external tables using the files that were created by the DBGEN program.



\* Analyze index performed during index creation

## 4.9 Qualification Database Configuration

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

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

## 4.10 Database Verification

*Verify that the rows in the loaded database after the performance test are correct by comparing any two files of the corresponding Base, Insert and Delete reference data files for each table and the corresponding rows of the database.*

Rows of the loaded database after the performance test compared correctly against the base, insert and delete reference data set files.

## 4.11 DBGEN Verification

*Verify that the dbgen (using the command lines provided in Appendix F of the TPC-H Specification) used in the benchmark generates a data set which matches the reference data set provided in Appendix F of the TPC-H Specification corresponding to the scale factor used in this benchmark.*

Output of dbgen, used in the benchmark, matched the reference data set provided in Appendix F of the TPC-H Specification.

## 4.12 Referential Integrity

*Verify referential integrity in the database after the initial load. Referential Integrity is a data property that can be verified by checking that every foreign key has a corresponding primary key.*

Referential integrity was confirmed after the initial load of the performance database.

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## 5 Clause 5 Performance Metrics and Execution Rules

### 5.1 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.*

There was no system activity on the SUT between the conclusion of the load and the beginning of the performance test.

### 5.2 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

### 5.3 Timing Intervals for Each Query and Refresh Functions

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

The timing intervals for each query and for both refresh functions are contained in the Numerical Quantities section of the Executive Summary, located at the beginning of this document.

### 5.4 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.

### 5.5 Start and End Date/Times for Each Query Stream

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

The throughput test start time and finish time for each stream are contained in the Numerical Quantities section of the Executive Summary, located at the beginning of this document.

### 5.6 Total Elapsed Time of the Measurement Interval

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

The total elapsed time of the throughput test is contained in the Numerical Quantities section of Executive Summary, located at the beginning of this document.

### 5.7 Refresh Function Start Date/Time and Finish Date/Time

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

The start and finish times for each refresh function in the refresh stream are contained in the Numerical Quantities section of the Executive Summary, located at the beginning of this document.

## 5.8 Timing Intervals for Each Query and Each Refresh Function for Each Stream

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

The timing intervals for each query and each refresh function for the throughput test are contained in the Numerical Quantities section of the Executive Summary, located at the beginning of this document.

## 5.9 Performance Metrics

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

The performance metrics, and the numbers on which they are based, are contained in the Numerical Quantities section of the Executive Summary, located at the beginning of this document.

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

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

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

Run ID	QppH@3000GB	QthH@3000GB	QphH@3000GB
Run 1	182,350.7	216,967.7	198,907.5
Run 2	190,183.0	215,202.2	202,306.2
% Difference	4.29%	0.81%	1.70%

## 5.11 System Activity Between Performance Tests

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

There was no activity on the SUT between Run1 and Run 2.

## 5.12 Documentation to satisfy Clause 5.2.7

*All documentation necessary to satisfy Clause 5.2.7 must be made available upon request.*

The Supporting Files Archive contains the documentation.

## 5.13 Query Output validation

*The output of the Query Output Validation Test must reported in the supporting files archive.*

The Supporting Files Archive contains the documentation.

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## 6 Clause 6 SUT and Driver Implementation

### 6.1 Driver

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

The Power Test and Throughput Test are performed by executing a shell script called runTPCHpt. QGEN is first called with a stream id of 0 to generate the queries for the Power Test. Then script runTPCHpus is executed asynchronously to control the refresh functions RF1 and RF2. The script then continues to the query portion of the Power Test (qexecpl.c ISL), which waits until RF1 is completed. After the query portion of the power run has finished the refresh function RF2 is executed by the same refresh stream that previously executed refresh function RF1.

Following the Power Test, QGEN is again executed with the subsequent 64 stream ids and seeds to generate new queries for each stream. qexecpl.c is called asynchronously for all 64 streams to execute each stream, similar to the power test. Then the runTPCHus script is executed to run all 64 pairs of RF1 and RF2 to complete the throughput run.

Both wall-clock and high-resolution times are collected for all measurement intervals.

### 6.2 Implementation-Specific Layer

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

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

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

### 6.3 Profile-Directed Optimization

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

Profile-directed optimization was not used.

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## 7 Clause 7 Pricing

### 7.1 Hardware and Software Used

*A detailed list of hardware and software used in the Priced Configuration must be reported. The listing for each separately Orderable item must have vendor Part Number, description, and applicable release/revision level, price source, unit price, quantity, extended price, applicable Discounted price and 3-year maintenance price. If package-pricing is used, the vendor Part Number of the package and a description uniquely identifying each of the Components of the package must be disclosed to a sufficient level of detail to meet the requirements of 1.4.1.1.*

The Executive Summary contains a list of the priced hardware and software, including maintenance for 3-years, and any applicable discounts.

### 7.2 Total Three-Year Price

*The total 3-year price of the Priced Configuration must be reported, including: hardware, software, and maintenance charges. The justification of any Discounts applied must be disclosed in the price sheet. Sufficient detail of what items are being discounted and by how much they are being discounted must be provided so that the Discount amount used in the computation of the total system cost can be independently reproduced.*

The Executive Summary contains the details for the total 3-year pricing of the configuration. Oracle applied two separate discounts to this pricing:

- Oracle's discounts are based upon US list prices and for similar quantities and configurations. A discount of 50% has been applied to all Oracle hardware, software and services based on the total value and quantities of the components of the configuration, including full payment of all components and maintenance.

For assistance with any of these prices or their applicability to any customer's requirements please contact:

Mary Beth Pierantoni

mary.beth.pierantoni@oracle.com

### 7.3 Availability Date

*The committed Availability Date of Components used in the price calculations must be reported. The Availability Date must be reported on the first page of the Executive Summary and with a precision of one day. When the priced system includes products with different availability dates, the reported Availability Date for the priced system must be a date at which all Components are committed to be Generally Available. Each Component used in the Priced Configuration is considered to be Available on the Availability Date unless an earlier date is specified.*

All components of the Priced Configuration are available now, with the exception of Oracle Database 11g Release 2.0.2 which will be available by December 9, 2010.

### 7.4 Benchmark Performance Metric

*A statement of the benchmark performance metric, as well as the respective calculations for 3-year pricing, price/performance, and the availability date must be included.*

<i>Performance Metric</i>	<i>Price/Performance Metric</i>	<i>Total 3-year Cost</i>	<i>Availability Date</i>
198,907.5 QphH@3000GB	\$15.27/QphH@3000GB	\$3,037,900 USD	December 9, 2010

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## 8 Supporting Files Index Table

*An index for all files included in the supporting files archive as required by Clause 8.3.2 8.3.8 must be provided in the report.*

<b>Clause</b>	<b>Description</b>	<b>Pathname</b>
Clause 1	OS and DB parameter settings	SupportingFiles/Clause1/Settings
Clause 2	Qualification queries and output	SupportingFiles/Clause2/QUAL_output
Clause 3	ACID scripts	SupportingFiles/Clause3/ACID_scripts
	ACID output	SupportingFiles/Clause3/ACID_output
Clause 4	DB Load scripts	SupportingFiles/Clause4/DB_creation
	Qualification DB scripts	SupportingFiles/Clause4/DB_creation
Clause 5	No Supporting Files	
Clause 6	Implementation Specific layer source code	SupportingFiles/Clause6/Implementation_code
Clause 8	Query substitution parameters	SupportingFiles/Claues8/Parameters
	Query and Refresh Output	SupportingFiles/Clause8/Run_output
	RF function source	SupportingFiles/Clause8/RF_source

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## **9 Auditor's Information and Attestation Letter**

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

The auditor's attestation letter is included at the front of this report, just after the Executive Summary.