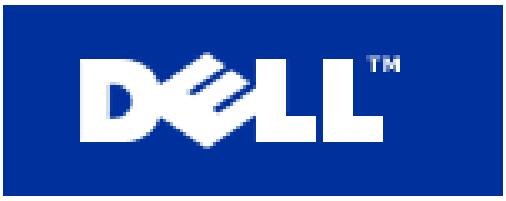

TPC Benchmark ™ E
Full Disclosure Report
DELL PowerEdge R900
Using
Microsoft SQL Server 2008 Enterprise Edition x64
On
Microsoft Windows Server 2008 Enterprise x64

First Edition

Submitted for Review

August 19, 2008

Dell, Inc. PowerEdge R900 Server with Microsoft SQL Server 2008 Enterprise Edition x64 on Microsoft Windows Server 2008 Enterprise x64

First Printing August 2008

Printed in U.S.A.

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Abstract

This report documents the methodology and results of the TPC Benchmark E test conducted on a PowerEdge R900 Server using SQL Server 2008 database in conformance with the requirements of the TPC-E Benchmark Specification. The operating system used for the server was Microsoft Windows Server 2008 Enterprise Edition x64. The operating systems on the clients were Microsoft Windows Server 2008 Enterprise Edition x64 and Microsoft Windows Server 2008 Standard Edition x64. All tests were done in compliance with Revision 1.5.1 of the Transaction Processing Council's TPC Benchmark™ E Standard Specification. The standard TPC Benchmark™ E metrics, transactions per second (tpsE), price per tpsE ($/tpsE) and the availability date are reported and referred to in this document.

The results from the tests are summarized below:

Hardware	Software	Total System Cost	tpsE	$/tpsE	Availability Date
Dell PowerEdge R900	Microsoft Windows 2008 Enterprise Ed. x64 SQL Server 2008 Enterprise Ed. x64	$336,039	671.35	$500.55	September 15, 2008

Additional copies of this Full Disclosure Report can be obtained from either the Transaction Processing Performance Council or Dell at the following address:

Transaction Processing Performance Council (TPC)
c/o Adminstrator, TPC
Presidio of San Francisco
Bldg 572B Ruger St.
San Francisco, CA 94129-0920
Phone: (415) 561-6272, fax 415-561 6120
www.tpc.org

or

Dell, Inc
One Dell Way
Round Rock, TX 78682
Attention: Mike Molloy

Auditor

In order to verify compliance to the TPC-E benchmark specification, Lorna Livingtree, Performance Metrics, Inc., audited the benchmark configuration, environment and methodology used to produce and validate the test results, and the pricing model used to calculate the price/performance.

PowerEdge™ R900 Server

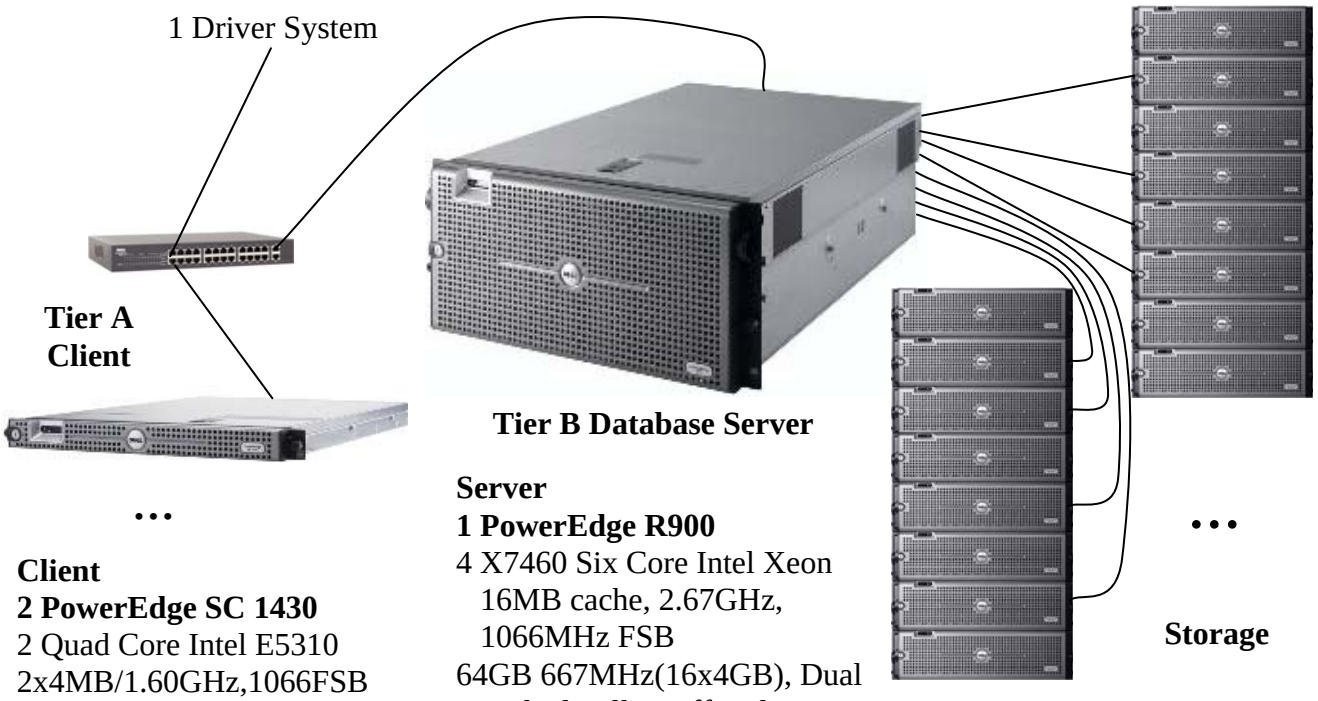
TPC-E 1.5.1
TPC Pricing 1.3

Report Date:
August 19, 2008

TPC-E Throughput	Price/Performance	Availability Date	Total System Cost
671.35 tpsE	**$500.55 USD per tpsE**	**September 15, 2008**	**$336,039 USD**

Database Server Configuration

Operating System	Database Manager	Processors/Cores/ Threads	Memory
Microsoft Windows Server 2008 Enterprise x64 Edition™	**SQL Server 2008 Enterprise x64 Edition™**	**4/24/24**	**64GB**



Client
2 PowerEdge SC 1430
2 Quad Core Intel E5310
2x4MB/1.60GHz,1066FSB
4GB Memory
2 Broadcom Ethernet
1 80GB SATA 7.2K Disk

Server
1 PowerEdge R900
4 X7460 Six Core Intel Xeon
16MB cache, 2.67GHz,
1066MHz FSB
64GB 667MHz(16x4GB), Dual
Ranked Fully Buffered DIMM
2 Broadcom NetExtreme II Gigabit
Ethernet
1 PERC6i SAS RAID Controller
6 MegaRAID SAS 8888ELP Cntrs
8 73GB 15k 2.5” SAS Disks
1 Intel(R) PRO/1000 PT Adapter

Storage
24 PowerVault MD1000
SAS Enclosures
308 73GB 15k 3.5”
3GBPS SAS Disks
28 146GB 15k 3.5”
3GBPS SAS Disks

Initial Database Size	Redundancy Level:	Storage
2,627.5GB	**One**	**8 x 73GB** **308 x 73GB, 28 x 146GB**

	PowerEdge R900	TPC-E 1.5.1 TPC Pricing 1.3 Report Date August 19, 2008 Revision Date August 19, 2008 Availability Date September 15, 2008

Description	Part Number	Price Source	Unit Price	Qty	Extended Price	3 yr. Maint. Price
Server Hardware						
PER900,DUAL X7460,2.67GHz,130W	223-4230	NIO	$10,196.00	1	$10,196.00	$540.00
& 2 Broadcom NICs						
Upgrade to Quad X7460, 2.67GHz	311-9170	NIO	$6,999.00	1	$6,999.00	
64GB,667MHZ, 16X4GB	311-7857	1	$5,241.00	1	$5,241.00	
Intel PRO1000PT,Cu,2PT,PCIe	430-0959	1	$199.00	1	$199.00	
PERC6i SAS RAID, Internal, Bat	341-5699	1	$299.00	1	$299.00	
MegaRAID SAS 8888ELP, 2X4 EXTERNAL	LS-8888ELP	3	$676.04	8	$5,408.32	
73GB,SAS,2.5-inch,15K RPM HD	341-4727	1	$339.00	8	$2,712.00	
DELL E157FP,15 IN,15.0 VIS	320-5090	1	$189.00	1	$189.00	
				Subtotal	$31,243.32	$540.00
Server Storage						
PV MD1000,RACK,3U,15 BAY,LBZL	222-2299	1	$2,480.00	24	$59,520.00	$39,792.00
SINGLE ENCL MGT MODULE, SAS ONLY	420-5927	1	$345.83	24	$8,299.92	
73GB,3GBPS,SAS,3.5IN,15K	341-2818	1	$299.00	308	$92,092.00	
146G,3GBPS,SAS,3.5IN,15K	341-2820	1	$349.00	28	$9,772.00	
RACK-42U, CUST	340-4896	1	$239.99	2	$479.98	
				Subtotal	$170,163.90	$39,792.00
Server Software						
SQL Server 2008 Enterprise x64 Edition **	810-07507	2	$23,432.00	4	$93,728.00	
Windows Server 2008 Enterprise Edition (x64) **	P72-03168	2	$2,310.00	1	$2,310.00	
Professional Support (1 Incident)	N/A		$245.00	1		$245.00
				Subtotal	$96,038.00	$245.00
Client Hardware						
Dell PowerEdge SC 1430, 1.60GHZ/2x4MB,1066 FSB	222-6813	1-1S	$561.00	2	$1,122.00	$492.00
Additional processor, E5310,2X4MB/1.6GHz,1066FSB	311-6862	1-1S	$349.00	2	$698.00	
4GB,667MHz,(2X2GB),2R,FBD	311-6254	1	$448.00	2	$896.00	
80GB,SATA,1IN,7.2K RPM,HD ,7.2K	341-3757	1	$99.00	2	$198.00	
BCOM NetX 5721,Gb,ETHERNET,NIC	430-1496	1	$59.00	2	$118.00	
				Subtotal	$3,032.00	$984.00
Client Software						
Windows Server 2008 Standard Edition (x64) **	P73-04165	2	$711.00	1	$711.00	
Windows Server 2008 Enterprise Edition (x64) **	P72-03168	2	$2,310.00	1	$2,310.00	
				Subtotal	$3,021.00	$0.00
Infastructure						
PowerConnect 2216, 16port Switch	222-2259	1	$69.00	1	$69.00	
1M SAS Cable MegaRAID SAS 8888ELP	HI-MS-1MSB	3	$34.10	12	$409.20	
2M SAS Cable, MD1000	310-7083	1	$40.00	12	$480.00	
				Subtotal	$958.20	$0.00
				Other Discounts*	($9,979.00)	
				Total	$294,477.43	$41,561.00

Notes:

One or more components of the measured configuration have been substituted in the Priced Configuration. See the FDR for details.

*All hardware from Dell(1) is discounted 5% based on total dollar volume of this config.

** All Microsoft maintenance is covered by the maint. costs of Microsoft SQL Server

Price Source: 1=Dell, 2=Microsoft, 3=eWiz, NIO = Not Immediately Orderable

Pricing may be verified by calling 1-800-BUY-DELL and referencing quote # 444564052 as a complex quote.

Audited by Lorna Livingtree, Performance Metrics Inc.

Three-Year Cost of Ownership:	**$336,039**	**USD**
TPC-E Throughput:	**671.35**	**tpsE**
Price/Performance:	**$500.55**	**tpsE/USD**

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 sections of the TPC benchmark specifications. If you find that the stated prices are not available according to these items, please inform the TPC at pricing@tpc.org.

Numerical Quantities Summary				
Reported Throughput: 671.35 tpsE	**Configured Customers: 340,000**			
Response Times (in seconds)	**Minimum**	**Average**	**90th%tile**	**Maximum**
Broker-Volume	0.01	0.08	0.24	0.57
Customer-Position	0.00	0.04	0.07	1.30
Market-Feed	0.00	0.06	0.21	0.67
Market-Watch	0.00	0.04	0.07	2.97
Security-Detail	0.00	0.02	0.03	0.55
Trade-Lookup	0.00	0.74	0.94	1.46
Trade-Order	0.00	0.11	0.17	2.44
Trade-Result	0.00	0.09	0.16	2.48
Trade-Status	0.00	0.04	0.10	0.57
Trade-Update	0.03	0.88	1.01	1.53
Data-Maintenance	0.00	0.15		2.43
Transaction Mix		**Transaction Count**		**Mix %**
Broker-Volume		2,368,580		4.900%
Customer-Position		6,283,850		13.000%
Market-Feed		483,373		1.000%
Market-Watch		8,700,974		18.000%
Security-Detail		6,767,690		14.001%
Trade-Lookup		3,866,907		8.000%
Trade-Order		4,882,160		10.100%
Trade-Result		4,833,730		10.000%
Trade-Status		9,184,614		19.001%
Trade-Update		966,696		2.000%
Data-Maintenance		120		
Test Duration and Timings				
Ramp-up Time (hh:mm:ss)		00:10:57		
Measurement Interval (hh:mm:ss)		02:00:00		
Business Recovery Time (hh:mm:ss)		00:43:33		
Total number of Transactions Completed in Measurement Interval		48,338,574		

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Introduction

Document Structure

The TPC Benchmark™ E Standard Specification requires test sponsors to publish, submit to the TPC, and make available to the public, a full disclosure report (FDR) for any result to be considered compliant with the specification. The required contents of the full disclosure report are specified in Clause 9. This report is submitted to satisfy the specification's requirement for full disclosure. It documents the compliance of the benchmark implementation and execution reported for the Dell PE2900 server using Microsoft SQL Server 2008 Enterprise Edition (x64) on Microsoft Windows Server 2008 Enterprise Edition (x64).

Benchmark Overview

The Transaction Processing Performance Council (TPC) developed The TPC Benchmark™ E Standard Specification Revision 1.5.1.
TPC Benchmark™ E (TPC-E) is an Online Transaction Processing (OLTP) workload. It is a mixture of read-only and update intensive transactions that simulate the activities found in complex OLTP application environments. The benchmark exercises a breadth of system components associated with such environments, which are characterized by:

- The simultaneous execution of multiple transaction types that span a breadth of complexity;
- Moderate system and application execution time;
- A balanced mixture of disk input/output and processor usage;
- Transaction integrity (ACID properties);
- A mixture of uniform and non-uniform data access through primary and secondary keys;
- Databases consisting of many tables with a wide variety of sizes, attributes, and relationships with realistic content;
- Contention on data access and update.

The TPC-E benchmark simulates the OLTP workload of a brokerage firm. The focus of the benchmark is the central database that exercises transactions related to the firm’s customer accounts. In keeping with the goal of measuring the performance characteristics of the database system, the benchmark does not attempt to measure the complex flow of data between multiple application systems that would exist in a real environment.

The mixture and variety of transactions being executed on the benchmark system is designed to capture the characteristic components of a complex system. Different transaction types are defined to simulate the interactions of the firm with its customers as well as its business partners. Different transaction types have varying run-time requirements.

Clause 1: General Items

1.1: Order and Titles

The order and titles of sections in the Report and Supporting Files must correspond with the order and titles of sections from the TPC-E Standard Specification (i.e., this document). The intent is to make it as easy as possible for readers to compare and contrast material in different Reports.(9.1.1.1)

The order and titles in this report correspond to those in the specification.

1.2: Executive Summary Statement

The TPC Executive Summary Statement must be included near the beginning of the Report (9.2).

The Executive summary has been included near the beginning of this FDR.

1.3: Test Sponsor

A statement identifying the benchmark sponsor(s) and other participating companies must be provided (9.3.1.1).

Dell, Inc. is the sponsor of this TPC Benchmark™ E result.

1.4: Configuration Diagram

Diagrams of both measured and Priced Configurations must be reported in the Report, accompanied by a description of the differences.(9.3.1.2)

The System Under Test (SUT) is depicted in the next diagram. The difference between the priced and measured system was as shown in Table 1

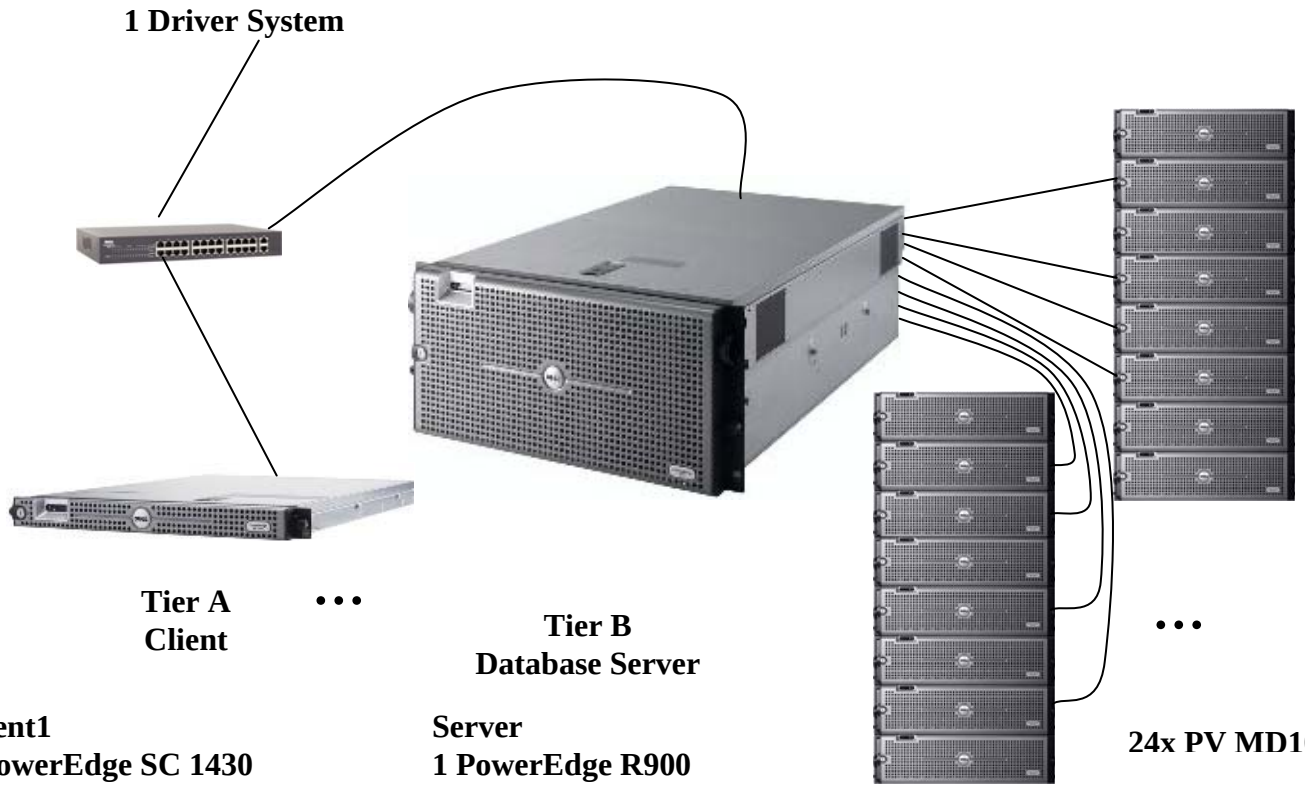
Table 1: *Difference between priced and measured configuration*

	Priced	**Measured**
Client Server	PE SC 1430	PE SC 1420
- FSB	1066MHz	800MHz
- Processors	Intel Quad-core Xeon 1.60 GHz/2x4MB-L2	Intel Xeon 3.2GHz/2x2MB-L2
- Memory	4GB	3GB
- OS drives	1x80GB	1x80GB

Measured Configuration

The measured and priced configurations are identical.

Figure 1: Measured Configuration



Client1
1 PowerEdge SC 1430
2 Quad Core Intel E5310
2x4MB/1.60GHz,1066FSB
4GB Memory
2 Broadcom Ethernet
1 80GB SATA 7.2K Disk

Client2
1 PowerEdge SC 1420
2 Intel Xeon
2MB/3.2GHz,800FSB
3GB Memory
1 Intel Internet Adapter
1 80GB SATA 7.2K Disk

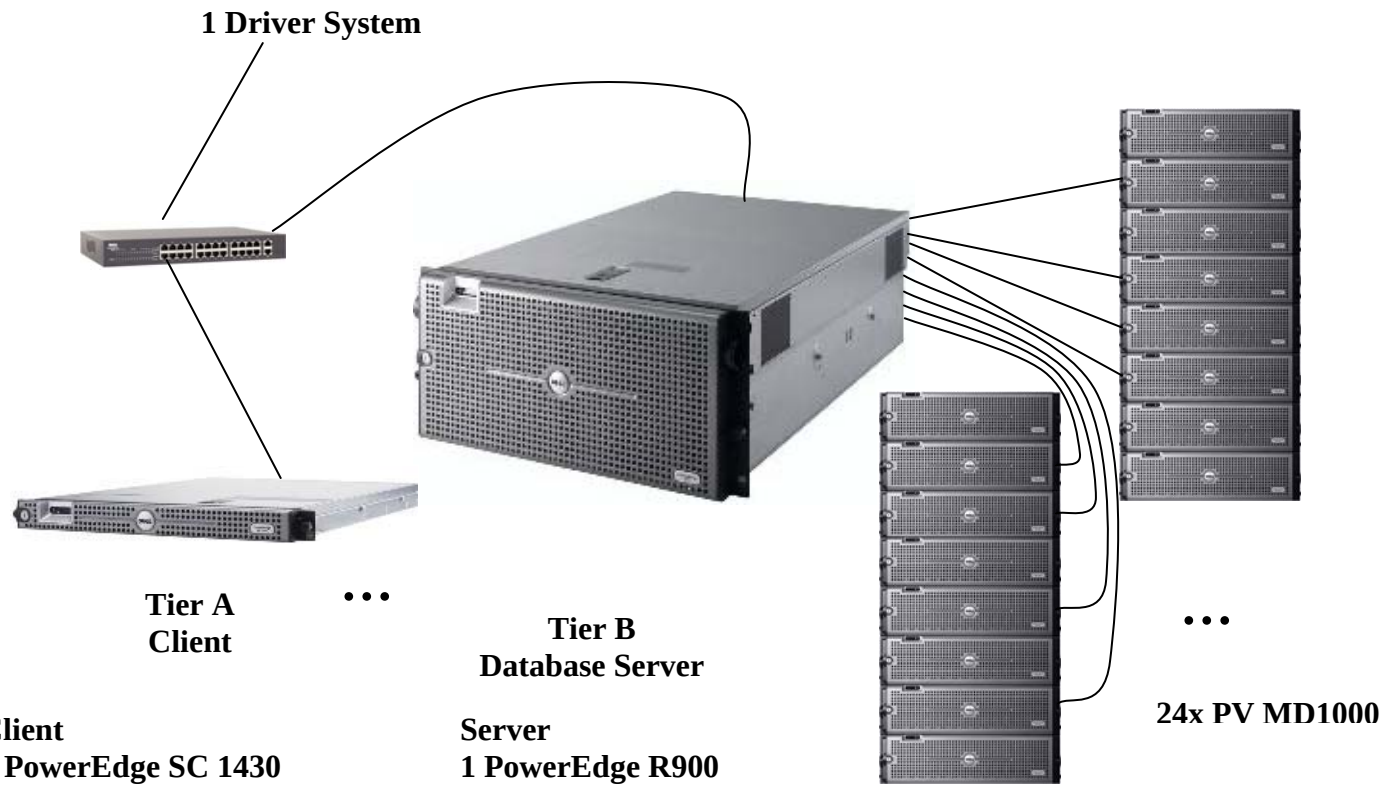
Server
1 PowerEdge R900
4 X7460 Six Core Intel Xeon
16MB cache, 2.67GHz,
1066MHz FSB
64GB 667MHz(16x4GB), Dual
Ranked Fully Buffered DIMM
2 Broadcom NetExtreme II
Gigabit Ethernet
1 PERC6i SAS RAID Controller
6 MegaRAID SAS 8888ELP
Cntrs
8 73GB 15k 2.5" SAS Disks
1 Intel(R) PRO/1000 PT Adapter

Storage

24 PowerVault MD1000
308 73GB 15k SAS Disks
28 146GB 15k SAS Disks

Priced Configuration

Figure 2: *Priced Configuration*



Client
2 PowerEdge SC 1430
2 Quad Core Intel E5310
2x4MB/1.60GHz,1066FSB
4GB Memory
2 Broadcom Ethernet
1 80GB SATA 7.2K Disk

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1 PERC6i SAS RAID Controller
6 MegaRAID SAS 8888ELP
Cntrs
8 73GB 15k 2.5” SAS Disks
1 Intel(R) PRO/1000 PT Adapter

Storage

24 PowerVault MD1000
308 73GB 15k SAS Disks
28 146GB 15k SAS Disks

1.5: Hardware configuration

A description of the steps taken to configure all of the hardware must be reported in the Report. Any and all configuration scripts or step by step GUI instructions are reported in the Supporting Files (see Clause 9.4.1.1). The description, scripts and GUI instructions must be sufficient such that a reader knowledgeable of computer systems and the TPC-E specification could recreate the hardware environment. (9.3.1.4)

The file ***PEr900_HardwareConfiguration.pdf*** in the *SupportingFiles* Directory ("Introduction") contains the hardware configuration used in running these TPC-E tests. The directory also contains the storage subsystem configuration in the file ***Storage_Hardware_config.pdf*** in the DiskSubsystem directory.

The hardware configuration used in this TPC-E test is a Dell PowerEdge R900 server (tier B) driven by two Dell PowerEdge SC 1430 (tierA) clients. The clients and server are networked together via a Dell PowerConnect 2216 10/100/1000 BaseT switch. One Dell PowerEdge 6950 server was the driver system that emulated 760 users executing the standard TPC-E workload. The driver system is connected to the client via the Dell Powerconnect network switch. Microsoft Windows 2008 Enterprise Server x64 was the operating system used on the server. Microsoft Windows 2008 Standard Server x64 was the operating system used on the client systems. Microsoft SQL Server 2008 Enterprise Edition x64 was the database management system on the server machine.

The PowerEdge R900 motherboard uses the Intel 7300 chipset and can hold up to four six-core Intel Xeon MP processors (2.67 GHz with 16MB L3 cache each). The system has 7 PCI-e I/O slots. The measured configuration used 64Gbytes of DDR II RAM, which was achieved by using 16 4096Mbyte DIMMs.

The PowerEdge R900 has an integrated PERC SAS controller to which was attached eight 73GB disk drives containing the operating system and databse logs. In addition, 6 MegaRAID SAS 8888ELP controllers were installed in 6 PCI-e slots and connected to 24 MD 1000 disk pods, which can hold 15 disks each. Each of the 4 controllers managed 4 RAID 10 LUNs. Each LUN had 14 physical drives. The total number of physical drives used for the database was 336 SAS disks. There were 1 empty PCI-e slots. Hyperthreading was not enabled on this server.

The PE sc 1430 client server has two Intel Quad-core Xeon processor with 2x4MB of L2 cache and a FSB rated at 1066MHz. The system had 4 Gbytes of RAM, one 80 GB hard disk, 2 intergrated Ethernet ports. The clients connected to the driver machine and the DB server through a powerconnect switch. Hyperthreading was not enabled on this client.

1.6: Software Configuration

A description of the steps taken to configure all software must be reported in the Report. Any and all configuration scripts or step by step GUI instructions are reported in the Supporting Files (see Clause 9.4.1.2). The description, scripts and GUI instructions must be sufficient such that a reader knowledgeable of computer systems and the TPC-E specification could recreate the software environment. (9.3.1.5)

The file ***SoftwareConfiguration.pdf*** in the *SupportingFiles* Directory (“Introduction”) contains the configuration and system parameters used in running these tests.

Clause 2: Database Design Scaling and Population

2.1: Physical Database Organization

The physical organization of tables and indices, within the database, must be reported in the Report. (9.3.2.1)

The **SupportingFiles/Clause2** folder contains the SQL definitions of all the required filegroups, tables and indexes.
The database tables and their indexes were divided into 3 file groups : Broker, Customer, market as shown in the table below :

***Table 2**: Physical database organization*

Broker File Group	Customer File Group	Market File Group
BROKER	ACCOUNT_PERMISSION	COMPANY
CASH_TRANSACTION	CUSTOMER	COMPANY_COMPETITOR
CHARGE	CUSTOMER_ACCOUNT	DAILY_MARKET
COMMISSION_RATE	CUSTOMER_TAXRATE	EXCHANGE
SETTLEMENT	HOLDING	FINANCIAL
TRADE	HOLDING_HISTORY	INDUSTRY
TRADE_HISTORY	HOLDING_SUMMARY	LAST_TRADE
TRADE_REQUEST	WATCH_ITEM	NEWS_ITEM
TRADE_TYPE	WATCH_LIST	NEWS_XREF
ADDRESS		SECTOR
TAXRATE		SECURITY
ZIP_CODE		STATUS_TYPE

2.2: Table and Row Partitioning

While few restrictions are placed upon horizontal or vertical partitioning of tables and rows in the TPC-E benchmark (see Clause 2.3.3), any such partitioning must be reported in the Report.(9.3.2.2)

No partitioning implemented in this configuration.

2.3: Replications, Duplications and Additions

Replication of tables, if used, must be reported in the Report (9.3.2.3)

No replication implemented in this configuration.

Additional and/or duplicated attributes in any table must be reported in the Report along with a statement on the impact on performance (9.3.2.4)

No additional or duplicated attributes.

2.4: Initial Cardinality of Tables

The cardinality (e.g. the number of rows) of each table, as it existed after database load (see Clause 2.6), must be reported in the Report.(9.3.2.5)

The database was configured for 150,000 customers. The cardinality of the tables is as shown in table 2.2 below:

***Table 3*: Table Cardinality**

Table	Cardinality after database load
Account_Permission	2413802
Address	510004
Broker	3400
Cash_Transaction	5405194455
Charge	15
Commission_Rate	240
Company	170000
Company_Competitor	510000
Customer	340000
Customer_Account	1700000
Customer_Taxrate	680000
Daily_Market	303934500
Exchange	4
Financial	3400000
Holding	300826769
Holding_History	7873776221
Holding_Summary	16917585
Industry	102
Last_Trade	232900
News_Item	340000
News_Xref	340000
Sector	12
Security	232900
Settlement	5875200000
Status_Type	5
Taxrate	320
Trade	5875200000
Trade_History	14100453801
Trade_Request	0
Trade_Type	5
Watch_Item	24003797
Watch_List	340000
Zip_Code	14741

2.5: Disk Configuration Data

The distribution of tables, partitions and logs across all media must be explicitly depicted for the measured and Priced Configurations. (9.3.2.6)

The Storage subsystem was configured as shown in Table 4. All database files were located on NTFS file systems. Backup devices were setup up on NTFS filesystems. Junction points were used to map to the NTFS partitions that contained the backup devices. The OS (C:\)drive was formatted for NTFS.

***Table 4**: Disk Configuration*

HBA#	Slot#	Disk#	Drives Enclosure model RAID level	OS Partition	Size	Use
0	internal	0	8x73GB,15K,SAS onboard RAID10	C:\	40GB	OS
		1	8x73GB,15K,SAS onboard RAID10	E:\	200GB	Logs
1	1	2	14x73GB,15K,SAS MD1000 RAID10	C:\A\A	167GB	Broker1
				C:\B\A	7GB	Customer1
				C:\C\A	34GB	Market1
				C:\D\A	266.25GB	Backup1
		3	14x73GB,15K,SAS MD1000 RAID10	C:\A\B	167GB	Broker2
				C:\B\B	7GB	Customer2
				C:\C\B	34GB	Market2
				C:\D\B	266.25GB	Backup2
		4	14x73GB,15K,SAS MD1000 RAID10	C:\A\C	167GB	Broker3
				C:\B\C	7GB	Customer3
				C:\C\C	34GB	Market3
				C:\D\C	266.25GB	Backup3
		5	14x73GB,15K,SAS MD1000 RAID10	C:\A\D	167GB	Broker4
				C:\B\D	7GB	Customer4
				C:\C\D	34GB	Market4
				C:\D\D	266.25GB	Backup4
2	2	6	14x73GB,15K,SAS MD1000 RAID10	C:\A\E	167GB	Broker5
				C:\B\E	7GB	Customer5
				C:\C\E	34GB	Market5
				C:\D\E	266.25GB	Backup5
		7	14x73GB,15K,SAS MD1000 RAID10	C:\A\F	167GB	Broker6
				C:\B\F	7GB	Customer6
				C:\C\F	34GB	Market6
				C:\D\F	266.25GB	Backup6

		8	14x73GB,15K,SAS MD1000 RAID10	C:\A\G	167GB	Broker7
				C:\B\G	7GB	Customer7
				C:\C\G	34GB	Market7
				C:\D\G	266.25GB	Backup7
		9	14x73GB,15K,SAS MD1000 RAID10	C:\A\H	167GB	Broker8
				C:\B\H	7GB	Customer8
				C:\C\H	34GB	Market8
				C:\D\H	744.87GB	Backup8
3	3	10	14x73GB,15K,SAS MD1000 RAID10	C:\A\I	167GB	Broker9
				C:\B\I	7GB	Customer9
				C:\C\I	34GB	Market9
				C:\D\I	266.25GB	Backup9
		11	14x73GB,15K,SAS MD1000 RAID10	C:\A\J	167GB	Broker10
				C:\B\J	7GB	Customer10
				C:\C\J	34GB	Market10
				C:\D\J	266.25GB	Backup10
		12	14x73GB,15K,SAS MD1000 RAID10	C:\A\K	167GB	Broker11
				C:\B\K	7GB	Customer11
				C:\C\K	34GB	Market11
				C:\D\K	744.87GB	Backup11
		13	14x73GB,15K,SAS MD1000 RAID10	C:\A\L	167GB	Broker12
				C:\B\L	7GB	Customer12
				C:\C\L	34GB	Market12
				C:\D\L	266.25GB	Backup12
4	4	14	14x73GB,15K,SAS MD1000 RAID10	C:\A\M	167GB	Broker13
				C:\B\M	7GB	Customer13
				C:\C\M	34GB	Market13
				C:\D\M	266.25GB	Backup13
		15	14x73GB,15K,SAS MD1000 RAID10	C:\A\O	167GB	Broker14
				C:\B\O	7GB	Customer14
				C:\C\O	34GB	Market14
				C:\D\O	266.25GB	Backup14
		16	14x73GB,15K,SAS MD1000 RAID10	C:\A\P	167GB	Broker15
				C:\B\P	7GB	Customer15
				C:\C\P	34GB	Market15
				C:\D\P	266.25GB	Backup15
		17	14x73GB,15K,SAS MD1000 RAID10	C:\A\Q	167GB	Broker16
				C:\B\Q	7GB	Customer16
				C:\C\Q	34GB	Market16
				C:\D\Q	266.25GB	Backup16

5	5	18	14x73GB,15K,SAS MD1000 RAID10	C:\A\R	167GB	Broker17
				C:\B\R	7GB	Customer17
				C:\C\R	34GB	Market17
				C:\D\R	266.25GB	Backup17
		19	14x73GB,15K,SAS MD1000 RAID10	C:\A\S	167GB	Broker18
				C:\B\S	7GB	Customer18
				C:\C\S	34GB	Market18
				C:\D\S	266.25GB	Backup18
		20	14x73GB,15K,SAS MD1000 RAID10	C:\A\T	167GB	Broker19
				C:\B\T	7GB	Customer19
				C:\C\T	34GB	Market19
				C:\D\T	266.25GB	Backup19
		21	14x73GB,15K,SAS MD1000 RAID10	C:\A\U	167GB	Broker20
				C:\B\U	7GB	Customer20
				C:\C\U	34GB	Market20
				C:\D\U	266.25GB	Backup20
6	6	22	14x73GB,15K,SAS MD1000 RAID10	C:\A\V	167GB	Broker21
				C:\B\V	7GB	Customer21
				C:\C\V	34GB	Market21
				C:\D\V	266.25GB	Backup21
		23	14x73GB,15K,SAS MD1000 RAID10	C:\A\W	167GB	Broker22
				C:\B\W	7GB	Customer22
				C:\C\W	34GB	Market22
				C:\D\W	266.25GB	Backup22
		24	14x73GB,15K,SAS MD1000 RAID10	C:\A\X	167GB	Broker23
				C:\B\X	7GB	Customer23
				C:\C\X	34GB	Market23
				C:\D\X	266.25GB	Backup23
		25	14x73GB,15K,SAS MD1000 RAID10	C:\A\N	167GB	Broker24
				C:\B\N	7GB	Customer24
				C:\C\N	34GB	Market24
				C:\D\N	266.25GB	Backup24

C:\..\back1[2] - C:\D\A\backup\back1
C:\..\back2[2] - C:\D\A\backup\back2
C:\..\back3[2] - C:\D\A\backup\back3
C:\..\back4[2] - C:\D\A\backup\back4
C:\..\back5[2] - C:\D\A\backup\back5
C:\..\back6[2] - C:\D\A\backup\back6
C:\..\back7[2] - C:\D\A\backup\back7
C:\..\back8[2] - C:\D\A\backup\back8
C:\..\back9[2] - C:\D\A\backup\back9
C:\..\back10[2] - C:\D\A\backup\back10
C:\..\back11[2] - C:\D\A\backup\back11
C:\..\back12[2] - C:\D\A\backup\back12
C:\..\back13[2] - C:\D\A\backup\back13
…
C:\..\back24[2] - C:\D\A\backup\back24

2.6: Database Interface

A statement must be provided in the Report that describes:
The Database Interface (e.g., embedded, call level) and access language (e.g., SQL, COBOL read/write) used to implement the TPC-E Transactions. If more than one interface / access language is used to implement TPC-E, each interface / access language must be described and a list of which interface /access language is used with which Transaction type must be reported. The data model implemented by the DBMS (e.g., relational, network, hierarchical). (9.3.2.7)
The methodology used to load the database must be reported in the Report. (9.3.2.8)

This test deployed Microsft SQL Server 2008 which is a relational database.
The client software interfaced to SQL Server via Stored Procedures invoked through ODBC calls driven by the C++ application code.
The methodology used to load the database is described in **Clause2** of the *SupportingFiles* directory (***MSTPCE Database Setup Reference.pdf***)

Clause 3: Transaction Items

3.1: Code Functionality

A statement that vendor-supplied code is functionally equivalent to Pseudo-code in the specification (see Clause 3.2.1.6) must be reported in the Report.(9.3.3.1)

The vendor supplied code is functionally equivalent to the pseudo-code.

3.2: Database Requirements

A statement that the database footprint requirements (as described in Clause 3.3) were met must be reported in the Report.(9.3.3.2)

Database footprint requirements were met as described in the specification.

Clause 4: SUT, Driver and Network

4.1: EGenDriver Items

The number of EGenDriverMEE and EGenDriverCE instances used in the benchmark must be reported in the Report (9.3.4.1)

There was 4 instances of EGenDriverMEE and 4 instances of EGenDriverCE

4.2: Network Configuration

The Network configurations of both the measured and Priced Configurations must be described and reported in the Report. This includes the mandatory Network between the Driver and Tier A (see Clause 4.2.2) and any optional Database Server interface networks (9.3.4.2)

Figure 1 and Figure 2 show the network connections of the configuration. The PE R900 server has an inbuilt network Ethernet controller with 2 1000MB/s ports. One of the ports is used to connect to the client (tier A) system via a Dell PowerConnect switch. The Client system also has an inbuilt network controller with 2 1000MB/s ports. One of these ports is connected to the driver system via the PowerConnect switch and satisfies the requirement for a mandatory network between tier A and the driver system.

Clause 5: EGen Items

5.1: EGen Version

The version of EGen used in the benchmark must be reported (9.3.5.1)

The EGen version used was 1.5.1

5.2: EGen Code

A statement that all required TPC-provided EGen code was used in the benchmark must be reported (9.3.5.2)

All the required TPC-provided code was used in the benchmark.

5.3: EGen Modifications

If the Test Sponsor modified EGen, a statement EGen has been modified must be reported in the Report. All formal waivers from the TPC documenting the allowed changes to EGen must also be reported in the Report (see Clause 5.3.7.1). If any of the changes to EGen do not have a formal waiver that must also be reported (9.3.5.3)

There were no modifications to the EGen.

5.4: EGen Loader Extension Code

If the Test Sponsor extended EGenLoader (as described in Appendix A.6), the use of the extended EGenLoader and the audit of the extension code by an Auditor must be reported (9.3.5.4)

There was no use and no implementation of the EGenloader extension code.

Clause 6: Performance Metrics and Response time

6.1: Measured Throughput (tpsE)

The Measured Throughput must be reported (9.3.6.1)

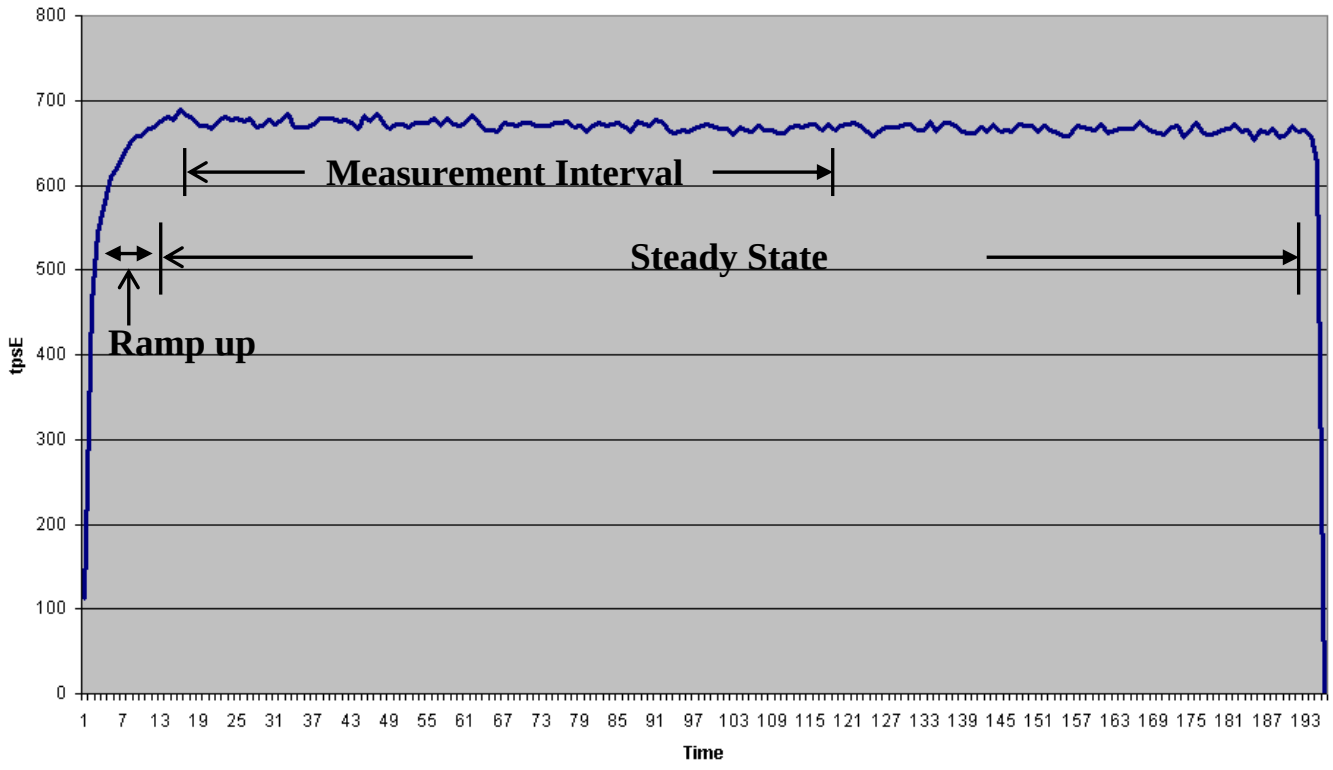
The measured tpsE was 671.35

6.2: Test Run times

A Test Run Graph of throughput versus elapsed wall clock time must be reported in the Report for the Trade-Result Transaction (see Clause 6.7.2). (9.3.6.2)

The transaction step report for the performance run was evaluated and drawn as shown in Figure 3.

***Figure 3**: Steady State graph*



6.3: Steady State Measurement

The method used to determine that the SUT had reached a Steady State prior to commencing the Measurement Interval must be reported. (9.3.6.3)

It can be seen that after ramp-up a steady state was maintained through outt the measurement interval and until the run was stopped.
A 1 hour window sliding by 10 mins in steady state was evaluated and was found to vary by 1.13%. A 10 min window sliding by 1 min was found to vary by 2.20%.

6.4: Work Measurements during Test Run

A description of how the work normally performed during a Test Run, actually occurred during the Measurement Interval must be reported in the Report (for example checkpointing, writing Undo/Redo Log records, etc.). (9.3.6.4)

The driver generated the required transactions and their input data. This data was timestamped. Response for the requested transaction was verified and time-stamped in the driver log files. Log file contents are consolidated for the reports.
The driver engine accessed the application processes running on the client system via an Ethernet network connection. The client application processes handled all requests to the database on the server. The applications communicated with the database server over an Ethernet connection using SQL Server ODBC library and RPC calls.
To perform checkpoints at specific intervals, the SQL Server recovery interval was set to 32767. Continuous checkpoints every 7.5 minutes were performed during steady state before and during the measurement interval by the driver engine. SQL Server was started with trace flag 3502, which caused it to log the occurrence of the checkpoints. This information was used to verify that the checkpoints occurred at the appropriate times during the test run.

6.5: Transaction Averages

The recorded averages over the Measurement Interval for each of the Transaction input parameters specified by clause 6.4.1 must be reported. (9.3.6.5)

The transaction averages were recorded as shown in Table 5.

***Table 5**: Transaction Averages*

Transaction	Overall	Parameter	Value	Range Check	Acceptable Range Min	Max
Customer Position	Ok	By Tax ID	50.02%	**Ok**	48.00%	52.00%
		Get history	50.00%	**Ok**	48.00%	52.00%
Trade Lookup	Ok	Frame 1	29.98%	**Ok**	28.50%	31.50%
		Frame 2	30.02%	**Ok**	28.50%	31.50%
		Frame 3	30.01%	**Ok**	28.50%	31.50%
		Frame 4	9.99%	**Ok**	9.50%	10.50%
Market Watch	Ok	By Watch List	60.03%	**Ok**	57.00%	63.00%
		By Customer Account	34.98%	**Ok**	33.00%	37.00%
		By Industry	4.99%	**Ok**	4.50%	5.50%
Trade Update	Ok	Frame 1	32.98%	**Ok**	31.00%	35.00%
		Frame 2	32.98%	**Ok**	31.00%	35.00%

		Frame 3	34.05%	**Ok**	32.00%	36.00%
Security Detail	Ok	Access LOB	1.01%	**Ok**	0.90%	1.10%
Trade Order	Ok	By Non-Owner	10.00%	**Ok**	9.50%	10.50%
		By Company Name	40.02%	**Ok**	38.00%	42.00%
		Buy on Margin	8.01%	**Ok**	7.50%	8.50%
		Rollback	0.98%	**Ok**	0.94%	1.04%
		LIFO	35.01%	**Ok**	33.00%	37.00%
		Trade Quantity 100	25.00%	**Ok**	24.00%	26.00%
		Trade Quantity 200	25.02%	**Ok**	24.00%	26.00%
		Trade Quantity 400	25.01%	**Ok**	24.00%	26.00%
		Trade Quantity 800	24.96%	**Ok**	24.00%	26.00%
		Market Buy	30.02%	**Ok**	29.70%	30.30%
		Market Sell	29.96%	**Ok**	29.70%	30.30%
		Limit buy	20.00%	**Ok**	19.80%	20.20%
		Limit sell	10.00%	**Ok**	9.90%	10.10%
		Stop Loss	10.01%	**Ok**	9.90%	10.10%

Clause 7: Transaction and System Properties

7.1 : Transaction Properties (ACID)

The results of the ACID tests must be reported in the Report along with a description of how the ACID requirements were met, and how the ACID tests were run. (9.3.7.1)

The benchmark specification requires that a system under test (SUT) must support a set of properties during the execution of the benchmark. Those properties are ACID and Redundancy.
This section defines each of these properties, describes the steps taken to ensure that they were present during the test and describes a series of tests done to demonstrate compliance with the specification. See file ***MSTPCE ACID Procedures.pdf*** in the *SupportingFiles* directory (Clause 7).

7.2: Redundancy Level

The Test Sponsor must report in the Report the Redundancy Level (see Clause 7.5.7.1) and describe the test(s) used to demonstrate compliance. (9.3.7.2)

Redundancy level 1 was used for all storage systems.

7.3: Data Accessibility Tests

A description of the Data Accessibility tests run and the Redundancy Level they were demonstrating must be reported. (9.3.7.3)

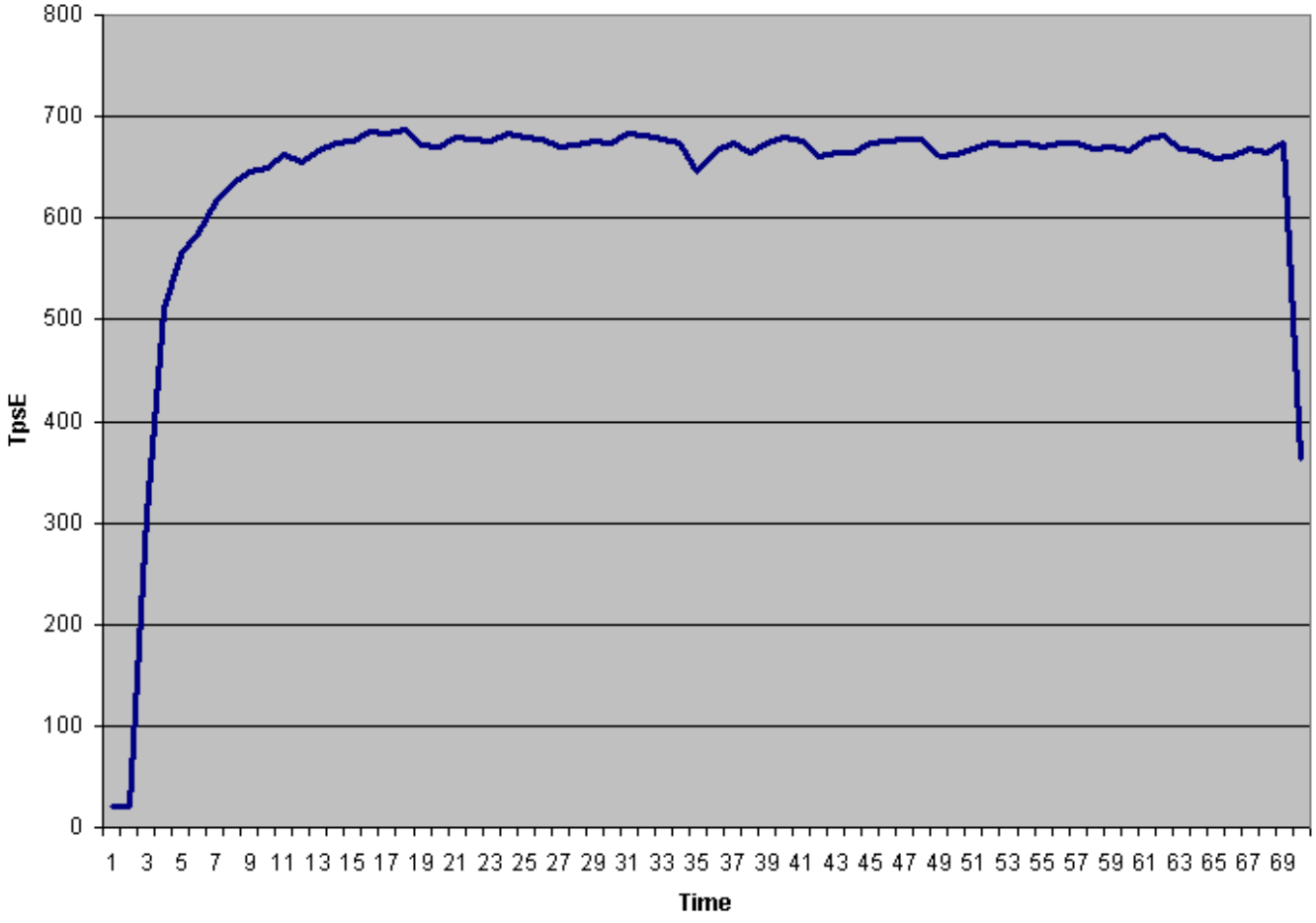
1. A restore was executed to yield a fresh database.
2. The rows in the Settlement table were counted to determine the initial count of completed trades present in the database (count-before).
3. A performance run was started with the same number of configured customers and driver load used for the measurement interval.
4. The test ramped up, and executed at or above 95% of the Reported Throughput for 30 mins.
5. After 30mins, a log disk drive was pulled from the disk pod.
6. The driver continued running normally for 5 mins.
7. After an additional 5mins, a data disk drive was pulled from the disk pod.
8. The drivers continued running normally with no errors logged in the SQL errorlog and OS logs.
9. After an additional 30mins the driver was stopped gracefully.
10. A transaction report for the test was generated and the number of Trade_Result transactions recorded during the run was noted.
11. The faulty log and data disk drives were replaced by spare disks of similar characteristics.
12. The Database was allowed to recover normally

13. Step 2 was repeated to determine the total number of completed trades present in the database (count-after)
14. count-after minus count-before was verified to be equal to the number of successful Trade-Result transaction records in the driver log file.
15. Consistency tests were run to ensure that the database was in a consistent state.

7.4: Data Accessibility Test Graph

A Data Accessibility Graph for each run demonstrating a Redundancy Level must be reported (9.3.7.4)

Figure 4: Data Accessibility Graph



7.5: Business Recovery Tests

The Test Sponsor must describe in the Report the test(s) used to demonstrate Business Recovery. (9.3.7.5)

Power to the SUT was removed as a way of demonstrating recovery from a system crash:

1. A restore was executed to yield a fresh database.
2. The rows in the Settlement table were counted to determine the initial count of completed trades present in the database (count-before).
3. A performance run (Run1) with the same number of configured customers and driver load was started and ramped up to steady state.
4. The test ran at 95% and above of reported throughput for 57mins.
5. Power to tier A and tier B systems was pulled.
6. After transaction failures were noted by the drivers, the drivers were stopped
7. Power to the SUT was returned.
8. Database recovery started. That marked the beginning of business recovery.
9. Database recovery was completed successfully
10. Transaction cleanup was executed on the database.
11. A performance run (Run2) was started.
12. The test ramped-up to steady state.
13. Business recovery ends when the test attains at least 95% of reported throughput and maintains that rate or above thereafter.
14. The test was allowed to run in steady-state for 20mins.
15. The drivers were stopped gracefully.
16. Transaction reports for Run1 and Run2 were generated and the count of Trade_Results transactions for both runs were noted and summed.
17. Step 2 was repeated to determine the total number of completed trades present in the database (count-after)
18. count-after minus count-before was verified to be equal to the number of successful Trade-Result transaction (sum of Run1 and Run2) records in the driver log file.
19. Consistency tests were run to ensure that the database was in a consistent state.

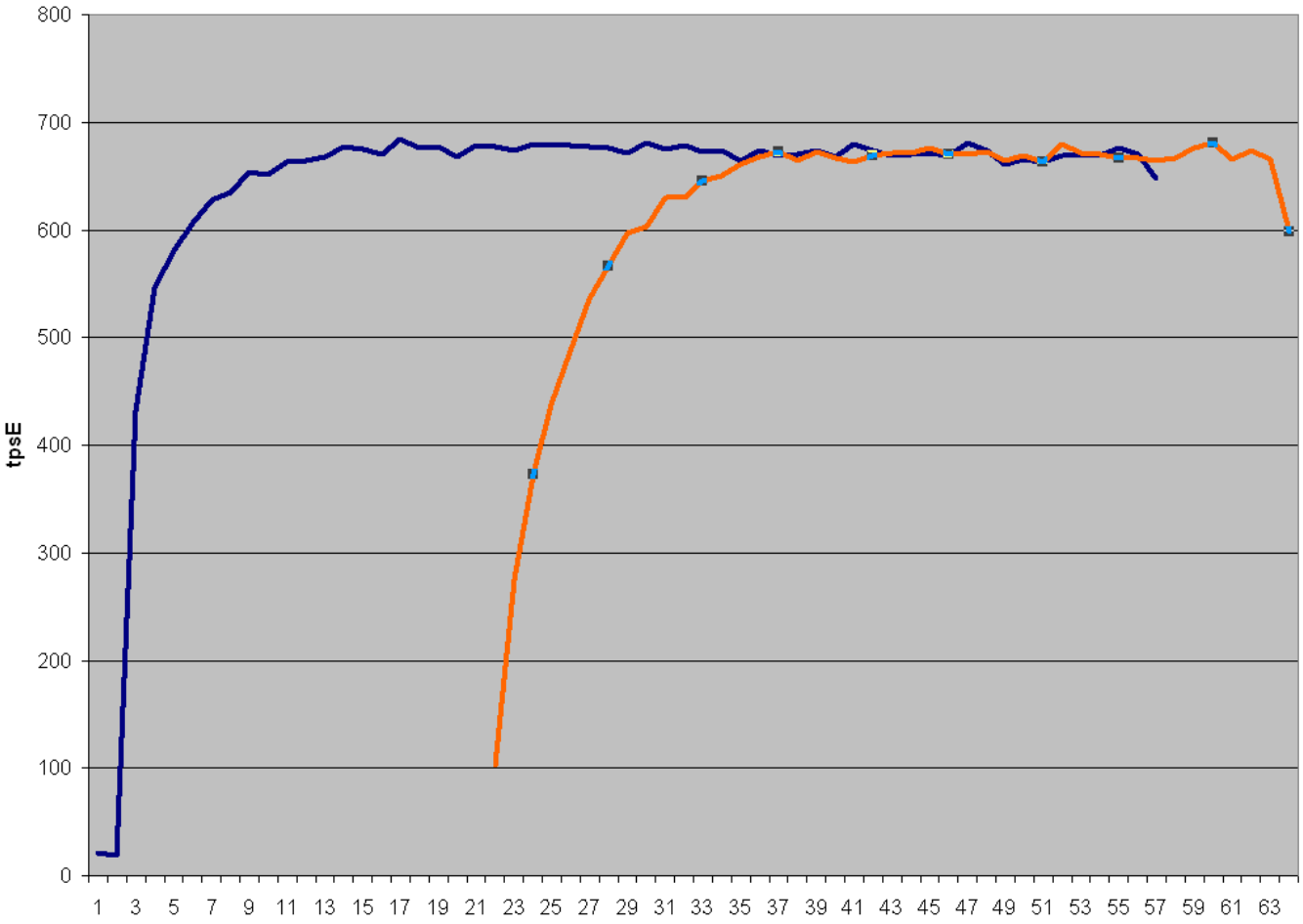
7.6: Business Recovery Time

The Business Recovery Time must be reported on the Executive Summary Statement and in the report.If the failures described in clauses 7.5.2.2, 7.5.2.3, and 7.5.2.4 were not combined into one Durability Test (Usually powering off the database during the run), then the Business Recovery Time for the failure described for instantaneous interruption is the Business Recovery Time that must be reported in the Executive Summary Statement. All the Business Recovery Times for each test requiring Business Recovery must be reported in the Report. (9.3.7.6)

A Business Recovery Graph (see clause 7.5.7.4) must be reported in the Report for all Business Recovery Tests. (9.3.7.7)

The Business Recovery Time was determined to be 43mins 33s. This is also recorded in the Executive Summary.

***Figure 5**: Business Recovery Tests Graph*



Clause 8: Pricing

8.1: 60-day space

Details of the 60-Day Space computations (see Clause 8.2.2) along with proof that the database is configured to sustain a Business Day of growth (see Clause 6.6.6.1) must be reported. (9.3.8.1)

Table 6: *Space Requirements*

Space calulcations for TPC-E		Customers:	340,000						
		TpsE:	671.35						
		TradeResult count:	7,757,513						
Table	**Rows**	**Data(KB)**	**Index(KB)**	**Total**	**Total + 5%**	**Rows After**	**Data After(KB)**	**Index After(KB)**	**Growth**
ACCOUNT_PERMISSION	2413802	241416	1464	242,880	255,024	2413802	241416	1464	0
ADDRESS	510004	29392	376	29,768	31,256	510004	29416	392	40
BROKER	3400	192	1264	1,456	1,529	3400	384	1280	208
CASH_TRANSACTION	5405194455	535203584	1130392	536,333,976	563,150,675	5412330527	547653056	2221504	13540584
CHARGE	15	8	8	16	17	15	8	8	0
COMMISSION_RATE	240	16	16	32	34	240	16	16	0
COMPANY	170000	36944	10344	47,288	49,652	170000	36952	10352	16
COMPANY_COMPETITOR	510000	13672	11280	24,952	26,200	510000	13672	11280	0
CUSTOMER	340000	57568	15016	72,584	76,213	340000	57568	15016	0
CUSTOMER_ACCOUNT	1700000	157848	187712	345,560	362,838	1700000	157848	187712	0
CUSTOMER_TAXRATE	680000	14168	328	14,496	15,221	680000	14304	344	152
DAILY_MARKET	303934500	15576376	6576464	22,152,840	23,260,482	303934500	15577400	6576672	1232
EXCHANGE	4	8	8	16	17	4	8	8	0
FINANCIAL	3400000	400040	1344	401,384	421,453	3400000	400208	1456	280
HOLDING	300826769	15989032	11844976	27,834,008	29,225,708	301030870	26465704	12213408	10845104
HOLDING_HISTORY	7873776221	286319168	149215272	435,534,440	457,311,162	7884233508	287246392	149850136	1562088
HOLDING_SUMMARY	16917585	572840	2320	575,160	603,918	16917674	1145624	6624	577088
INDUSTRY	102	8	40	48	50	102	8	40	0
LAST_TRADE	232900	10800	328	11,128	11,684	232900	21544	336	10752
NEWS_ITEM	340000	37447104	664	37,447,768	39,320,156	340000	37447120	680	32
NEWS_XREF	340000	8456	328	8,784	9,223	340000	8456	328	0
SECTOR	12	8	24	32	34	12	8	24	0
SECURITY	232900	36560	15976	52,536	55,163	232900	36576	15984	24
SETTLEMENT	5875200000	288321296	608144	288,929,440	303,375,912	5882957513	300138696	1214896	12424152
STATUS_TYPE	5	8	8	16	17	5	8	8	0
TAXRATE	320	64	88	152	160	320	64	88	0
TRADE	5875200000	650498016	348351176	998,849,192	1,048,791,652	5882994623	661846328	353200352	16197488
TRADE_HISTORY	14100453801	404314128	1054056	405,368,184	425,636,593	14119088754	405777960	1060320	1470096
TRADE_REQUEST	0	0	0	-	-	37110	7776	11752	19528
TRADE_TYPE	5	8	1032	1,040	1,092	5	8	1032	0
WATCH_ITEM	34007419	929488	3568	933,056	979,709	34007419	929616	3720	280
WATCH_LIST	340000	8440	7072	15,512	16,288	340000	8440	7072	0
ZIP_CODE	14741	520	336	856	899	14741	520	336	0
Totals in KB	39796739200	2236187176	519041424	2755228600	2892990030		2285263104	526614640	56649144

									file size
Database File Groups	**Allocated size MB**	**Required size MB**	**Diff**						# of files
Customer_fg	744,576	487,156	257,420	OK					total in KB (*8)
Broker_fg	3,718,848	2,286,142	1,432,706	OK					
Market_fg	140,448	61,684	78,764	OK					
Total	4,603,872								
Total in GB	4,496.0								

Growing Space	56,636,128	KB							
per Trade Results	7.30	KB							
Data Growth	141,160,284	KB							
60 Day Space	11,224,845,643	KB							
60 Day Space	10,705	GB							
		%	size						
Log space before in MB	2,068	0.87632418	236000						
Log space after in MB	83,051	35.191002	236000						
per Trade Results	0.010								
Log Growth	201,842	MB							
Total 8 hours log space	203,910	MB							
Total 8 hours log space	199.13	GB							

	Count	Formatted size GB	Total GB Configured	Total Needed
Data Disks configured	0	33.37	-	
	308	67.75	20,867	
	28	135.49	3,794	
RAID 10 overhead 50%			(12,330)	
Data Disks space total			**12,330**	10,705
Log Disks configured	8	67.75	542	
RAID 10 overhead 50%			(271)	
Log Disk space total			271	199

8.2: Orderability Date

For each of the components that are not orderable on the report date of the FDR, the following information must be included in the FDR:

- *Name and part number of the item that is not orderable*
- *The date when the component can be ordered (on or before the Availability Date)*
- *The method to be used to order the component (at or below the quoted price) when the date arrives*
- *The method for verifying the price*

Some components used in this benchmark are not orderable at the time of this publication. These items will be orderable on or before the stated Availability Date in this submission. For specific information regarding the orderable dates and prices of these items, please refer to the table below:

Orderable Information

Description	Part #	Order Date	Order Method	Price Verification
PER900,DUAL X7460,2.67GHz,130W	223-4230	9/15/2008	1-800-BUY-DELL	Note 1
Upgrade to Quad X7460, 2.67GHz	311-9170	9/15/2008	1-800-BUY-DELL	Note 1

Note 1: These parts are not yet immediately orderable. For price verification before the stated Availability Date, please contact the Dell COC Pricing Department at: (512) 728-6044.

8.3: Attestation Letter

The Auditor's Attestation Letter, which indicates compliance, must be included in the Report. (9.3.8.2)

This configuration and benchmark test was audited by a TPC certified auditor Lorna Livingtree as shown by the attestation letter shown below:

August 14, 2008

Mr. Gene Purdy
Dell, Inc.
One Dell Way
Round Rock, TX 78682

I have verified the TPC Benchmark™ E for the following configuration:

Platform: Dell PowerEdge R900
Database Manager: Microsoft SQL Server 2008 Enterprise x64 Edition
Operating System: Microsoft Windows Sever 2008 Enterprise x64 Edition

Server (Tier B): R900			
CPU's	Memory	Disks (total)	tpsE
4 Intel Xeon 6 core @ 2.67 Ghz	64 GB	316 @ 73 GB 28 @ 146 GB	**671.35**
Clients (Tier A): 1 PE SC 1430			
2 Intel quad core @ 1.60 Ghz	4 GB	1 @ 80 GB	Na
Clients (Tier A): 1 PE SC 1420			
2 Intel @ 3.2 Ghz	3 GB	1 @ 80 GB	NA

In my opinion, these performance results were produced in compliance with the TPC requirements for the benchmark. The following attributes of the benchmark were given special attention:

- All EGen components were verified to be version 1.5.1.
- The database files were properly sized and populated for 340,000 customers.
- The transaction components were properly implemented.
- The required network between the driver and the transaction harness was configured.
- The ACID properties were successfully demonstrated.
- The database was verified to have no Trade-Request rows prior to the start of the test run.
- The test run met all the requirements for timing, mix, and response times.
- Input data was generated according to the specified percentages.
- One and only one Data-Maintenance process was running during the test run.
- There were no inactive load units during the test run.
- Eight hours of mirrored log space was present on the measured system.
- Eight hours of growth space was present on the measured system.
- The data for the 60 day space calculation was verified.
- There were 760 user contexts present on the system.
- The steady state portion of the test was 120 minutes.
- One checkpoint was taken after steady state and before the measured interval.
- Checkpoint interval was verified to be equal to or less than 7.5 minutes.
- The system pricing was checked for major components and maintenance.
- Third party quotes were verified for compliance.
- The FDR was reviewed and verified as required.

Auditor Notes:
One of the Tier A clients tested was a PowerEdge SC 1420 which is no longer available. A PowerEdge SC 1430 has been substituted in the priced configuration. The specifications were verified and meets the substitution requirements.

Sincerely,

Lorna Livingtree
Auditor

Clause 9: Supporting Files

9.1: Supporting Files

An index for all files required by Clause 9.4 Supporting Files must be provided in the Report. The Supporting Files index is presented in a tabular format where the columns specify the following:

- *The first column denotes the clause in the TPC Specification*
- *The second column provides a short description of the file contents*
- *The third column contains the path name for the file starting at the SupportingFiles directory.*

If there are no Supporting Files provided then the description column must indicate that there is no supporting file and the path name column must be left blank. (9.3.9.1)

Microsoft Corporation
One Microsoft Way
Redmond, WA 98052-6399

Tel 425 882 8080
Fax 425 936 7329
http://www.microsoft.com/

Microsoft

August 10, 2008

Dell
Gene Purdy
1 Dell Way
Round Rock, TX 78664

Here is the information you requested regarding pricing for several Microsoft products to be used in conjunction with your TPC-E benchmark testing.

All pricing shown is in US Dollars ($).

Part Number	Description	Unit Price	Quantity	Price
810-07507	**SQL Server 2008 Enterprise x64 Edition** *Per Processor License* *Discount Schedule: Open Program - Level C* *Unit Price reflects a 6% discount from the retail unit price of $24,999.*	$23,432	4	$93,728
P73-04165	**Windows Server 2008 Standard Edition (x64)** *Server License with 5 CALs* *Discount Schedule: Open Program - Level C* *Unit Price reflects a 29% discount from the retail unit price of $999.*	$711	1	$711
P72-03168	**Windows Server 2008 Enterprise Edition (x64)** *Server License with 25 CALs* *Discount Schedule: Open Program - Level C* *Unit Price reflects a 42% discount from the retail unit price of $3,999.*	$2,310	2	$4,620
N/A	**Microsoft Problem Resolution Services** *Professional Support* *(1 Incident)*	$245	1	$245

Windows Server 2008 and Windows Server 2003 are currently orderable through Microsoft's normal distribution channels. A list of Microsoft's resellers can be found at **http://www.microsoft.com/products/info/render.aspx?view=22&type=mnp&content=22/licensing**

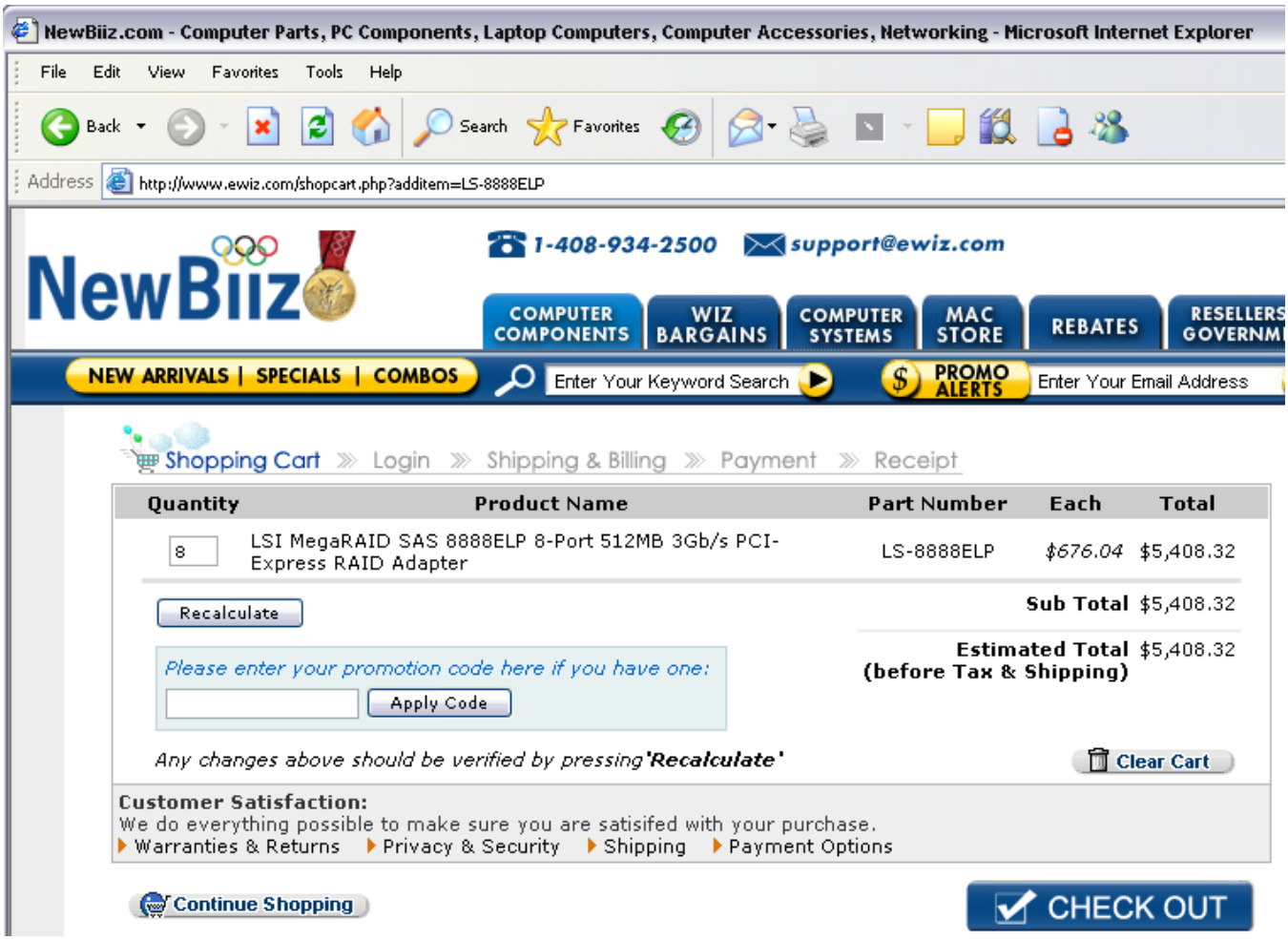
SQL Server 2008 will be orderable and available by August 30, 2008.

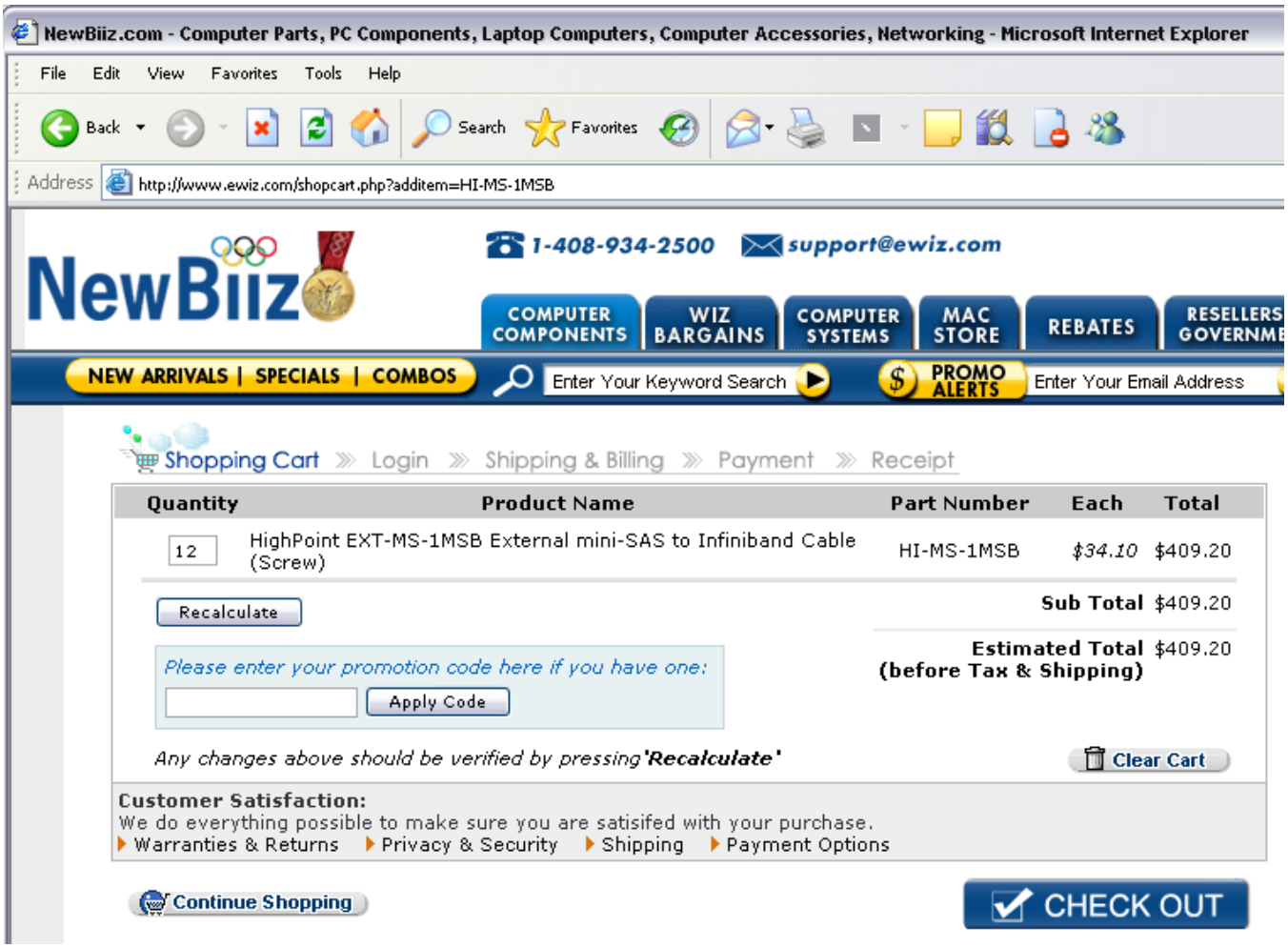
Defect support is included in the purchase price. Additional support is available from Microsoft PSS on an incident by incident basis at $245 per call.

This quote is valid for the next 90 days.

If we can be of any further assistance, please contact Jamie Reding at (425) 703-0510 or jamiere@microsoft.com.

Reference ID: PEgepu0808100000002421.
Please include this Reference ID in any correspondence regarding this price quote.

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Enter Your Email Address
Shopping Cart » Login » Shipping & Billing » Payment » Receipt
Quantity
Product Name
Part Number
Each
Total
12
HighPoint EXT-MS-1MSB External mini-SAS to Infiniband Cable (Screw)
HI-MS-1MSB
$34.10
$409.20
Recalculate
Sub Total $409.20
Please enter your promotion code here if you have one:
Apply Code
Estimated Total (before Tax & Shipping) $409.20
Any changes above should be verified by pressing 'Recalculate'
Clear Cart
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We do everything possible to make sure you are satisifed with your purchase.
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