



TPC Benchmark™ E Report

Unisys ES7000 Model 7600R Enterprise Server (16s)

using

**Microsoft SQL Server 2008
Enterprise Edition (64-bit)**

on

**Microsoft Windows Server 2008
Datacenter Edition (64-bit)**

**First Edition
November 19, 2008**

**Revision Date
November 25, 2008**

First Edition - November 2008

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Abstract

Overview

This report documents the methodology and results of the TPC Benchmark™ E (TPC-E) conducted on the Unisys Corporation ES7000 Model 7600R Enterprise Server (16s). The operating system on the server was Microsoft Windows Server 2008 Datacenter Edition (64-bit). The DBMS used was Microsoft SQL Server 2008 Enterprise Edition (64-bit). The TPC applications, which included TPC provided EGen software, were provided by Microsoft Corporation. The operating system on the clients was Microsoft Windows Server 2008 Standard Edition. The standard TPC Benchmark™ E metrics, tpsE (transactions per second), price per tpsE (three year capital cost per reported tpsE), and the availability date are reported as required by the benchmark specification.

Executive Summary

The following pages contain the **Executive Summary** results of the benchmark. The **Executive Summary Statement (ExecutiveSummary.pdf)** and the **(ES.xml)** file can be found in the *ExecutiveSummaryStatement* folder.

Auditor

Lorna Livingtree of Performance Metrics, Inc., verified compliance with the relevant TPC specifications, audited the benchmark configuration, environment, and methodology used to produce and validate the test results, along with the pricing model used to calculate the price per tpsE.

UNISYS	ES7000 Model 7600R Enterprise Server (16s)		TPC-E 1.6.0 TPC Pricing 1.3
			Report Date November 19, 2008 Revision Date November 25, 2008
TPC-E Throughput	Price/Performance	Availability Date	Total System Cost
1493.42 tpsE	\$917.26 USD per tpsE	December 9, 2008	\$1,369,840 USD
Database Server Configuration			
Operating System Microsoft Windows Server 2008 Datacenter Edition (64-bit)	Database Manager Microsoft SQL Server 2008 Enterprise Edition (64-bit)	Processors/Cores/ Threads 16/64/64	Memory 512GB
Tier A 2 Clients ES3220L Server Tier B Server ES7000 Model 7600R Storage RTS 4200 RAID 2 Driver Machines 1Gb Ethernet 1Gb Ethernet 4Gb Fibre Channel (17) (3) (3) (Database) (Log)			
Client ES3220L Server 2 x 2.00GHz Intel® Quad-core Xeon™ w/ 4MB L2 cache, 4 GB memory, 1 x 73GB internal disk, 2 Inbuilt 1Gb Eth. cntrls.		Server ES7000 Model 7600R 16 x Intel® Hex-core Xeon™ X7460 2.66GHz w/ 16MB L3 cache, * 512 GB memory, 2 x 73GB SAS disk, internal , 1 x PCISAS RAID cntrl, internal, 9 x PCI Fibre Channel cntrls, 8 Inbuilt 1Gb Eth. cntrls. (2 used). *(4 of 6 cores used / socket)	
		Storage RTS 4200 RAID Storage 765 x 73GB 10 x 146GB External Fibre Channel disks, 19 x FC RAID controllers	
Initial Database Size	Redundancy Level: 1		Database Storage
5,809 GB	RAID-10		765 x 73GB 15K rpm 10 x 146GB 15K rpm

	ES7000 Model 7600R Enterprise Server (16s)				TPC-E 1.6.0		
					TPC Pricing 1.3		
					Report Date November 19, 2008		
					Revision Date November 25, 2008		
Description	Part Number	Price Source	Unit Price	Qty.	Extended Price	3-yr. Maint. Price	
Server Hardware:							
ES 7000 Model 7600R with 32 GB	ES7763163-100	1	\$135,003	1	\$135,003	\$6,768	
Memory Initial 8GB with 4 GB DIMMs	FAC7102403-ICA	1	\$1,514	4	\$6,056		
Boot Drive (Mirrored Drives)	FAC7760361-IDK	1	\$2,083	1	\$2,083		
Memory Expansion - 8GB	FAC7102403-8GB	1	\$720	56	\$40,320		
USB to CAT5 KVM Converter	KVM9002301-CNV	1	\$250	1	\$250		
Emulex LPe12002	NU9233231-IOD	1	\$3,986	9	\$35,874		
					Subtotal	\$219,586	\$6,768
Server Software:							
Windows 2008 Srvr, DC x64 Edtn	WDX286416-NPR	1	\$47,984	1	\$47,984		
Windows 2008 Server, DC Lmt'd Sbscrptn, 1yr.	DUS2200316-LI	1	\$8,400	2	\$16,800		
Microsoft SQL Server 2008 Enterprise x64 Edtn.	810-07507	2	\$23,432	16	\$374,912		
Microsoft Problem Resolution Svc		2	\$245	1			
					Subtotal	\$439,696	\$245
Storage Hardware:							
Rack Mount Kit for Enclosures -1 Pack	RTS400012-P01	1	\$855	4	\$3,420		
Rack Mount Kit for Enclosures -5 Pack	RTS400012-P05	1	\$3,815	1	\$3,815		
Enclosure with Disk (30 Pack)	RTS4307315-30P	1	\$333,144	1	\$333,144		
Enclosure with Disk	RTS4307315-1P	1	\$13,881	4	\$55,524		
Dual RAID Controller for Log	RTS422880-T2	1	\$15,490	1	\$15,490		
UPS for Log Disk	RTS412120-UPS	1	\$2,246	1	\$2,246		
SAN Manager Software	RTS44101-SAN	1	\$2,246	1	\$2,246		
146 GB Disk Drive	RTS4314615-4FH	1	\$675	10	\$6,750		
73GB Disk Drive	RTS4307315-4FH	1	\$495	255	\$126,225		
RAID Controller 1x1	RTS422880-1X1	1	\$10,102	2	\$20,204		
RAID Controller 1x1 - 15 Pack	RTS4228801-P15	1	\$104,277	1	\$104,277		
AC Power Cord	RTS400740-CBL	1	\$14	34	\$476		
					Subtotal		\$673,817
Infrastructure							
Snap in 1U Filler	RCK4219421-1UP	1	\$20	5	\$100		
Snap in 3U Filler	RCK4219421-3UP	1	\$22	7	\$154		
42U Rack	RCK4219421-SC2	1	\$462	1	\$462		
Power Strip	PWR4243001-SD	1	\$323	1	\$323		
Power Strip	PWR4243001-SVD	1	\$332	2	\$664		
42U 19" Rack	RCK4219421-FSS	1	\$2,769	1	\$2,769		
8 port KVM switch	KVM9083101-SWC	1	\$1,300	1	\$1,300		
16 Port Ethernet Switch (Netgear)	FS116	4	\$56	2	\$112		
16 Port Gigabit Ethernet Switch (Netgear)	GS516T	5	\$256	1	\$256		
Rack mount LCD w/1U Drawer	MON2145-LCD	1	\$2,700	1	\$2,700		
Rack mount keyboard, w/touchpad, USB	KBR210501-USB	1	\$275	1	\$275		
42U Rack - No Doors	RM421940-FRM	1	\$1,286	5	\$6,429		
8 Outlet Power Strip	SFR9-PWR	1	\$170	19	\$3,230		
Power Cord	USE1936-LC6	1	\$90	19	\$1,710		
Fiber Channel Cables - 18 Pack	GCFAZLLM20-M	3	\$625	1	\$625		
Ethernet Cables - 27 Pack	GCPO888925-BK	3	\$136	1	\$136		
					Subtotal		\$21,244
Client Hardware:							
ESL3220 Quad Core Server 2.0 GHz	ESL3220611-200	1	\$787	2	\$1,574	\$986	
ESL3220 Brand Kit	ESL322001-UNI	1	\$19	2	\$38		
VersaRail Mount Kit	ESL322001-RVR	1	\$249	2	\$498		
Processor Upgrade	CPL3220612-200	1	\$369	2	\$738		
Hard Drive - 73GB 15K SAS	HDP73115-SAS	1	\$299	2	\$598		
Memory - 4GB (8 x 512 DIMMs)	DIM3220083-4GB	1	\$628	2	\$1,256		
Bezel	ESL322001-BZL	1	\$19	2	\$38		
SAS RAID Controller	RAD322004-P6I	1	\$299	2	\$598		
CD/DVD Drive	DVW322001-INT	1	\$99	2	\$198		
CD/DVD Drive Cable	CBL322001-CD	1	\$20	2	\$40		
USB to Cat5 KVM Adapter	KVM9002301-CNV	1	\$250	2	\$500		
					Subtotal		\$6,076
Client Software:							
O/S: Windows Server 2008, Standard Edition	P73-04165	2	\$711	2	\$1,422		
					Subtotal		\$1,422
Unisys Product Pricing (List Prices) - Michael Heifner (215)986-4757 (where Price Source = 1)					Total USD	\$1,361,841	\$7,999
Benchmark results and test methodology audited by Lorna Livingtree of Performance Metrics, Inc.							
Notes: 1. * 10% or minimum 2 spares are added in place of onsite service. 2. HW & SW maintenance at 24 x 7 w/ 4 hr. max. response time for spares. 3. Price Source: 1 = Unisys Product Price, Unisys Maintenance Price 2 = Microsoft 3 = GoCables 4 = ProVantage 5 = Xtreme Gadgets			3-Year Cost of Ownership: \$1,369,840 USD TPC-E Throughput: 1,493.42 tpsE Price/Performance: \$917.26 USD				
Benchmark results and test methodology audited by Lorna Livingtree of Performance Metrics, Inc.							
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 assumption 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 benchmarks specifications. If you find that the stated prices are not available according to these terms, please inform the TPC at pricing@tpc.org. Thank You.							

	ES7000 Model 7600R Enterprise Server (16s)		TPC-E 1.6.0	
			Report Date November 19, 2008 Revision Date November 25, 2008	
Numerical Quantities Summary				
Reported Throughput:			1493.42	
Configured Customers:			750,000	
Response Time (in seconds)	Minimum	Average	90 th %tile	Maximum
Broker-Volume	0.01	0.06	0.11	2.05
Customer-Position	0.00	0.03	0.06	2.72
Market-Feed	0.00	0.04	0.07	2.66
Market-Watch	0.00	0.05	0.09	4.60
Security-Detail	0.00	0.02	0.04	2.41
Trade-Lookup	0.00	0.56	0.80	3.33
Trade-Order	0.00	0.09	0.14	1.76
Trade-Result	0.00	0.11	0.18	2.11
Trade-Status	0.00	0.02	0.05	1.54
Trade-Update	0.01	0.66	0.87	3.47
Data-Maintenance	0.01	0.13	N/A	0.81
Transaction Mix (in percent of total transactions)		Transaction Count		Mix
Broker_Volume		5,268,290		4.900%
Customer-Position		13,976,891		13.000%
Market-Feed		1,075,286		1.000%
Market-Watch		19,352,704		18.000%
Security-Detail		15,052,471		14.000%
Trade-Lookup		8,600,780		7.999%
Trade-Order		10,858,957		10.100%
Trade-Result		10,752,677		10.001%
Trade-Status		20,428,880		19.001%
Trade-Update		2,150,108		2.000%
Data-Maintenance		120		N/A
Test Duration and Timing				
Ramp-up Time (hh:mm:ss)		0:40:37		
Measurement Interval (hh:mm:ss)		2:00:00		
Business Recovery Time (hh:mm:ss)		0:54:43		
Total Number of Transactions Completed in Measurement Interval		107,517,044		

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Preface

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 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 Unisys ES7000 Model 7600R Enterprise Server (16s) using Microsoft SQL Server 2008 Enterprise Edition (64-bit) on Microsoft Windows Server 2008 Datacenter Edition (64-bit).

TPC Benchmark™ E Overview

The Transaction Processing Performance Council (TPC) developed The TPC Benchmark™ E Standard Specification Revision 1.6.0. It is the intent of the TPC to develop a suite of benchmarks to measure the performance of computer systems executing a wide range of applications. Unisys and Microsoft Corporations are active participants in the TPC to define and develop such a suite of benchmarks. 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 the different **Reports**. (9.1.1.1)*

The order and titles of the sections in this report correspond with those from the TPC-E standard specification.

1.2. Executive Summary Statement

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

The schema of the ES.xml document is defined by the XML schema document tpce-es.xsd (available from www.tpc.org). The ES.xml file must conform to the tpce-es.xsd (established by XML schema validation). (9.2.3.1)

The TPC **Executive Summary Statement** is included in the *ExecutiveSummaryStatement* folder. The TPC **Executive Summary Statement** is located near the beginning of this report.

The **ES.xml** file conforms to the tpce-es-xsd specification and is included in the **ExecutiveSummaryStatement** folder.

1.3. Benchmark Sponsor

*A statement identifying the benchmark **sponsor(s)** and other participating companies must be **reported** in the **Report**. (9.3.1.1)*

Unisys Corporation sponsored this TPC benchmark™ E. Microsoft and Unisys developed the benchmark test. The benchmark was conducted at Unisys, Mission Viejo, California.

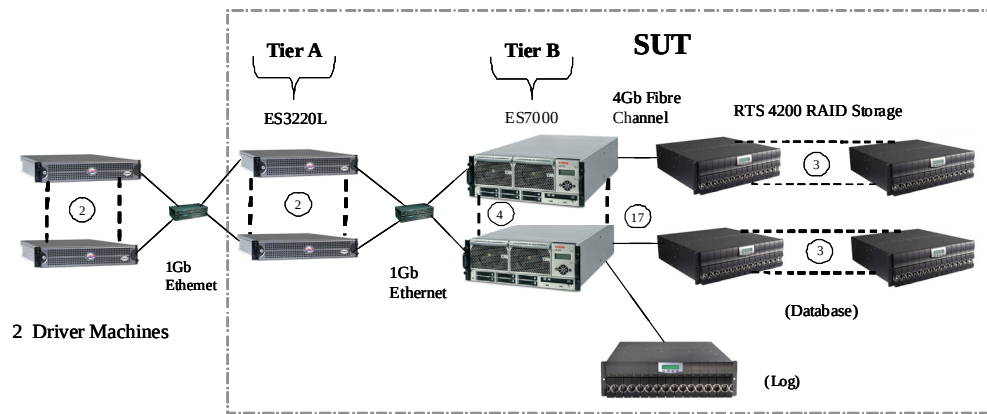
1.4. Configuration Diagrams

*Diagrams of both the Measured and **Priced Configurations** must be **reported** in the **Report**, accompanied by a description of the differences. This includes, but is not limited to: (9.3.1.2)(9.3.1.3)*

- o Number and type of processors, number of cores, and number of threads.*
- o Size of allocated memory, and any specific mapping/partitioning of memory unique to the test.*
- o Number and type of disk units (and controllers, if applicable).*
- o Number of channels or bus connections to disk units, including their protocol type.*
- o Number of LAN (e.g., Ethernet) connections, including routers, workstations, etc., that were physically used in the test or are incorporated into the pricing structure.*
- o Type and the run-time execution location of software components (e.g., **DBMS**, client, processes, transaction monitors, software drivers, etc.).*

The **Benchmarked Configuration** of the drivers and Unisys ES7000 Model 7600R Enterprise Server (16s) is illustrated in Figure 1.1. The **Priced Configuration** is shown in figure 1.2. Table 2.2 contains a detailed description of the disk configuration.

Figure 1-1: Benchmarked Configuration



Client

ES3220L Server
 2 x 2.00 GHz Intel®
 Quad-core Xeon™
 w/ 4MB L2 cache,
 4 GB memory,
 1 x 73GB internal disk,
 2 Inbuilt 1Gb Eth. cntrls.

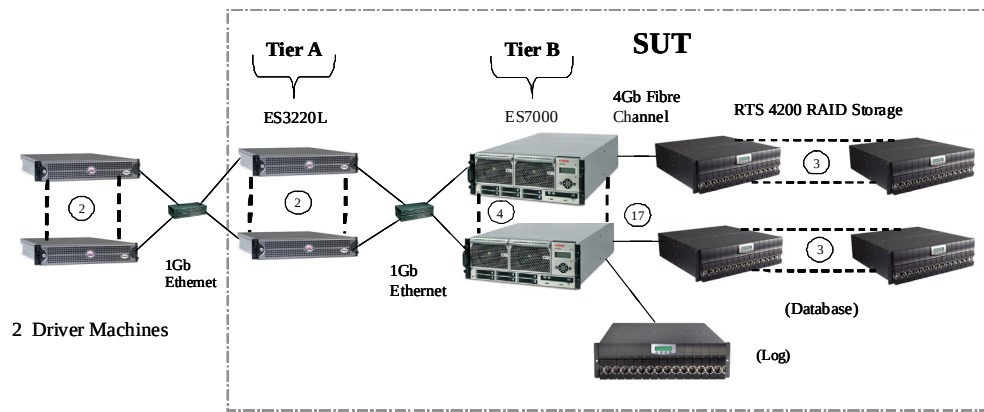
Server

ES7000 Model 7600R
 16 x Intel® Hex-core Xeon™
 X7460 2.66GHz w/ 16MB L3 cache, *
 512 GB memory,
 2 x 73GB SAS disk, internal ,
 1 x PCI SAS RAID cntrl, internal,
 9 x PCI Fibre Channel cntrls,
 8 Inbuilt 1Gb Eth. cntrls. (2 used).
 *(4 of 6 cores used / socket)

Storage

RTS 4200 RAID Storage
 616 x 73GB (Old Style)
 132 x 73GB (New Style)
 10 x 146GB
 External Fibre Channel disks,
 19 x FC RAID controllers

Figure 1-2: Priced Configuration



Client

ES3220L Server
 2 x 2.00 GHz Intel®
 Quad-core Xeon™
 w/ 4MB L2 cache,
 4 GB memory,
 1 x 73GB internal disk,
 2 Inbuilt 1Gb Eth. cntrls.

Server

ES7000 Model 7600R
 16 x Intel® Hex-core Xeon™
 X7460 2.66GHz w/ 16MB L3 cache, *
 512 GB memory,
 2 x 73GB SAS disk, internal ,
 1 x PCI SAS RAID cntrl, internal,
 9 x PCI Fibre Channel cntrls,
 8 Inbuilt 1Gb Eth. cntrls. (2 used).
 *(4 of 6 cores used / socket)

Storage

RTS 4200 RAID Storage
 616 x 73GB (Old Style)
 132 x 73GB (New Style)
 10 x 146GB
 External Fibre Channel disks,
 19 x FC RAID controllers

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 specifications could recreate the hardware environment. This includes but is not limited to: (9.3.1.4)

- o A description of any firmware updates or patches to the hardware.
- o A description of any GUI configuration used to configure the system hardware.
- o A description of exactly how the hardware is combined to create the complete system.
- o A description of how the hardware components are connected. The description can assume the reader is knowledgeable of computer systems and the TPC-E specification.

The file **HardwareConfiguration.pdf** in the **SupportingFiles** Directory (“Introduction”) contains the hardware configuration used in running these TPC-E tests. It also contains the disk subsystem configuration in the file **RAID_Hardware_config.pdf** in the **DiskSubsystem** directory. Figure 1.3 shows the layout of the ES7000 Model 7600R server.

Figure 1.3: ES7000 Model 7600R Server Layout

CELL-3	4 x 2.66GHz HC Xeon Processor MP	
		FC-HBA-DATA9
	128GB RAM	FC-HBA-DATA8
CELL-2	4 x 2.66GHz HC Xeon Processor MP	FC-HBA-DATA7
		FC-HBA-DATA6
	128GB RAM	
CELL-1	4 x 2.66GHz HC Xeon Processor MP	FC-HBA-DATA5
		FC-HBA-DATA4
	128GB RAM	
CELL-0	4 x 2.66GHz HC Xeon Processor MP	FC-HBA-DATA3
		FC-HBA-DATA2
	128GB RAM	FC-HBA-LOG-DATA1

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 specifications could recreate the software environment. This includes but is not limited to: (9.3.1.5)*

- o A description of any updates or patches to the software.*
- o A description of any changes to the software.*
- o A description of any GUI configurations used to configure the software.*

The file **SoftwareConfiguration.pdf** in the *SupportingFiles* Directory (“Introduction”) contains the configuration and system parameters used in running these TPC-E tests. It also contains all the client and server OS and SQL Server tunable parameters.

Clause2: Database Design, Scaling & Population

2.1. Physical Database Creation

A description of the steps taken to create the database for the **Reported Throughput** must be **reported** in the **Report**. Any and all scripts or step by step GUI instructions are **reported** in the **Supporting Files** (see Clause 9.4.2). The description, scripts and GUI instructions must be sufficient such that a reader knowledgeable of database software environments and the TPC-E specification could recreate the database. (9.3.2)

All the steps required to create the database are described in **MSTPCE Database Setup Reference.pdf** (included in *SupportingFiles\Clause2*). The Unisys customized scripts are located in *Supportingfiles\Clause2\Database*. These include:

- o Tempdb.sql (used to increase the size of tempdb)
- o Create_Database.sql (used to create the customer TPCE database)
- o Backup.sql (used to backup the database once it has been built)
- o Restore.sql (used to restore the TPCE database from the backup)

2.2. Physical Database Organization

The physical organization of tables and **User-Defined Objects**, within the database, must be **reported** in the **Report**. (9.3.2.1)

The database tables and their corresponding User-Defined Objects were organized into four file groups as shown in Table 2.1 below. The *SupportingFiles/Clause2* folder contains the SQL definitions of all the required filegroups, tables and indexes.

Table 2.1: Physical Database Organization

Broker File Group	Customer File Group	Market File Group	Misc File Group
BROKER	ACCOUNT_PERMISSION	COMPANY	ADDRESS
CASH_TRANSACTION	CUSTOMER	COMPANY_COMPETITOR	TAXRATE
CHARGE	CUSTOMER_ACCOUNT	DAILY_MARKET	ZIP_CODE
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	
		SECTOR	
		SECURITY	
		STATUS_TYPE	

2.3. Table and Row Partitioning

*Any horizontal or vertical partitioning of tables and rows in the TPC-E benchmark (see Clause 2.3.3), must be **reported** in the **Report**. (9.3.2.2)*

No partitioning was done for this implementation.

2.4. Replications, Duplications, or Additions

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

*Additional and/or duplicate columns in any table must be **reported** in the **Report** along with a statement on the impact on performance. (see Clause 2.3.5) (9.3.2.4)*

No replications, duplications or additional attributes were used in this implementation.

2.5. Initial Cardinality of Tables

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

The TPC-E database for this test was configured with 750,000 customers. The cardinality of each table the database is listed in Table 2.2

Table 2.2: Initial Cardinality of Database

Table	Rows
BROKER	7,500
CASH_TRANSACTION	11,923,187,680
CHARGE	15
COMMISSION_RATE	240
SETTLEMENT	12,960,000,000
TRADE	12,960,000,000
TRADE_HISTORY	31,104,030,225
TRADE_REQUEST	0
TRADE_TYPE	5
ACCOUNT_PERMISSION	5,325,184
CUSTOMER	750,000
CUSTOMER_ACCOUNT	3,750,000
CUSTOMER_TAXRATE	1,500,000
HOLDING	663,639,422
HOLDING_HISTORY	17,368,591,534
HOLDING_SUMMARY	37,301,786
WATCH_ITEM	74,987,894
WATCH_LIST	750,000
COMPANY	375,000
COMPANY_COMPETITOR	1,125,000
DAILY_MARKET	670,443,750
EXCHANGE	4
FINANCIAL	7,500,000
INDUSTRY	102
LAST_TRADE	513,750
NEWS_ITEM	750,000
NEWS_XREF	750,000
SECTOR	12
SECURITY	513,750
STATUS_TYPE	5
ADDRESS	1,125,004
TAXRATE	320
ZIP_CODE	14,741

2.6. 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)

Table 2.2 lists the distribution of the database over 748 73GB disks for the measured configuration, of which, 616 disks were style RTS4307315-4F and 132 disks were style RTS4307315-4FH. For the Priced configuration, 765 73GB disks were used. The transaction log was distributed over 4 mirrored pairs of 146GB disks for both the priced and measured configurations. The tempdb log was distributed over 1 mirrored pair of 146GB disks for both the priced and measured configurations. In addition, there were two 73GB mirrored disks in the host server containing Windows Server 2008 Datacenter Edition (64-bit) and SQL Server 2008 Enterprise Edition (64-bit) code and the master database plus the paging file.

Each database disk volume, as seen by the Windows operating system, was configured as a RAID-10 disk array with 22 physical disks. There were a total of 34 such disk volumes. Each disk volume was configured in Windows as four partitions, one for broker, one for market, one for customer and the last partition was used by the **tempdb** during the measurements.

Table 2.3: Disk Rack Configuration

Cell #	Slot #	HBA#	Controller #	Disk #	Drives Enduse model RAID level	FileSystem Partition	Size	Use
Cell 0	PCI Slot 2	HBA #1 port 1	RTS4200 #1, 2	1	8 X 146 GB RTS422880 RAID 10	C:\Bigdb\dblogs\tpclog1\ (RAW)	541.93 GB	TPCE database Log
				2	2 X 146 GB RTS422880 RAID 10	C:\Bigdb\dblogs\tpclog2\ (NTFS)	133.93 GB	Tempdb Log
		HBA #1 port 2	RTS4200 #3	3	22 x 73 GB RTS422880 RAID 10	C:\Bigdb\cabA\Broker1 (RAW) C:\Bigdb\cabA\Customer1 (RAW) C:\Bigdb\cabA\Market1 (RAW) C:\Bigdb\dbbackups\backupA1 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup, tempdb, Misc_FG
				4	22 x 73 GB RTS422880 RAID 10	C:\Bigdb\cabA\Broker2 (RAW) C:\Bigdb\cabA\Customer2 (RAW) C:\Bigdb\cabA\Market2 (RAW) C:\Bigdb\dbbackups\backupA2 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup, tempdb
	PCI Slot 3	HBA #2 port 1	RTS4200 #4	5	22 x 73 GB RTS422880 RAID 10	C:\Bigdb\cabB\Broker1 (RAW) C:\Bigdb\cabB\Customer1 (RAW) C:\Bigdb\cabB\Market1 (RAW) C:\Bigdb\dbbackups\backupB1 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup, tempdb
				6	22 x 73 GB RTS422880 RAID 10	C:\Bigdb\cabB\Broker2 (RAW) C:\Bigdb\cabB\Customer2 (RAW) C:\Bigdb\cabB\Market2 (RAW) C:\Bigdb\dbbackups\backupB2 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup, tempdb
		HBA #2 port 2	RTS4200 #5	7	22 x 73 GB RTS422880 RAID 10	C:\Bigdb\cabC\Broker1 (RAW) C:\Bigdb\cabC\Customer1 (RAW) C:\Bigdb\cabC\Market1 (RAW) C:\Bigdb\dbbackups\backupC1 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup, tempdb
				8	22 x 73 GB RTS422880 RAID 10	C:\Bigdb\cabC\Broker2 (RAW) C:\Bigdb\cabC\Customer2 (RAW) C:\Bigdb\cabC\Market2 (RAW) C:\Bigdb\dbbackups\backupC2 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup, tempdb
	PCI Slot 4	HBA #3 port 1	RTS4200 #6	9	22 x 73 GB RTS422880 RAID 10	C:\Bigdb\cabD\Broker1 (RAW) C:\Bigdb\cabD\Customer1 (RAW) C:\Bigdb\cabD\Market1 (RAW) C:\Bigdb\dbbackups\backupD1 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup, tempdb
				10	22 x 73 GB RTS422880 RAID 10	C:\Bigdb\cabD\Broker2 (RAW) C:\Bigdb\cabD\Customer2 (RAW) C:\Bigdb\cabD\Market2 (RAW) C:\Bigdb\dbbackups\backupD2 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup, tempdb
		HBA #3 port 2	RTS4200 #7	11	22 x 73 GB RTS422880 RAID 10	C:\Bigdb\cabE\Broker1 (RAW) C:\Bigdb\cabE\Customer1 (RAW) C:\Bigdb\cabE\Market1 (RAW) C:\Bigdb\dbbackups\backupE1 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup, tempdb
				12	22 x 73 GB RTS422880 RAID 10	C:\Bigdb\cabE\Broker2 (RAW) C:\Bigdb\cabE\Customer2 (RAW) C:\Bigdb\cabE\Market2 (RAW) C:\Bigdb\dbbackups\backupE2 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup, tempdb

Table 2.3: Disk Rack Configuration (Cont)

Cell #	Slot #	HBA #	Controller #	Disk #	Drives Endosure model RAID level	FileSystem Partition	Size	Use
Cell 1	PCI Slot 1	HBA #4 port 1	RTS4200 #8	13	22 x 73GB RTS422880 RAID 10	C:\Bigdb\cabF\Broker1 (RAW) C:\Bigdb\cabF\Customer1 (RAW) C:\Bigdb\cabF\Market1 (RAW) C:\Bigdb\dbbackups\backupF1 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup, tempdb
				14	22 x 73GB RTS422880 RAID 10	C:\Bigdb\cabF\Broker2 (RAW) C:\Bigdb\cabF\Customer2 (RAW) C:\Bigdb\cabF\Market2 (RAW) C:\Bigdb\dbbackups\backupF2 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup, tempdb
				15	22 x 73GB RTS422880 RAID 10	C:\Bigdb\cabG\Broker1 (RAW) C:\Bigdb\cabG\Customer1 (RAW) C:\Bigdb\cabG\Market1 (RAW) C:\Bigdb\dbbackups\backupG1 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup, tempdb
				16	22 x 73GB RTS422880 RAID 10	C:\Bigdb\cabG\Broker2 (RAW) C:\Bigdb\cabG\Customer2 (RAW) C:\Bigdb\cabG\Market2 (RAW) C:\Bigdb\dbbackups\backupG2 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup, tempdb
	PCI Slot 3	HBA #5 port 1	RTS4200 #10	17	22 x 73GB RTS422880 RAID 10	C:\Bigdb\cabH\Broker1 (RAW) C:\Bigdb\cabH\Customer1 (RAW) C:\Bigdb\cabH\Market1 (RAW) C:\Bigdb\dbbackups\backupH1 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup, tempdb
				18	22 x 73GB RTS422880 RAID 10	C:\Bigdb\cabH\Broker2 (RAW) C:\Bigdb\cabH\Customer2 (RAW) C:\Bigdb\cabH\Market2 (RAW) C:\Bigdb\dbbackups\backupH2 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup, tempdb
				19	22 x 73GB RTS422880 RAID 10	C:\Bigdb\cabI\Broker1 (RAW) C:\Bigdb\cabI\Customer1 (RAW) C:\Bigdb\cabI\Market1 (RAW) C:\Bigdb\dbbackups\backupI1 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup, tempdb
				20	22 x 73GB RTS422880 RAID 10	C:\Bigdb\cabI\Broker2 (RAW) C:\Bigdb\cabI\Customer2 (RAW) C:\Bigdb\cabI\Market2 (RAW) C:\Bigdb\dbbackups\backupI2 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup, tempdb
	PCI Slot 3	HBA #6 port 1	RTS4200 #12	21	22 x 73GB RTS422880 RAID 10	C:\Bigdb\cabJ\Broker1 (RAW) C:\Bigdb\cabJ\Customer1 (RAW) C:\Bigdb\cabJ\Market1 (RAW) C:\Bigdb\dbbackups\backupJ1 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup, tempdb
				22	22 x 73GB RTS422880 RAID 10	C:\Bigdb\cabJ\Broker2 (RAW) C:\Bigdb\cabJ\Customer2 (RAW) C:\Bigdb\cabJ\Market2 (RAW) C:\Bigdb\dbbackups\backupJ2 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup, tempdb
				23	22 x 73GB RTS422880 RAID 10	C:\Bigdb\cabK\Broker1 (RAW) C:\Bigdb\cabK\Customer1 (RAW) C:\Bigdb\cabK\Market1 (RAW) C:\Bigdb\dbbackups\backupK1 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup, tempdb
				24	22 x 73GB RTS422880 RAID 10	C:\Bigdb\cabK\Broker2 (RAW) C:\Bigdb\cabK\Customer2 (RAW) C:\Bigdb\cabK\Market2 (RAW) C:\Bigdb\dbbackups\backupK2 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup, tempdb
Cell 2	PCI Slot 5	HBA #7 port 1	RTS4200 #14	25	22 x 73GB RTS422880 RAID 10	C:\Bigdb\cabL\Broker1 (RAW) C:\Bigdb\cabL\Customer1 (RAW) C:\Bigdb\cabL\Market1 (RAW) C:\Bigdb\dbbackups\backupL1 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup, tempdb
				26	22 x 73GB RTS422880 RAID 10	C:\Bigdb\cabL\Broker2 (RAW) C:\Bigdb\cabL\Customer2 (RAW) C:\Bigdb\cabL\Market2 (RAW) C:\Bigdb\dbbackups\backupL2 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup, tempdb
				27	22 x 73GB RTS422880 RAID 10	C:\Bigdb\cabM\Broker1 (RAW) C:\Bigdb\cabM\Customer1 (RAW) C:\Bigdb\cabM\Market1 (RAW) C:\Bigdb\dbbackups\backupM1 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup, tempdb
				28	22 x 73GB RTS422880 RAID 10	C:\Bigdb\cabM\Broker2 (RAW) C:\Bigdb\cabM\Customer2 (RAW) C:\Bigdb\cabM\Market2 (RAW) C:\Bigdb\dbbackups\backupM2 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup, tempdb

Table 2.3: Disk Rack Configuration (Cont)

Cell #	Slot #	HBA #	Controller #	Disk #	Drives Enclosure model RAID level	FileSystem Partition	Size	Use
Cell 3	PCI Slot 1	HBA #8 port 1	RTS4200 #16	29	22 x 73GB RTS422880 RAID 10	C:\Bigdb\cabN\Broker1 (RAW) C:\Bigdb\cabN\Customer1 (RAW) C:\Bigdb\cabN\Market1 (RAW) C:\Bigdb\dbbackups\backupN1 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup,tempdb
				30	22 x 73GB RTS422880 RAID 10	C:\Bigdb\cabN\Broker2 (RAW) C:\Bigdb\cabN\Customer2 (RAW) C:\Bigdb\cabN\Market2 (RAW) C:\Bigdb\dbbackups\backupN2 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup,tempdb
		HBA #8 port 2	RTS4200 #17	31	22 x 73GB RTS422880 RAID 10	C:\Bigdb\cabO\Broker1 (RAW) C:\Bigdb\cabO\Customer1 (RAW) C:\Bigdb\cabO\Market1 (RAW) C:\Bigdb\dbbackups\backupO1 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup,tempdb
				32	22 x 73GB RTS422880 RAID 10	C:\Bigdb\cabO\Broker2 (RAW) C:\Bigdb\cabO\Customer2 (RAW) C:\Bigdb\cabO\Market2 (RAW) C:\Bigdb\dbbackups\backupO2 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup,tempdb
	PCI Slot 3	HBA #9 port 1	RTS4200 #18	33	22 x 73GB RTS422880 RAID 10	C:\Bigdb\cabP\Broker1 (RAW) C:\Bigdb\cabP\Customer1 (RAW) C:\Bigdb\cabP\Market1 (RAW) C:\Bigdb\dbbackups\backupP1 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup,tempdb
				34	22 x 73GB RTS422880 RAID 10	C:\Bigdb\cabP\Broker2 (RAW) C:\Bigdb\cabP\Customer2 (RAW) C:\Bigdb\cabP\Market2 (RAW) C:\Bigdb\dbbackups\backupP2 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup,tempdb
		HBA #9 port 2	RTS4200 #19	35	22 x 73GB RTS422880 RAID 10	C:\Bigdb\cabQ\Broker1 (RAW) C:\Bigdb\cabQ\Customer1 (RAW) C:\Bigdb\cabQ\Market1 (RAW) C:\Bigdb\dbbackups\backupQ1 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup,tempdb
				36	22 x 73GB RTS422880 RAID 10	C:\Bigdb\cabQ\Broker2 (RAW) C:\Bigdb\cabQ\Customer2 (RAW) C:\Bigdb\cabQ\Market2 (RAW) C:\Bigdb\dbbackups\backupQ2 (NTFS)	176.08 GB 42.98 GB 7.24 GB 513.64 GB	Broker_FG Customer_FG Market_FG backup,tempdb

2.7. Database Interface

A statement must be provided in the **Report** that describes:

- o The **Database Interface** (e.g. embedded, call level) and access language (e.g. SQL, COBOL, read/write) used to implement 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**.
- o 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. (9.3.2.8)

Microsoft SQL Server 2008 is a relational database.

The client software interfaced to SQL Server through Stored Procedures invoked through ODBC calls embedded in the C++ application code.

The methodology used to load the database used the flat files option on the EGenLoader command line. This generates flat files then a bulk insert of the data into the tables. For a more detailed description, refer to **Clause2** of the *SupportingFiles* directory (**MSTPCE Database Setup Steps.pdf**)

Clause 3: Transaction Related 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)*

Secondary sponsor-supplied code is functionally equivalent to the Pseudo-code in the specification.

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)*

The database footprint requirements were met.

Clause 4: SUT, Driver, and Network Items

4.1. Network Configurations

*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 (see Clause 4.1.3.12). (9.3.4.1).*

Figures 1.1 and 1.2 in Clause 1 of this report diagram the network configurations of the measured and priced configurations and represent the drivers connected via LAN replacing the user PCs that are directly connected via LAN.

Local area networks (LANs) were used in the priced and measured configurations. The database server contained eight (8) 1 gigabit-per-second LAN adapters of which two (2) were used. Tier A contained two (2) 1 gigabit-per-second inbuilt LAN controllers in the measured configuration. The Tier A clients, Tier B database server and the driver systems were all connected through the same 1 gigabit-per-second switch in the tested configuration.

Clause 5: EGen Items

5.1. EGen Version

*The version of **EGen** used in the benchmark must be **reported** in the **Report** (see Clause 5.3.1). (9.3.5.1)*

The EGen version used in this test was 1.6.0.

5.2. EGen Code

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

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

5.3. EGen Modifications

*If the **Test Sponsor** modified the **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** in the **Report**. (9.3.5.3)*

No modifications were made to EGen.

5.4. EGenLoader 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 extended code by an **Auditor** must be **reported** in the **Report** (see Clause 5.7.4). (9.3.5.4)*

No extensions were made to the EGenLoader for this test.

5.5. EGenLoader Make/Project Files

*The make/project files used to compile/link **EGenLoader** and **EGen Validate** must be **reported** in the **Supporting Files**. The compiler/linker options and flags used to compile/link **EGen** Objects for the **SUT** must be **reported** in the **Supporting Files**. (9.3.5.5)*

The project files (and solution file) for EGen are located in the “SupportingFiles\Clause3\prj\VS2008\” folder. The project files (and solution file) for the SUT CE_Server are located in the SupportingFiles\Clause3\SUT_CE_Server\ folder. The project files (and solution file) for the SUT MEE_Server are located in the SupportingFiles\Clause3\SUT_MEE_Server\ folder.

Clause 6: Performance Metrics & Response Time

6.1. EGenDriver Instances

*The number of **EGenDriverMEE** and **EGenDriverCE** instances used in the benchmark must be **reported** in the **Report**. (see Clause 6.2.5) (9.3.6.1)*

There were four EGenDriverMEEs with a dynamic number of instances and four EGenDriverCEs with 1375 instances used in this benchmark run.

6.2. Measured Throughput (tpsE)

*The **Measured Throughput** must be **reported** in the **Report**. (see Clause 6.7.1.2) (9.3.6.2)*

The measured tpsE was 1493.42.

6.3. Test Run Times/Steady State Measurement

*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). (9.3.6.3)*

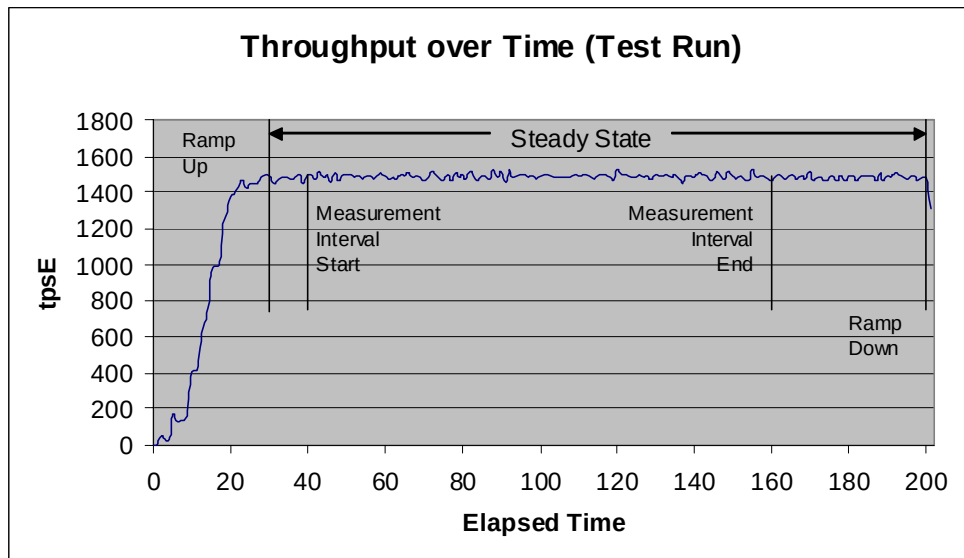
*The method used to determine that the **SUT** had reached a **Steady State** prior to commencing the **Measurement Interval** must be **reported** in the **Report**. (9.3.6.4)*

The transaction throughput rate (tpsE) and response time were relatively constant after the initial ramp-up period. The throughput and response time behavior were determined by examining data reported for each 60-second interval over the duration of the benchmark. Ramp-up and steady state are discernible in the graph presented in Figure 6.1

After the run, Steady State was confirmed by:

- Looking at the Test Run Graph and verifying that tpsE was steady prior to commencing the Measurement Interval.
- Calculated 60-minute average tpsE during the Steady State moving the time window 10 minutes each time. Then confirmed that the minimum 60-minute average tpsE was not less than 98% of the Reported Throughput, and that the maximum 60-minute average tpsE was not greater than 102% of the Reported Throughput.
- Calculated 10-minute average tpsE during the Steady State moving the window 1 minute each time. Then confirmed that the minimum 10-minute average tpsE was not less than 80% of the Reported Throughput, and the maximum 10-minute average tpsE was not greater than 120% of the Reported Throughput.

Figure 6.1: Test Run Graph



6.4. Work Measurements (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**, etc.). (9.3.6.5)

The driver engines generated the required transactions and their input data. This data was timestamped. The response for the requested transaction was verified and time-stamped in the driver log files. Each driver engine maintains its own log file. Log file contents are consolidated for the reports.

The driver engines transactions were sent to the SUT processes running on the Tier A machines through Ethernet LANs. These Tier A SUT processes handled all requests to the database on the server. The SUT processes communicated with the database server over a TCP/IP network using Microsoft 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 450 seconds were performed during the steady state before and during the measurement interval by a script running on the database server. SQL Server was started with trace flag 3502, which caused it to log the occurrence and duration of the checkpoints. This information was used to verify that the checkpoints occurred at the appropriate times during the test run.

During a checkpoint, SQL Server flushes all dirty pages from its cache to disk. It places a record in the database transaction log indicating that the checkpoint has completed and that all dirty pages for transactions which were committed prior to the checkpoint have been written to disk.

Data Maintenance was run every 60 seconds.

6.5. Transaction Report (Averages)

The recorded averages over the **Measurement Interval** for each of the **Transaction** input parameters specified by Clause 6.4.1 must be **reported** in the **Report**. (9.3.6.6)

Table 6.3 shows the **Transaction Report** Averages.

Table 6.3: Transaction Parameters (Averages)

<u>Transaction</u>	<u>Overall</u>	<u>Parameter</u>	<u>Value</u>	<u>Range</u> <u>Check</u>	<u>Acceptable Range</u>	
					<u>Min</u>	<u>Max</u>
Customer Position	Ok	By Tax ID	49.98%	Ok	48.00%	52.00%
		Get history	49.99%	Ok	48.00%	52.00%
Trade Lookup	Ok	Frame 1	30.00%	Ok	28.50%	31.50%
		Frame 2	30.00%	Ok	28.50%	31.50%
		Frame 3	29.98%	Ok	28.50%	31.50%
		Frame 4	10.02%	Ok	9.50%	10.50%
Market Watch	Ok	By Watch List	60.01%	Ok	57.00%	63.00%
		By Customer Account	34.99%	Ok	33.00%	37.00%
		By Industry	5.00%	Ok	4.50%	5.50%
Trade Update	Ok	Frame 1	33.02%	Ok	31.00%	35.00%
		Frame 2	32.99%	Ok	31.00%	35.00%
		Frame 3	33.99%	Ok	32.00%	36.00%
Security Detail	Ok	Access LOB	1.00%	Ok	0.90%	1.10%
Trade Order	Ok	By Non-Owner	10.00%	Ok	9.50%	10.50%
		By Company Name	40.01%	Ok	38.00%	42.00%
		Buy on Margin	7.99%	Ok	7.50%	8.50%
		Rollback	0.99%	Ok	0.94%	1.04%
		LIFO	34.99%	Ok	33.00%	37.00%
		Trade Quantity 100	25.03%	Ok	24.00%	26.00%
		Trade Quantity 200	25.00%	Ok	24.00%	26.00%
		Trade Quantity 400	25.00%	Ok	24.00%	26.00%
		Trade Quantity 800	24.97%	Ok	24.00%	26.00%
		Market Buy	30.00%	Ok	29.70%	30.30%
		Market Sell	30.00%	Ok	29.70%	30.30%
		Limit buy	19.98%	Ok	19.80%	20.20%
		Limit sell	10.01%	Ok	9.90%	10.10%
		Stop Loss	10.01%	Ok	9.90%	10.10%

Clause 7: Transaction and System Properties

7.1. Transaction System 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 TPC Benchmark™ E Standard Specification defines a set of transaction processing system properties that a system under test (SUT) must support during the execution of the benchmark. Those properties are Transaction System Properties (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 Data Accessibility test(s) used to demonstrate compliance. (9.3.7.2)*

Redundancy level 1 was used for all tests.

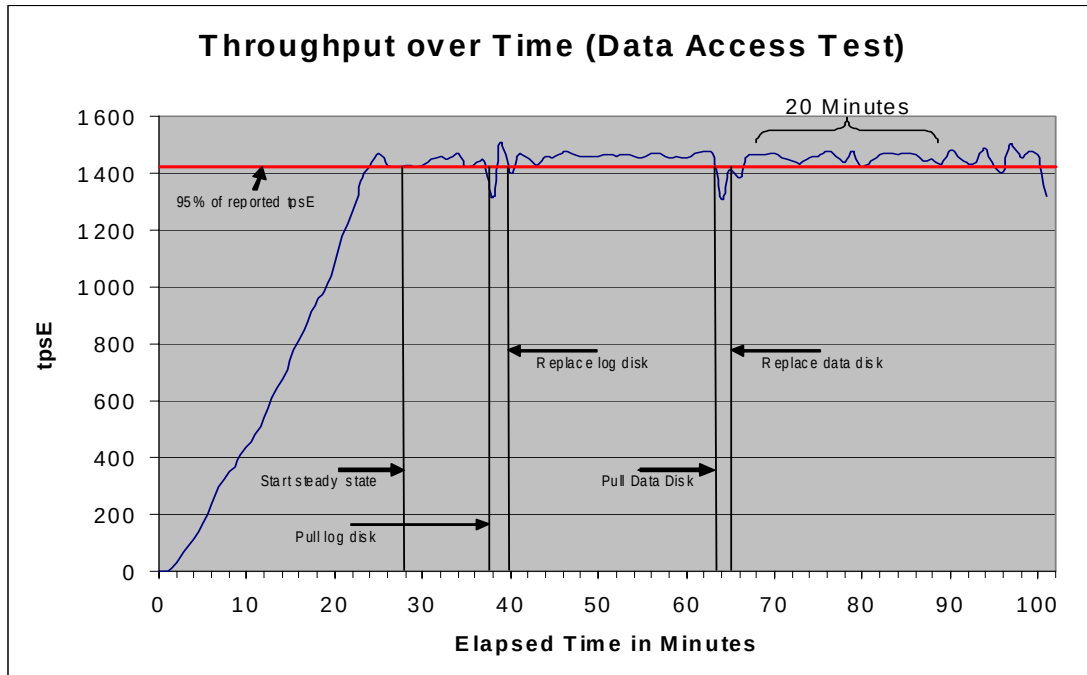
The following is a description of the Data Accessibility Tests:

1. The rows in the Settlement table were counted to determine the initial count of completed trades present in the database (count1).
2. The benchmark was executed above 95% load with the same number of configured customers and drivers load used for the measurement interval.
3. After five minutes of running at steady state, a hot-pluggable log disk was removed from the disk cabinet. Redundancy level 1 was used for the Data Accessibility Tests.
4. A spare disk drive installed in the RAID subsystem was configured to replace the faulty drive.
5. The Drivers continued running for a minimum of 20 minutes with no errors on the OS or SQL Server. The performance was at or above 95% of Reported throughput this period.
6. A hot-pluggable data disk was removed from the disk cabinet.
7. A spare disk drive installed in the RAID subsystem was configured to replace the faulty drive.
8. The Drivers continued running for a minimum of 20 minutes with no errors on the OS or SQL Server.
9. The Drivers were stopped gracefully.
10. No errors were reported by the Drivers during steps 2 through 8.
11. Step 1 was repeated to determine the total number of completed trades present in the database (count2).
12. Count2 minus count1 was verified to be equal to the number of successful Trade-Result transaction records in the driver log file.
13. The recovery process completed.

7.3. Data Accessibility Graph

A **Data Accessibility** Graph for each run demonstrating a Redundancy Level must be **reported** in the **Report** (see Clause 7.5.7.2). (9.3.7.3)

Figure 7-2: Data Accessibility Test Run



7.4. Business Recovery Tests

The **Test Sponsor** must describe in the **Report** the test(s) used to demonstrate **Business Recovery**. (9.3.7.4)

Removing the primary power to the SUT while the benchmark was executing induced this failure:

1. The rows in the Settlement table were summed up to determine the initial count of completed trades present in the database (count1).
2. The benchmark was executed above 95% load with the same number of configured customers and drivers load used for the measurement interval for a minimum of twenty minutes.
3. The primary power to the Tier B server and the Tier A client was removed.
4. After transaction failures were noted by the drivers, the drivers were stopped.
5. Power was restored to the SUT, the system rebooted, SQL Server was restarted, and automatic database recovery was performed. The database recovery used the transaction log to reapply all committed transactions and rollback any (in progress) uncommitted transactions, so that the database disks were correct.
6. Business Recovery starts when SQL Server reports "Starting up database 'master'". Database recovery ended when SQL Server reported "Recovery is complete".
7. The Trade-Cleanup Transaction was executed.

8. After Trade-Cleanup finished, the benchmark was executed above 95% load with same number of configured customers and drivers load used for the measurement interval for a minimum of twenty minutes.
9. Business Recovery ended successfully.
10. The drivers were stopped gracefully.
11. No errors were reported by the Drivers during steps 8 through 9.
12. Step 1 was repeated to determine the total number of completed trades present in the database (count2).
13. Count2 minus count1 was not less than the aggregate number of successful Trade-Result transaction records in the driver log file for the runs performed in step 2 and step 8.
14. Finally, consistency conditions as specified in Clause 7.3.1.1 were executed to verify that the database was consistent.

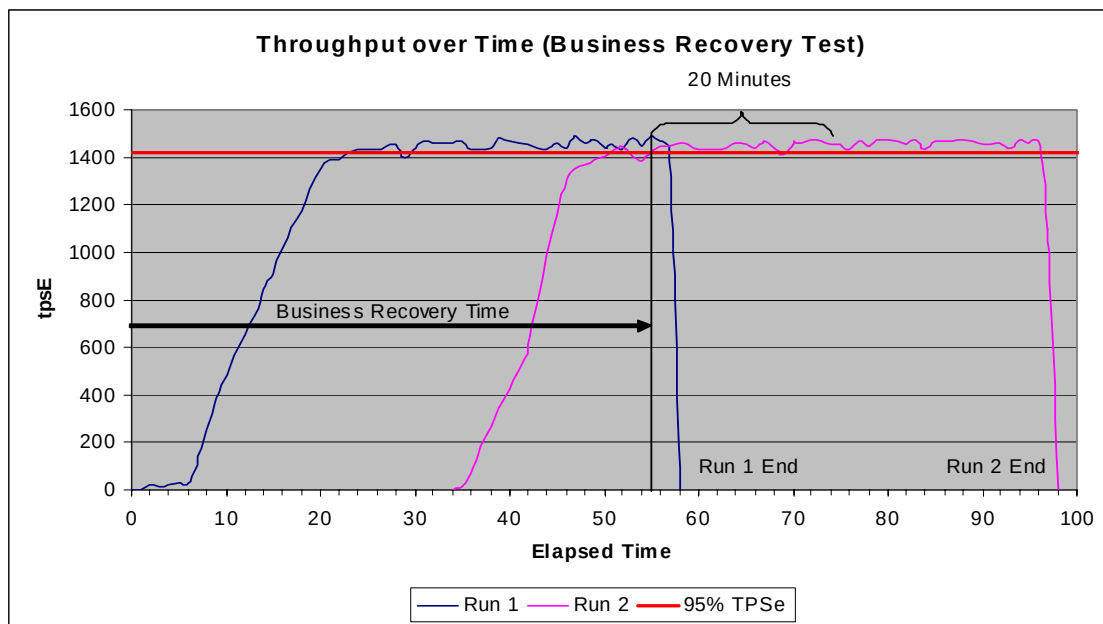
7.5. Business Recovery Time

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**. (9.3.7.5)

A **Business Recovery Time Graph** (see Clause 7.5.7.4) must be **reported** in the **Report** for all **Business Recovery Tests**. (9.3.7.6)

Business Recovery time was 00:54:43. This time is also reported in the Executive Summary Statement.

Figure 7-2: Business Recovery Time



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** in the **Report**.*
(9.3.8.1)

Figure 8.1 contains the details of the 60-Day Space Requirements.

Figure 8-1: Disk Space Requirements

Customers Used	750,000	Performance		1493.42 TpsE			
Broker File Group	Initial Rows	Data (KB)	Index size (KB)	Extra 5% (KB)	Total + 5% (KB)	After run (KB)	Growth (KB)
BROKER	7,500	416	728	57	1,201	1,600	456
CASH_TRANSACTION	11,923,187,680	1,183,070,144	2,489,264	59,278,470	-	1,214,844,760	29,275,352
CHARGE	15	8	8	1	17	16	0
COMMISSION_RATE	240	16	16	2	34	32	0
SETTLEMENT	12,960,000,000	636,002,792	1,341,864	31,867,233	-	664,279,576	26,934,920
TRADE	12,960,000,000	1,439,755,464	774,686,128	110,722,080	-	2,238,730,328	24,288,736
TRADE_HISTORY	31,104,030,225	891,872,112	2,327,008	44,709,956	-	897,346,872	3,147,752
TRADE_REQUEST	0	0	0	0	-	28,864	28,864
TRADE_TYPE	5	8	1,032	52	1,092	1,040	0
Customer File Group							
ACCOUNT_PERMISSION	5,325,184	453,472	3,640	22,856	479,968	457,400	288
CUSTOMER	750,000	127,184	34,928	8,106	170,218	162,112	0
CUSTOMER_ACCOUNT	3,750,000	348,408	416,768	38,259	803,435	765,232	56
CUSTOMER_TAXRATE	1,500,000	31,408	1,312	1,636	34,356	32,488	128
HOLDING	663,639,422	35,587,808	26,456,824	3,102,232	-	84,204,880	22,160,248
HOLDING_HISTORY	17,368,591,534	631,585,392	329,151,888	48,036,864	-	964,099,576	3,362,296
HOLDING_SUMMARY	37,301,786	1,281,264	6,128	64,370	-	2,577,224	1,289,832
WATCH_ITEM	74,987,894	2,084,408	8,856	104,663	2,197,927	2,093,544	280
WATCH_LIST	750,000	18,808	16,968	1,789	37,565	35,776	0
VIEW_CX_TXTX	0	0	0	0	0	0	0
VIEW_WL_WLS	0	0	0	0	0	0	0
Market File Group							
COMPANY	375,000	81,776	24,744	5,326	111,846	106,544	24
COMPANY_COMPETITOR	1,125,000	30,368	26,168	2,827	59,363	56,536	0
DAILY_MARKET	670,443,750	34,657,008	14,822,264	2,473,964	51,953,236	49,480,704	1,432
EXCHANGE	4	8	8	1	17	16	0
FINANCIAL	7,500,000	882,584	3,752	44,317	930,653	886,672	336
INDUSTRY	102	8	40	2	50	48	0
LAST_TRADE	513,750	24,200	1,312	1,276	26,788	49,632	24,120
NEWS_ITEM	750,000	81,314,240	2,272	4,065,826	85,382,338	81,316,552	40
NEWS_XREF	750,000	18,848	1,312	1,008	21,168	20,160	0
SECTOR	12	8	24	2	34	32	0
SECURITY	513,750	81,144	37,640	5,939	124,723	118,874	0
STATUS_TYPE	5	8	8	1	17	16	0
Misc File Group							
ADDRESS	1,125,004	65,008	1,040	3,302	69,350	66,096	48
TAXRATE	320	24	16	2	42	56	16
ZIP_CODE	14,741	488	16	25	529	504	0
TOTALS (KB)		4,939,374,832	1,151,873,976	304,562,440	142,405,964		
Initial Database Size (MB)		5,948.485	5.809 GB	5.67 TB			
Db/Filegroups	LUN Count	Partition Size (KB)	MB allocated	MB Loaded	MB Loaded+5%	Ending size	8 Hours
misc_fg	1	512,000	500	65	68	65	65
broker_fg	34	184,637,440	6,130,540	4,815,974	2	4,897,689	5,025,321
market_fg	34	7,587,840	251,940	128,916	135,362	128,941	128,981
customer_fg	34	45,066,240	1,496,340	1,003,531	3,636	1,029,715	1,070,614
Settlements		16,788,346					
Initial Growing Space (MB)	5,816,039						
Final Growing Space (MB)	5,923,938	Data LUNS	34	Initial Log size (MB)	13,327	Log LUNS	1
Delta (MB)	107,898	Disks per LUN	22	Final Log size (MB)	178,503	Log Disks	8
Data Space per Trade (MB)	0.006426984	Disk Capacity (MB)	68,881	Log Growth (MB)	165,176	Disk Capacity (MB)	138,752
1 Day Data Growth (MB)	276,428	RAID10 overhead	50%	Log Growth/trade (MB)	0.00983870295	RAID10 overhead	50%
60 Day Space (MB)	22,534,152	Total Space (MB)	25,761,494	1 Day log space (MB)	423,168	Log Space (MB)	555,000

8.2. Attestation Letter

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

Lorna Livingtree, a TPC certified auditor, audited this implementation of the TPC Benchmark™ E on the Unisys ES7000 Model 7600R Enterprise Server (16s) representing:

Performance Metrics, Inc.
P.O. Box 984
Klamath, CA 95548-0984

Phone: (707) 482-0523
Fax: (707) 482-0575
Email: Lorna@PerfMetrics.com

The attestation letter is shown near the end of this section.



PERFORMANCE METRICS INC.
TPC Certified Auditors

November 18, 2008

Mr. Jerrold Buggert
Director of Product Development & Technology Performance Group
Unisys Corporation
25725 Jeronimo Road
Mission Viejo, CA 92691

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

Platform: Unisys ES7000 Model 7600R Enterprise (16s)
Database Manager: Microsoft SQL Server 2008 Enterprise Edition (64-bit)
Operating System: Microsoft Windows Server 2008 Datacenter Edition (64-bit)

Server (Tier B): ES7000 Model 7600R			
CPU's	Memory	Disks (total)	tpsE
16 Intel @ 2.66 GHz	512 GB	10 @ 146 GB 765 @ 73 GB	1493.42
Clients (Tier A): ES3220L			
2 Intel @ 2.00 GHz	4 GB	1 @ 73 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 1.6.0.
- The database files were properly sized and populated for 750,000 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.

PERFORMANCE METRICS INC.
TPC Certified Auditors

- 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 1375 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 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:

The tested system had 765 disks at 73GB. Of these, 616 were older style 73GB drives and are no longer orderable. The technical specifications were reviewed and the new drives meet or exceed all technical details. Data collected during a TPC-E performance run demonstrated the priced disks were performing better than the obsolete disks. Therefore 616 disks of the new style were substituted one for one in the priced configuration. This disks substitution meets the substitution requirements.

Sincerely,



Lorna Livingtree
Auditor

Clause 9: Supporting Files

9.0. Supporting Files Index Table

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:

- o The first column denotes the clause in the TPC Specification
- o The second column provides a short description of the file contents
- o 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)

The **Supporting Files** Index Table must be provided in the **Report**. (9.3.9.1)

The **Supporting Files** Index table is shown below. Individual files within the htm file can be viewed by clicking on the active links under *Pathname* in the file.

Table 9.1: Index of Supporting Files

Clause	Description	Pathname
Introduction	Disk Configuration	SupportingFiles\Introduction\DatabaseDisks\disks.txt
		SupportingFiles\Introduction\DatabaseDisks\formats.cmd
		SupportingFiles\Introduction\DatabaseDisks\input.txt
		SupportingFiles\Introduction\DatabaseDisks\mkdir.cmd
		SupportingFiles\Introduction\DatabaseDisks\mounts.txt
	Hardware Configuration	SupportingFiles\Introduction\Hardware_Configuration\RAID_Hardware_config.pdf
		SupportingFiles\Introduction\Hardware_Configuration\HardwareConfiguration.pdf
	Software Configuration Document	SupportingFiles\Introduction\Software_Configuration\SoftwareConfiguration.pdf
Clause 2	Checkpoint scripts	SupportingFiles\Introduction\Software_Configuration\Checkpoint Loop.sql SupportingFiles\Introduction\Software_Configuration\Checkpoint.cmd
	Database Tunables	SupportingFiles\Introduction\Software_Configuration\sql_config.sql SupportingFiles\Introduction\Software_Configuration\STARTSQL.CMD
	Tier-A Scripts	SupportingFiles\Introduction\Software_Configuration\TierA-1_Start-CE.cmd
		SupportingFiles\Introduction\Software_Configuration\TierA-1_Start-MEE.cmd
		SupportingFiles\Introduction\Software_Configuration\TierA-2_Start-CE.cmd
		SupportingFiles\Introduction\Software_Configuration\TierA-2_Start-MEE.cmd
	System Information	SupportingFiles\Introduction\Software_Configuration\system info_DBMS.txt
		SupportingFiles\Introduction\Software_Configuration\system info_TierA-1.txt
		SupportingFiles\Introduction\Software_Configuration\system info_TierA-2.txt
	Database Setup Procedure	SupportingFiles\Clause2\MSTPCE Database Setup Reference.pdf SupportingFiles\Clause2\TPCE_Setup.cmd
	Database Audit Scripts	SupportingFiles\Clause2\Audit_Scripts\Database\Create_DB_Audit_Tables.SQL SupportingFiles\Clause2\Audit_Scripts\Database\DB_Check.sql SupportingFiles\Clause2\Audit_Scripts\Database\DB_FK_Constraints.sql SupportingFiles\Clause2\Audit_Scripts\Database\DB_Primary_Key_Check.SQL SupportingFiles\Clause2\Audit_Scripts\Database\DB_Tables.sql SupportingFiles\Clause2\Audit_Scripts\Database\Drop_DB_Audit_Tables.SQL SupportingFiles\Clause2\Audit_Scripts\Database\Insert_Duplicates_Tests.sql SupportingFiles\Clause2\Audit_Scripts\Database\Referential_Integrity_Tests.sql
	Database Space Scripts	SupportingFiles\Clause2\Audit_Scripts\Space\SPFiles.sql SupportingFiles\Clause2\Audit_Scripts\Space\SPLog.sql

Table 9.1: Index of Supporting Files (cont.)

Clause	Description	Pathname
		SupportingFiles\Clause2\Audit_Scripts\Space\SPUsed.sql
	Database Creation Scripts	SupportingFiles\Clause2\750000.Cust\Database\Backup_database.sql SupportingFiles\Clause2\750000.Cust\Database\Create_Database.sql SupportingFiles\Clause2\750000.Cust\Database\flatfiles.txt SupportingFiles\Clause2\750000.Cust\Database\Remove_Database.sql SupportingFiles\Clause2\750000.Cust\Database\Restore_Database.sql SupportingFiles\Clause2\750000.Cust\Database\tempdb.sql SupportingFiles\Clause2\Utility\Checkpoint_TPCE_Database.SOL SupportingFiles\Clause2\Utility\Count_Customers.sql SupportingFiles\Clause2\Utility\Create_DM_Audit_Table.sql SupportingFiles\Clause2\Utility\Create_TID_Ranges_Table.sql SupportingFiles\Clause2\Utility\Create_Timer_Table.sql SupportingFiles\Clause2\Utility\Create_TPCE_VERSIONS_Table.sql SupportingFiles\Clause2\Utility\Database_Options_1.sql SupportingFiles\Clause2\Utility\Database_Options_2.sql SupportingFiles\Clause2\Utility\Drop_and_Create_TPCE_INFO.sql SupportingFiles\Clause2\Utility\End_Load_Timer.sql SupportingFiles\Clause2\Utility\Get_Next_T_ID.sql SupportingFiles\Clause2\Utility\Install_Load_Timer_Proc.sql SupportingFiles\Clause2\Utility\Load_TPCE_Info.sql SupportingFiles\Clause2\Utility\SQL_Server_Configuration.sql SupportingFiles\Clause2\Utility\Trade_Cleanup.sql SupportingFiles\Clause2\Utility\Version.sql
	Table Creation Scripts	SupportingFiles\Clause2\DDL\BulkInsert_1.sql SupportingFiles\Clause2\DDL\BulkInsert_10.sql SupportingFiles\Clause2\DDL\BulkInsert_11.sql SupportingFiles\Clause2\DDL\BulkInsert_12.sql SupportingFiles\Clause2\DDL\BulkInsert_13.sql SupportingFiles\Clause2\DDL\BulkInsert_14.sql SupportingFiles\Clause2\DDL\BulkInsert_15.sql SupportingFiles\Clause2\DDL\BulkInsert_16.sql SupportingFiles\Clause2\DDL\BulkInsert_17.sql SupportingFiles\Clause2\DDL\BulkInsert_18.sql SupportingFiles\Clause2\DDL\BulkInsert_19.sql SupportingFiles\Clause2\DDL\BulkInsert_2.sql SupportingFiles\Clause2\DDL\BulkInsert_20.sql SupportingFiles\Clause2\DDL\BulkInsert_21.sql SupportingFiles\Clause2\DDL\BulkInsert_22.sql SupportingFiles\Clause2\DDL\BulkInsert_23.sql SupportingFiles\Clause2\DDL\BulkInsert_24.sql SupportingFiles\Clause2\DDL\BulkInsert_25.sql SupportingFiles\Clause2\DDL\BulkInsert_26.sql SupportingFiles\Clause2\DDL\BulkInsert_27.sql SupportingFiles\Clause2\DDL\BulkInsert_28.sql SupportingFiles\Clause2\DDL\BulkInsert_29.sql SupportingFiles\Clause2\DDL\BulkInsert_3.sql SupportingFiles\Clause2\DDL\BulkInsert_30.sql SupportingFiles\Clause2\DDL\BulkInsert_31.sql SupportingFiles\Clause2\DDL\BulkInsert_32.sql SupportingFiles\Clause2\DDL\BulkInsert_33.sql SupportingFiles\Clause2\DDL\BulkInsert_34.sql SupportingFiles\Clause2\DDL\BulkInsert_4.sql SupportingFiles\Clause2\DDL\BulkInsert_5.sql SupportingFiles\Clause2\DDL\BulkInsert_6.sql SupportingFiles\Clause2\DDL\BulkInsert_7.sql SupportingFiles\Clause2\DDL\BulkInsert_8.sql SupportingFiles\Clause2\DDL\BulkInsert_9.sql SupportingFiles\Clause2\DDL\Convert_NI_ITEM_Data.SOL SupportingFiles\Clause2\DDL\Create_Check_Constraints_Fixed.sql SupportingFiles\Clause2\DDL\Create_Check_Constraints_Growing.sql SupportingFiles\Clause2\DDL\Create_Check_Constraints_Scaling.sql SupportingFiles\Clause2\DDL\Create_FK_Constraints.sql SupportingFiles\Clause2\DDL\Create_Tables_Fixed.sql SupportingFiles\Clause2\DDL\Create_Tables_Growing.sql SupportingFiles\Clause2\DDL\Create_Tables_Scaling.sql SupportingFiles\Clause2\DDL\Create_Tables_Scaling_Flat.sql SupportingFiles\Clause2\DDL\Create_TPCE_Types.sql SupportingFiles\Clause2\DDL\Drop_FK_Constraints.sql SupportingFiles\Clause2\DDL\Drop_Tables_Fixed.sql SupportingFiles\Clause2\DDL\Drop_Tables_Growing.sql SupportingFiles\Clause2\DDL\Drop_Tables_Scaling.sql

Table 9.1: Index of Supporting Files (cont.)

Clause	Description	Pathname
	Index Creation Scripts	SupportingFiles\Clause2\DDL\Create_Clustered_Indexes_Fixed.sql SupportingFiles\Clause2\DDL\Create_Clustered_Indexes_Growing.sql SupportingFiles\Clause2\DDL\Create_Clustered_Indexes_Scaling.sql SupportingFiles\Clause2\DDL\Create_NC_Indexes_Fixed.sql SupportingFiles\Clause2\DDL\Create_NC_Indexes_Growing.sql SupportingFiles\Clause2\DDL\Create_NC_Indexes_Scaling.sql
	Load Transaction Frames	SupportingFiles\Clause2\DDL\BrokerVolume.sql SupportingFiles\Clause2\DDL\CustomerPosition.sql SupportingFiles\Clause2\DDL\DataMaintenance.sql SupportingFiles\Clause2\DDL\MarketFeed.sql SupportingFiles\Clause2\DDL\MarketWatch.sql SupportingFiles\Clause2\DDL\SecurityDetail.sql SupportingFiles\Clause2\DDL\TradeLookup.sql SupportingFiles\Clause2\DDL\TradeOrder.sql SupportingFiles\Clause2\DDL\TradeResult.sql SupportingFiles\Clause2\DDL\TradeStatus.sql SupportingFiles\Clause2\DDL\TradeUpdate.sql
Clause 3	Transaction Frames	SupportingFiles\Clause3\BrokerVolume.sql SupportingFiles\Clause3\CustomerPosition.sql SupportingFiles\Clause3\DataMaintenance.sql SupportingFiles\Clause3\Get_Next_T_ID.sql SupportingFiles\Clause3\MarketFeed.sql SupportingFiles\Clause3\MarketWatch.sql SupportingFiles\Clause3\SecurityDetail.sql SupportingFiles\Clause3\TradeLookup.sql SupportingFiles\Clause3\TradeOrder.sql SupportingFiles\Clause3\TradeResult.sql SupportingFiles\Clause3\TradeStatus.sql SupportingFiles\Clause3\TradeUpdate.sql SupportingFiles\Clause3\Trade_Cleanup.sql
	BaseServer	SupportingFiles\Clause3\BaseServer\BaseServer.cpp SupportingFiles\Clause3\BaseServer\BaseServer.h SupportingFiles\Clause3\BaseServer\BaseServer.vcproj SupportingFiles\Clause3\BaseServer\msccprj.scc SupportingFiles\Clause3\BaseServer\stdafx.cpp SupportingFiles\Clause3\BaseServer\stdafx.h SupportingFiles\Clause3\BaseServer\UTServersLocals.h
	EGen Make/Project files	SupportingFiles\Clause3\prj\VS2008\EGen.sln SupportingFiles\Clause3\prj\VS2008\EGenBaseLoader.vcproj SupportingFiles\Clause3\prj\VS2008\EGenDriverCELib.vcproj SupportingFiles\Clause3\prj\VS2008\EGenDriverDMLib.vcproj SupportingFiles\Clause3\prj\VS2008\EGenDriverMEELib.vcproj SupportingFiles\Clause3\prj\VS2008\EGenFlatFileLoad.vcproj SupportingFiles\Clause3\prj\VS2008\EGenGenerateAndLoad.vcproj SupportingFiles\Clause3\prj\VS2008\EGenLoader.vcproj SupportingFiles\Clause3\prj\VS2008\EGenLogger.vcproj SupportingFiles\Clause3\prj\VS2008\EGenMSSQLLoader.vcproj SupportingFiles\Clause3\prj\VS2008\EGenNullLoader.vcproj SupportingFiles\Clause3\prj\VS2008\EGenTables.vcproj SupportingFiles\Clause3\prj\VS2008\EGenUtilities.vcproj SupportingFiles\Clause3\prj\VS2008\EGenValidate.vcproj
	SUT_CE_Server	SupportingFiles\Clause3\SUT_CE_Server\CEServer.cpp SupportingFiles\Clause3\SUT_CE_Server\CEServer.h SupportingFiles\Clause3\SUT_CE_Server\CEServerMain.cpp SupportingFiles\Clause3\SUT_CE_Server\PortDefinitions.h SupportingFiles\Clause3\SUT_CE_Server\stdafx.cpp SupportingFiles\Clause3\SUT_CE_Server\stdafx.h SupportingFiles\Clause3\SUT_CE_Server\SUTServer.sln SupportingFiles\Clause3\SUT_CE_Server\SUTServer.suo SupportingFiles\Clause3\SUT_CE_Server\SUTStructs.h SupportingFiles\Clause3\SUT_CE_Server\SUT_CE_Server.vcproj
	SUT_MEE_Server	SupportingFiles\Clause3\SUT_MEE_Server\MEEServer.cpp SupportingFiles\Clause3\SUT_MEE_Server\MEEServer.h SupportingFiles\Clause3\SUT_MEE_Server\MEEServerMain.cpp SupportingFiles\Clause3\SUT_MEE_Server\stdafx.cpp SupportingFiles\Clause3\SUT_MEE_Server\stdafx.h SupportingFiles\Clause3\SUT_MEE_Server\SUT_MEE_Server.vcproj

Table 9.1: Index of Supporting Files (cont.)

Clause	Description	Pathname
	TransactionsSP	SupportingFiles\Clause3\TransactionsSP\BrokerVolumeDB_SP.cpp SupportingFiles\Clause3\TransactionsSP\BrokerVolumeDB_SP.h SupportingFiles\Clause3\TransactionsSP\CheckpointDB_SP.cpp SupportingFiles\Clause3\TransactionsSP\CheckpointDB_SP.h SupportingFiles\Clause3\TransactionsSP\CustomerPositionDB_SP.cpp SupportingFiles\Clause3\TransactionsSP\CustomerPositionDB_SP.h SupportingFiles\Clause3\TransactionsSP\DataMaintenanceDB_SP.cpp SupportingFiles\Clause3\TransactionsSP\DataMaintenanceDB_SP.h SupportingFiles\Clause3\TransactionsSP\MarketFeedDB_SP.cpp SupportingFiles\Clause3\TransactionsSP\MarketFeedDB_SP.h SupportingFiles\Clause3\TransactionsSP\MarketWatchDB_SP.cpp SupportingFiles\Clause3\TransactionsSP\MarketWatchDB_SP.h SupportingFiles\Clause3\TransactionsSP\SecurityDetailDB_SP.cpp SupportingFiles\Clause3\TransactionsSP\SecurityDetailDB_SP.h SupportingFiles\Clause3\TransactionsSP\stdafx.cpp SupportingFiles\Clause3\TransactionsSP\stdafx.h SupportingFiles\Clause3\TransactionsSP\TradeLookupDB_SP.cpp SupportingFiles\Clause3\TransactionsSP\TradeLookupDB_SP.h SupportingFiles\Clause3\TransactionsSP\TradeOrderDB_SP.cpp SupportingFiles\Clause3\TransactionsSP\TradeOrderDB_SP.h SupportingFiles\Clause3\TransactionsSP\TradeResultDB_SP.cpp SupportingFiles\Clause3\TransactionsSP\TradeResultDB_SP.h SupportingFiles\Clause3\TransactionsSP\TradeStatusDB_SP.cpp SupportingFiles\Clause3\TransactionsSP\TradeStatusDB_SP.h SupportingFiles\Clause3\TransactionsSP\TradeUpdateDB_SP.cpp SupportingFiles\Clause3\TransactionsSP\TradeUpdateDB_SP.h SupportingFiles\Clause3\TransactionsSP\TransactionsSP.vcproj SupportingFiles\Clause3\TransactionsSP\TxnHarnessDBBase.cpp SupportingFiles\Clause3\TransactionsSP\TxnHarnessDBBase.h SupportingFiles\Clause3\TransactionsSP\TxnHarnessDBConn.cpp SupportingFiles\Clause3\TransactionsSP\TxnHarnessDBConn.h
	TxnHarness	SupportingFiles\Clause3\TxnHarness\TxnHarness.vcproj SupportingFiles\Clause3\TxnHarness\TxnHarness.vcproj.user SupportingFiles\Clause3\TxnHarness\TxnHarnessSendToMarket.cpp SupportingFiles\Clause3\TxnHarness\TxnHarnessSendToMarket.h SupportingFiles\Clause3\TxnHarness\TxnHarness_stdafx.cpp SupportingFiles\Clause3\TxnHarness\TxnHarness_stdafx.h
Clause 4	No Requirements	
Clause 5	No EGen Modifications	
	No EGenLoader Extensions	
	EGenDriver Configuration	SupportingFiles\Clause5\750k.xml
	EGenLoader Parameters	SupportingFiles\Clause5\BuildSteps.log SupportingFiles\Clause5\EGenLoaderFrom110001To132000.log SupportingFiles\Clause5\EGenLoaderFrom132001To154000.log SupportingFiles\Clause5\EGenLoaderFrom154001To176000.log SupportingFiles\Clause5\EGenLoaderFrom176001To199000.log SupportingFiles\Clause5\EGenLoaderFrom199001To221000.log SupportingFiles\Clause5\EGenLoaderFrom1To22000.log SupportingFiles\Clause5\EGenLoaderFrom22001To44000.log SupportingFiles\Clause5\EGenLoaderFrom221001To243000.log SupportingFiles\Clause5\EGenLoaderFrom243001To265000.log SupportingFiles\Clause5\EGenLoaderFrom265001To287000.log SupportingFiles\Clause5\EGenLoaderFrom287001To309000.log SupportingFiles\Clause5\EGenLoaderFrom309001To331000.log SupportingFiles\Clause5\EGenLoaderFrom331001To353000.log SupportingFiles\Clause5\EGenLoaderFrom353001To375000.log SupportingFiles\Clause5\EGenLoaderFrom375001To397000.log SupportingFiles\Clause5\EGenLoaderFrom397001To419000.log SupportingFiles\Clause5\EGenLoaderFrom419001To441000.log SupportingFiles\Clause5\EGenLoaderFrom44001To66000.log SupportingFiles\Clause5\EGenLoaderFrom441001To463000.log SupportingFiles\Clause5\EGenLoaderFrom463001To485000.log SupportingFiles\Clause5\EGenLoaderFrom485001To507000.log SupportingFiles\Clause5\EGenLoaderFrom507001To529000.log SupportingFiles\Clause5\EGenLoaderFrom529001To551000.log SupportingFiles\Clause5\EGenLoaderFrom551001To574000.log SupportingFiles\Clause5\EGenLoaderFrom574001To596000.log SupportingFiles\Clause5\EGenLoaderFrom596001To618000.log SupportingFiles\Clause5\EGenLoaderFrom618001To640000.log SupportingFiles\Clause5\EGenLoaderFrom640001To662000.log SupportingFiles\Clause5\EGenLoaderFrom662001To88000.log SupportingFiles\Clause5\EGenLoaderFrom662001To684000.log SupportingFiles\Clause5\EGenLoaderFrom684001To706000.log SupportingFiles\Clause5\EGenLoaderFrom706001To728000.log SupportingFiles\Clause5\EGenLoaderFrom728001To750000.log SupportingFiles\Clause5\EGenLoaderFrom88001To110000.log
	EGenLogger Output	SupportingFiles\Clause5\EGenLogs.xlt

Table 9.1: Index of Supporting Files (cont.)

Clause	Description	Pathname
Clause 6	EGenValidate Output	SupportingFiles\Clause6\EGenValidate.out
Clause 7	ACID Procedure document	SupportingFiles\Clause7\MSTPCE ACID Procedures.pdf
	ACID Procedure Scripts	SupportingFiles\Clause7\AcidProcs\AcidProc.cmd
		SupportingFiles\Clause7\AcidProcs\Remove_AcidProcs.cmd
		SupportingFiles\Clause7\AcidProcs\Scripts\AcidProc.vbs
		SupportingFiles\Clause7\AcidProcs\Scripts\CustomerPosition_Iso3.sql
		SupportingFiles\Clause7\AcidProcs\Scripts\CustomerPosition_Iso4.sql
		SupportingFiles\Clause7\AcidProcs\Scripts\Drop_SPROC.sql
		SupportingFiles\Clause7\AcidProcs\Scripts\Remove_AcidProcs.vbs
		SupportingFiles\Clause7\AcidProcs\Scripts\TradeOrder_C.sql
		SupportingFiles\Clause7\AcidProcs\Scripts\TradeOrder_Iso1_1.sql
		SupportingFiles\Clause7\AcidProcs\Scripts\TradeOrder_Iso1_2.sql
		SupportingFiles\Clause7\AcidProcs\Scripts\TradeOrder_Iso2.sql
		SupportingFiles\Clause7\AcidProcs\Scripts\TradeOrder_Iso3.sql
		SupportingFiles\Clause7\AcidProcs\Scripts\TradeOrder_Iso4.sql
		SupportingFiles\Clause7\AcidProcs\Scripts\TradeOrder_RB.sql
		SupportingFiles\Clause7\AcidProcs\Scripts\TradeResult_Iso1_1.sql
		SupportingFiles\Clause7\AcidProcs\Scripts\TradeResult_Iso1_2.sql
		SupportingFiles\Clause7\AcidProcs\Scripts\TradeResult_Iso2_1.sql
		SupportingFiles\Clause7\AcidProcs\Scripts\TradeResult_Iso2_2.sql
		SupportingFiles\Clause7\AcidProcs\Scripts\TradeResult_Iso3.sql
		SupportingFiles\Clause7\AcidProcs\Scripts\TradeResult_Iso4.sql
	ACID Procedure output	SupportingFiles\Clause7\AcidProcs\AcidProc.out
	Atomicity Scripts	SupportingFiles\Clause7\Atomicity\Atomicity.cmd
		SupportingFiles\Clause7\Atomicity\Scripts\atom.vbs
		SupportingFiles\Clause7\Atomicity\Scripts\Atomicity_C.sql
		SupportingFiles\Clause7\Atomicity\Scripts\Atomicity_RB.sql
	Atomicity Output	SupportingFiles\Clause7\Atomicity\Atomicity_C.out
		SupportingFiles\Clause7\Atomicity\Atomicity_RB.out
	Consistency Scripts	SupportingFiles\Clause7\Consistency\Consistency.cmd
		SupportingFiles\Clause7\Consistency\Scripts\Consistency.sql
		SupportingFiles\Clause7\Consistency\Scripts\Consistency.vbs
	Consistency Output	SupportingFiles\Clause7\Consistency\Consistency.out
		SupportingFiles\Clause7\Consistency\Consistency_crash_e.out
		SupportingFiles\Clause7\Consistency\Consistency_e_data loss.out
		SupportingFiles\Clause7\Consistency\Consistency_initial.out
		SupportingFiles\Clause7\Consistency\Consistency_run5b.out
		SupportingFiles\Clause7\Consistency\Consistency_run5e.out
	Durability Business Recovery	SupportingFiles\Clause7\Durability\BusinessRecovery\750k.xml
		SupportingFiles\Clause7\Durability\BusinessRecovery\lapp_event.txt
		SupportingFiles\Clause7\Durability\BusinessRecovery\lcnb.txt
		SupportingFiles\Clause7\Durability\BusinessRecovery\lcnbte.txt
		SupportingFiles\Clause7\Durability\BusinessRecovery\Consistency_BusinessRecovery_b.out
		SupportingFiles\Clause7\Durability\BusinessRecovery\Consistency_BusinessRecovery_e.out
		SupportingFiles\Clause7\Durability\BusinessRecovery\CountSettlement.sql
		SupportingFiles\Clause7\Durability\BusinessRecovery\crash_test_1.jpg
		SupportingFiles\Clause7\Durability\BusinessRecovery\crash_test_2.jpg
		SupportingFiles\Clause7\Durability\BusinessRecovery\crash_test_3.jpg
		SupportingFiles\Clause7\Durability\BusinessRecovery\crash_test_4.jpg
		SupportingFiles\Clause7\Durability\BusinessRecovery\ERRORLOG_run1.txt
		SupportingFiles\Clause7\Durability\BusinessRecovery\ERRORLOG_run2.txt
		SupportingFiles\Clause7\Durability\BusinessRecovery\lsamm-tpce1_application.log
		SupportingFiles\Clause7\Durability\BusinessRecovery\lsamm-tpce1_system.log
		SupportingFiles\Clause7\Durability\BusinessRecovery\lsamm-tpce2_application.log
		SupportingFiles\Clause7\Durability\BusinessRecovery\lsamm-tpce2_system.log
		SupportingFiles\Clause7\Durability\BusinessRecovery\SQL_Server_Configuration.txt
		SupportingFiles\Clause7\Durability\BusinessRecovery\sys_event.txt
		SupportingFiles\Clause7\Durability\BusinessRecovery\TradeRequest_cnfb.ver
		SupportingFiles\Clause7\Durability\BusinessRecovery\TradeSe.txt
		SupportingFiles\Clause7\Durability\BusinessRecovery\trade_cleanup_after_database_recovery.txt
		SupportingFiles\Clause7\Durability\BusinessRecovery\TxnErrorlog_BusinessRecovery_Run1.xlt
		SupportingFiles\Clause7\Durability\BusinessRecovery\TxnErrorlog_BusinessRecovery_Run2.xlt
		SupportingFiles\Clause7\Durability\BusinessRecovery\TxnReportE_BusinessRecovery_Run1-20min.xls
		SupportingFiles\Clause7\Durability\BusinessRecovery\TxnReportE_BusinessRecovery_Run2-20min.xls
		SupportingFiles\Clause7\Durability\BusinessRecovery\TxnReport_BusinessRecovery_Run1-20min.xlt
		SupportingFiles\Clause7\Durability\BusinessRecovery\TxnReport_BusinessRecovery_Run1-All.xlt
		SupportingFiles\Clause7\Durability\BusinessRecovery\TxnReport_BusinessRecovery_Run2-20min.xlt
		SupportingFiles\Clause7\Durability\BusinessRecovery\TxnReport_BusinessRecovery_Run2-all.xlt
		SupportingFiles\Clause7\Durability\BusinessRecovery\TxnStep_BusinessRecovery_Run1.xlt
		SupportingFiles\Clause7\Durability\BusinessRecovery\TxnStep_BusinessRecovery_Run2.xlt
		SupportingFiles\Clause7\Durability\BusinessRecovery\run1_logs\DRIVER1.log
		SupportingFiles\Clause7\Durability\BusinessRecovery\run1_logs\DRIVER2.log
		SupportingFiles\Clause7\Durability\BusinessRecovery\run1_logs\DRIVER3.log
		SupportingFiles\Clause7\Durability\BusinessRecovery\run1_logs\DRIVER4.log
		SupportingFiles\Clause7\Durability\BusinessRecovery\run1_logs\IMEE1.log
		SupportingFiles\Clause7\Durability\BusinessRecovery\run1_logs\IMEE2.log
		SupportingFiles\Clause7\Durability\BusinessRecovery\run1_logs\IMEE3.log
		SupportingFiles\Clause7\Durability\BusinessRecovery\run1_logs\IMEE4.log
		SupportingFiles\Clause7\Durability\BusinessRecovery\run2_logs\DRIVER1.log
		SupportingFiles\Clause7\Durability\BusinessRecovery\run2_logs\DRIVER2.log
		SupportingFiles\Clause7\Durability\BusinessRecovery\run2_logs\DRIVER3.log
		SupportingFiles\Clause7\Durability\BusinessRecovery\run2_logs\DRIVER4.log
		SupportingFiles\Clause7\Durability\BusinessRecovery\run2_logs\IMEE1.log
		SupportingFiles\Clause7\Durability\BusinessRecovery\run2_logs\IMEE2.log
		SupportingFiles\Clause7\Durability\BusinessRecovery\run2_logs\IMEE3.log

Table 9.1: Index of Supporting Files (cont.)

Clause	Description	Pathname
	Durability Data Accessibility	SupportingFiles\Clause7\Durability\BusinessRecovery\run2_logs\MEE4.log
		SupportingFiles\Clause7\Durability\DataAccessibility\750k.xml
		SupportingFiles\Clause7\Durability\DataAccessibility\app_log.txt
		SupportingFiles\Clause7\Durability\DataAccessibility\cnfb.txt
		SupportingFiles\Clause7\Durability\DataAccessibility\cnfe.txt
		SupportingFiles\Clause7\Durability\DataAccessibility\Consistency_dataloss_b.out
		SupportingFiles\Clause7\Durability\DataAccessibility\Consistency_e_dataloss.out
		SupportingFiles\Clause7\Durability\DataAccessibility\Data_disk_pulled.JPG
		SupportingFiles\Clause7\Durability\DataAccessibility\Data_disk_pulled_2.JPG
		SupportingFiles\Clause7\Durability\DataAccessibility\ERRORLOG.txt
		SupportingFiles\Clause7\Durability\DataAccessibility\Log_disk_pulled.JPG
		SupportingFiles\Clause7\Durability\DataAccessibility\Log_disk_pulled_2.JPG
		SupportingFiles\Clause7\Durability\DataAccessibility\SQL_Server_Configuration.txt
		SupportingFiles\Clause7\Durability\DataAccessibility\sys_log.txt
		SupportingFiles\Clause7\Durability\DataAccessibility\TradeRequest_cnfb.ver
		SupportingFiles\Clause7\Durability\DataAccessibility\TxnReportE_DataAccessibility_20min_data-recovery.xls
		SupportingFiles\Clause7\Durability\DataAccessibility\TxnReportE_DataAccessibility_20min_log-recovery.xls
		SupportingFiles\Clause7\Durability\DataAccessibility\TxnReportE_DataAccessibility_5min.xls
		SupportingFiles\Clause7\Durability\DataAccessibility\TxnReport_DataAccessibility_20min_data-recovery.xlt
		SupportingFiles\Clause7\Durability\DataAccessibility\TxnReport_DataAccessibility_20min_log-recovery.xlt
		SupportingFiles\Clause7\Durability\DataAccessibility\TxnReport_DataAccessibility_5min.xlt
		SupportingFiles\Clause7\Durability\DataAccessibility\TxnReport_DataAccessibility_all.xlt
		SupportingFiles\Clause7\Durability\DataAccessibility\TxnStep_DataAccessibility.xlt
		SupportingFiles\Clause7\Durability\DataAccessibility\DriverLog.s\DRIVER1.log
		SupportingFiles\Clause7\Durability\DataAccessibility\DriverLog.s\DRIVER2.log
		SupportingFiles\Clause7\Durability\DataAccessibility\DriverLog.s\DRIVER3.log
		SupportingFiles\Clause7\Durability\DataAccessibility\DriverLog.s\DRIVER4.log
		SupportingFiles\Clause7\Durability\DataAccessibility\DriverLog.s\MEE1.log
		SupportingFiles\Clause7\Durability\DataAccessibility\DriverLog.s\MEE2.log
		SupportingFiles\Clause7\Durability\DataAccessibility\DriverLog.s\MEE3.log
		SupportingFiles\Clause7\Durability\DataAccessibility\DriverLog.s\MEE4.log
	Isolation Scripts	SupportingFiles\Clause7\Isolation\Scripts\Isolation1_S1.sql
		SupportingFiles\Clause7\Isolation\Scripts\Isolation1_S2.sql
		SupportingFiles\Clause7\Isolation\Scripts\Isolation1_S3.sql
		SupportingFiles\Clause7\Isolation\Scripts\Isolation1_S4.sql
		SupportingFiles\Clause7\Isolation\Scripts\Isolation2_S1.sql
		SupportingFiles\Clause7\Isolation\Scripts\Isolation2_S2.sql
		SupportingFiles\Clause7\Isolation\Scripts\Isolation2_S3.sql
		SupportingFiles\Clause7\Isolation\Scripts\Isolation2_S4.sql
		SupportingFiles\Clause7\Isolation\Scripts\Isolation3_S1.sql
		SupportingFiles\Clause7\Isolation\Scripts\Isolation3_S2.sql
		SupportingFiles\Clause7\Isolation\Scripts\Isolation3_S3.sql
		SupportingFiles\Clause7\Isolation\Scripts\Isolation4_S1.sql
		SupportingFiles\Clause7\Isolation\Scripts\Isolation4_S2.sql
		SupportingFiles\Clause7\Isolation\Scripts\Isolation4_S3.sql
	Isolation Output	SupportingFiles\Clause7\Isolation\Isolation1_S1.txt
		SupportingFiles\Clause7\Isolation\Isolation1_S2.txt
		SupportingFiles\Clause7\Isolation\Isolation1_S3.txt
		SupportingFiles\Clause7\Isolation\Isolation1_S4.txt
		SupportingFiles\Clause7\Isolation\Isolation2_S1.txt
		SupportingFiles\Clause7\Isolation\Isolation2_S2.txt
		SupportingFiles\Clause7\Isolation\Isolation2_S3.txt
		SupportingFiles\Clause7\Isolation\Isolation2_S4.txt
		SupportingFiles\Clause7\Isolation\Isolation3_S1.txt
		SupportingFiles\Clause7\Isolation\Isolation3_S2.txt
		SupportingFiles\Clause7\Isolation\Isolation3_S3.txt
		SupportingFiles\Clause7\Isolation\Isolation4_S1.txt
		SupportingFiles\Clause7\Isolation\Isolation4_S2.txt
		SupportingFiles\Clause7\Isolation\Isolation4_S3.txt
		SupportingFiles\Clause7\Isolation\Isolation4_S4.txt
		SupportingFiles\Clause7\Isolation\Isolation4_S5.txt
Clause 8	60-day Space Calculation	SupportingFiles\Clause8\trce_space.xls

9.1. Supporting Files

*The **Supporting Files** contain human readable and machine executable (i.e., able to be performed by the appropriate program without modification) scripts that are required to recreate the benchmark **Result**. If there is a choice of using a GUI or a script, then the machine executable script must be provided in the **Supporting Files**. If no corresponding script is available for a GUI, then the **Supporting Files** must contain a step-by-step description of how to manipulate the GUI. (9.4)*

All **Supporting Files** can be found in the *SupportingFiles* Directory.

Appendix A - Third Party Price Quotations

Microsoft Corporation
One Microsoft Way
Redmond, WA 98052-6399

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

Microsoft

November 4, 2008

Unisys Corporation
Steve Barrish
25725 Jeronimo Road
Mission Viejo, CA 92691

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 <i>Per Processor License</i> <i>Discount Schedule: Open Program - Level C</i> <i>Unit Price reflects a 6% discount from the retail unit price of \$24,999.</i>	\$23,432	16	\$374,912
P73-04165	Windows Server 2008 Standard Edition (x64) <i>Server License with 5 CALs</i> <i>Discount Schedule: Open Program - Level C</i> <i>Unit Price reflects a 29% discount from the retail unit price of \$999.</i>	\$711	2	\$1,422
N/A	Microsoft Problem Resolution Services <i>Professional Support</i> <i>(1 Incident)</i>	\$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>

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: PEstba0811040000000620.
Please include this Reference ID in any correspondence regarding this price quote.

