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# **TPC Benchmark™ E**

## **Full Disclosure Report**

***NEC Express5800/1320Xf (32 SMP)***

**with Microsoft® SQL Server® 2008 Enterprise Edition  
for Itanium-based Systems  
and  
Microsoft® Windows Server® 2008 for Itanium-based Systems**

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**First Edition  
Submitted for Review  
27-Feb-2008**

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

All performance data contained in this report were obtained in a rigorously controlled environment. Results obtained in other operating environments may vary significantly. NEC does not warrant or represent that a user can or will achieve similar performance expressed in transactions per second (tpsE) or normalized price/performance (\$/tpsE). No warranty of system performance or price/performance is expressed or implied in this report.

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## ***Abstract***

This report documents the compliance of NEC Corporation's TPC Benchmark™ E tests on the NEC Express5800/1320Xf client/server system with version 1.4.0 of the TPC Benchmark E Standard Specification. 8 Clients (NEC Express5800/120Ri-2) were used as the Tier-A clients.

The operating system and the DBMS used on the server were Microsoft® Windows Server® 2008 for Itanium-based Systems and Microsoft® SQL Server® 2008 Enterprise Edition for Itanium-based Systems. The operating system on the clients was Microsoft® Windows Server® 2003 R2 Standard Edition with SP2.

Two standard metrics, transaction-per-second-E(tpsE) and price per tpsE(\$/tpsE) are reported, in accordance with the TPC Benchmark™ E Standard. The independent auditor's report by Francois Raab appears at the end of this report.

## ***TPC Benchmark™ E Metrics***

The standard TPC Benchmark™ E metrics, tpsE (transactions per second), price per tpsE are reported.

<b>System</b>	<b>Software</b>	<b>Total System Cost</b>	<b>tpsE</b>	<b>\$ USD /tpsE</b>	<b>Availability Date</b>
NEC Express5800 /1320Xf	Microsoft® SQL Server® 2008 Enterprise Edition for Itanium-based Systems Microsoft® Windows Server® 2008 for Itanium-based Systems	\$3,122,387 (USD)	1126.49	\$2,771.79	30-Aug-2008

## ***Executive Summary***

The following pages contain executive summary of results for this benchmark.

## ***Auditor***

The benchmark configuration, environment and methodology were audited by Francois Raab of Info Sizing Inc. to verify compliance with the relevant TPC specifications.

<b>NEC</b>	<b>NEC Express5800/1320Xf (32 SMP)</b>		<b>TPC-E 140</b> <b>TPC Pricing 1.3.0</b>
			Report Date February 27, 2008
TPC-E Throughput <b>1126.49 tpsE</b>	Price/Performance <b>\$2,771.79 USD per tpsE</b>	Availability Date <b>August 30, 2008</b>	Total System Cost <b>\$3,122,387 USD</b>
<b>Database Server Configuration</b>			
Operating System <b>Microsoft<sup>®</sup> Windows Server<sup>®</sup> 2008 for Itanium-based Systems</b>	Database Manager <b>Microsoft<sup>®</sup> SQL Server<sup>®</sup> 2008 Enterprise Edition for Itanium-based Systems</b>	Processors/Cores/ Threads <b>32 / 64 / 64</b>	Memory <b>512GB</b>
<div> <div> <p><b><u>Tier B: Server</u></b>  <u>NEC Express5800/1320Xf</u>            32 x Dual-Core Intel<sup>®</sup> Itanium<sup>®</sup> processor 9150N 1.6GHz,            24MB L3 cache            512GB Memory, 2 x 73GB Disk            8 x 2-port 2Gbps FC HBA, 1 x 1-port 4Gbps FC HBA            1 x SCSI RAID Controller            8 x 1Gbps Ether NIC</p> </div> <div> <p><b><u>Tier B : System Console</u></b>  <u>1 x NEC Express5800/120Ri-2</u>            2x Dual-Core Intel<sup>®</sup> Xeon<sup>®</sup> processor            5160 3.0GHz. 4MB L2 cache, 4            processor cores, 4 threads            4GB of Memory            1x 36GB SAS drive            2x Onboard 1Gbps Ether Controllers            1x Dual-Port 1Gb Ether NIC</p> </div> <div> <p><b><u>Tier A : Client</u></b>  <u>8 x NEC Express5800/120Ri-2</u>            2x Dual-Core Intel<sup>®</sup> Xeon<sup>®</sup> processor 5160 3.0GHz.            4MB L2 cache, 4 processor cores, 4 threads            4GB of Memory            1x 36GB SAS drive            2x Onboard 1Gbps Ether Controllers            1x Dual-Port 1Gb Ether NIC</p> </div> <div> <p><b><u>Storage</u></b>  <u>NEC Storage S2500</u>            16x NEC Storage S2500 Controllers            46x NEC Storage S2500 FC Disk            Expansion Box            860x 73GB 15k RPM FC drives</p> </div> </div>			
Initial Database Size <b>4,413 GB</b>	Redundancy Level : 1 <b>RAID50 : LOG / RAID10 : Data</b>	Storage <b>860 x 73GB 15K</b>	



## NEC Express5800/1320Xf (32 SMP)


### TPC-E 140 TPC Pricing 1.3.0

Report Date  
February 27, 2008

Available Date  
August 30, 2008

Description	Part Number	Third Party Brand	Pricing	Unit Price	Qty	Extended Price	3-yr Mnt. Price
<b>Server Hardware</b>							
NEC Express5800/1320Xf system	850203702	NEC	1	1,931,114	1	1,931,114 (included)	
Cabinet w/8cells&11IO					1		
4 Itanium 9150N (1.6G/24M) for 1320Xf					8		
1320Xf Memory 8GB (4x2GB DIMM) memory kit					64		
Memory Slot Expansion Module Option					8		
IO Expansion Cabinet					1		
IO Enclosure					3		
1320Xf IO partition (Core)					1		
1320Xf IO partition (Non-core)					7		
73GB Ultra SCSI HDD 10k RPM					2		
RAID controller (Windows)					1		
1port 10/100/1000 base-T LAN card					8		
2-port 2Gbps FC HBA					8		
1-port 4Gbps FC HBA					1		
Installation					1		
Microsoft Windows Server 2008 32procs					32		
3Year 4h 24x7 maintenance					1		
NEC Express5800/120Ri-2 (for System Console)	850190702	NEC	1	6,695	1	6,695 (included)	
120Ri-2.XD2/3.0G/2G N8100-1248F 1 EA					1		
CPU Kit (XD2/G(4)) 1 EA					1		
Additional 2G Memory Board 1 EA					1		
1000Base-T NIC Dual Channel 1 EA					1		
Additional 36.3 GB HDD 1 EA					1		
3Year 4h 24x7 maintenance					1		
NEC AccuSync LCD52V 15"LCD Display (+2 spare)	704053	NEC	3	190	4	760	-
<b>Subtotal</b>						<b>1,938,569</b>	<b>0</b>
<b>Disk Subsystem</b>							
NEC Storage S2500 Base Model	850183001	NEC	1	31,000	16	496,000	
S2500 FC Disk Expansion Box	062-02942-000	NEC	1	6,200	46	285,200	
Fibre channel disk drive (15k rpm/73GB) (+10% spares) S*	062-02959-000	NEC	1	1,220	946	1,154,120	
UPS 3kVA	050-02424-000	NEC	1	1,799	2	3,598	
4hr onsite maintenance service	OS2X-SD4HR-YYY	NEC	1	193,892	1		193,892
42U Rackframe	050-02378-001	NEC	1	1,799	5	8,995	-
FC Cable 10M LC-LC (+10% spares)	BR-FC5PVLCLC-10	NEC	1	50	18	900	-
<b>Subtotal</b>						<b>1,948,813</b>	<b>193,892</b>
<b>Server Software</b>							
Microsoft SQL Server 2008 Enterprise Edition for Itanium-based systems		Microsoft	2	24,999	32	799,968	245
6% discount from the retail unit price		Microsoft	2	-1,567	32	-50,144	
<b>Subtotal</b>						<b>749,824</b>	<b>245</b>

*continued on the next page*

	NEC Express5800/1320Xf (32 SMP)						TPC-E 140	
							TPC Pricing 1.3.0	
							Report Date February 27, 2008	
						Available Date August 30, 2008		
<b>Client Hardware</b>								
NEC Express5800/120Ri-2	850190702	NEC	1	6,695	8	53,560 (included)		
120Ri-2,XD2/3.0G/2G N8100-1248F 1 EA					1			
CPU Kit (XD2/G(4)) 1 EA					1			
Additional 2G Memory Board 1 EA					1			
1000Base-T NIC Dual Channel 1 EA					1			
Additional 36.3 GB HDD 1 EA					1			
3Year 4h 24x7 maintenance					1			
NEC AccuSync LCD52V 15"LCD Display (+2 spares)	704053	NEC	3	190	10	1,900		
42U Rackframe	050-02378-001	NEC	1	1,799	1	1,799		
External USB Floppy Disk Drive (+2 spares)	494301	Verbatim	3	30	3	90		
Floppy Disk (10 Pack)	39031	Verbatim	3	5	1	5		
Ether Cable 25' RJ45-RJ45 (+10% spares)	324516	Tripp Lite	3	7	28	196		
Ether Cable 10' RJ45-RJ45 (+10% spares)	324527	Tripp Lite	3	6	11	66		
					<b>Subtotal</b>	<b>57,615</b>	<b>0</b>	
<b>Client Software</b>								
Windows Server 2003 R2 Standard Edition**	P73-01972	Microsoft	2	999	9	8,991 (Included)		
28% discount from the retail unit price		Microsoft	2	-280	9	-2,520		
					<b>Subtotal</b>	<b>6,471</b>	<b>0</b>	
<b>Infrastructure</b>								
24-Port 10/100/1000 Gigabit Switch (+2 spares)	1012601	Linksys	3	283	3	849 -		
					<b>Subtotal</b>	<b>849</b>	<b>0</b>	
						<b>TOTAL</b>	<b>4,702,141 194,137</b>	
NEC Large Volume Discount***				-45%	-1,773,891			
<b>Notes:</b> Pricing: 1-NEC 2-Microsoft 3-CDW S* means one or more components of the measured configuration have been substituted in the Priced Configuration. See the FDR for details. ** Qty of Windpws Server 2003 R2 Standard Edition includes the license of the DB server's maintenance Console ***45% discount was based on the overall value of the specific components from NEC in this single quotation except 3-yr Mnt. Price for Disk Subsystem Discount for similarly sized configurations will be similar to those quoted here but may vary based on the components in quotation <b>Results and methodology audited by Francois Raab of InfoSizing, Inc. (www.sizing.com)</b>					3-Yr. Cost of Ownership: <b>\$3,122,387</b>  tpsE Throughput: <b>1126.49</b>  <b>\$ / tpsE \$2,771.79</b>			
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 reflects 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 terms, please inform the TPC at pricing@tpc.org. Thank you.								



NEC Express5800/1320Xf (32 SMP)

TPC-E 140  
TPC Pricing 1.3.0

Report Date  
February 27, 2008

Available Date  
August 30, 2008

### Numerical Quantities Summary

**Reported Throughput : 1126.49 tpsE** **Configured Customers : 570,000**

Response Times (in seconds)	Minimum	Average	90 <sup>th</sup> %tile	Maximum
Broker Volume	0.01	0.13	0.22	3.45
Customer Position	0.00	0.04	0.08	3.25
Market Feed	0.00	0.06	0.10	3.27
Market Watch	0.00	0.07	0.15	3.40
Security Detail	0.00	0.02	0.04	3.32
Trade Lookup	0.00	0.57	0.85	6.20
Trade Order	0.00	0.12	0.18	3.45
Trade Result	0.00	0.13	0.21	3.36
Trade Status	0.00	0.04	0.07	3.26
Trade Update	0.02	0.67	0.91	6.16
Data Maintenance	0.01	0.16		1.61

Transaction Mix	Transaction Count	Mix %
Broker Volume	3,974,314	4.900%
Customer Position	10,543,586	13.000%
Market Feed	811,080	1.000%
Market Watch	14,598,618	18.000%
Security Detail	11,354,567	14.000%
Trade Lookup	6,487,787	7.999%
Trade Order	8,191,514	10.100%
Trade Result	8,110,752	10.000%
Trade Status	15,409,630	19.000%
Trade Update	1,622,048	2.000%
Data Maintenance	120	

### Test Duration and Timings

Ramp-up Time	0:36:54
Measurement Interval	2:00:00
Business Recovery Time	3:11:25
Total Number of Transactions Completed in Measurement Interval	81,103,896

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# PREAMBLE

## *Introduction*

TPC Benchmark™ E (TPC-E) is an On-Line 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 database schema, data population, transactions, and implementation rules have been designed to be broadly representative of modern OLTP systems. 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 operations are modeled as follows: The database is continuously available 24 hours a day, 7 days a week, for data processing from multiple Sessions and data modifications against all tables, except possibly during infrequent (e.g., once a month) maintenance Sessions. Due to the worldwide nature of the application modeled by the TPC-E benchmark, any of the transactions may be executed against the database at anytime, especially in relation to each other.

## *Goal of the TPC-E Benchmark*

The TPC-E benchmark simulates the OLTP workload of a brokerage firm. The focus of the benchmark is the central database that executes 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.

The benchmark defines:

- Two types of transactions to simulate Consumer-to-Business as well as Business-to-Business activities
- Several transactions for each transaction type
- Different execution profiles for each transaction type
- A specific run-time mix for all defined transactions

For example, the database will simultaneously execute transactions generated by systems that interact with customers along with transactions that are generated by systems that interact with financial markets as well as administrative systems. The benchmark system will interact with a set of Driver systems that simulate the various sources of transactions without requiring the benchmark to implement the complex environment.

The Performance Metric reported by TPC-E is a "business throughput" measure of the number of completed Trade-Result transactions processed per second (see Clause 6.7.1). Multiple Transactions are used to simulate the business activity of processing a trade, and each Transaction is subject to a Response Time constraint. The Performance Metric for the benchmark is expressed in transactions-per-second-E (tpsE). To be compliant with the TPC-E standard, all references to tpsE Results must include the tpsE rate, the associated price-per-tpsE, and the Availability Date of the Priced Configuration (See Clause 6.7.3 for more detail).

Although this specification defines the implementation in terms of a relational data model, the database may be implemented using any commercially available Database Management System (DBMS), Database Server, file system, or other data repository that provides a functionally equivalent implementation. The terms "table", "row", and "column" are used in this document only as examples of logical data structures.

TPC-E uses terminology and metrics that are similar to other benchmarks, originated by the TPC and others. Such similarity in terminology does not imply that TPC-E Results are comparable to other benchmarks. The only benchmark Results comparable to TPC-E are other TPC-E Results that conform to a comparable version of the TPC-E specification.

## ***Restrictions and Limitations***

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

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

Benchmark Sponsors are permitted various possible implementation designs, insofar as they adhere to the model described and pictorially illustrated in this specification. A Full Disclosure Report (FDR) of the implementation details, as specified in Clause 9.1, must be made available along with the reported Results.

**Comment:** While separated from the main text for readability, comments are a part of the standard and must be enforced.

# Clause 1 : General Items

## 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.*

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

## Executive Summary Statement

*The TPC Executive Summary Statement must be included near the beginning of the Report. An example of the Executive Summary Statement is presented in Appendix B. The latest version of the required format is available from the TPC Administrator.*

The TPC Executive Summary Statement is included at the beginning of this report.

## Benchmark Sponsor

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

This benchmark test was sponsored by NEC Corporation.

## Configuration Diagrams

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

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

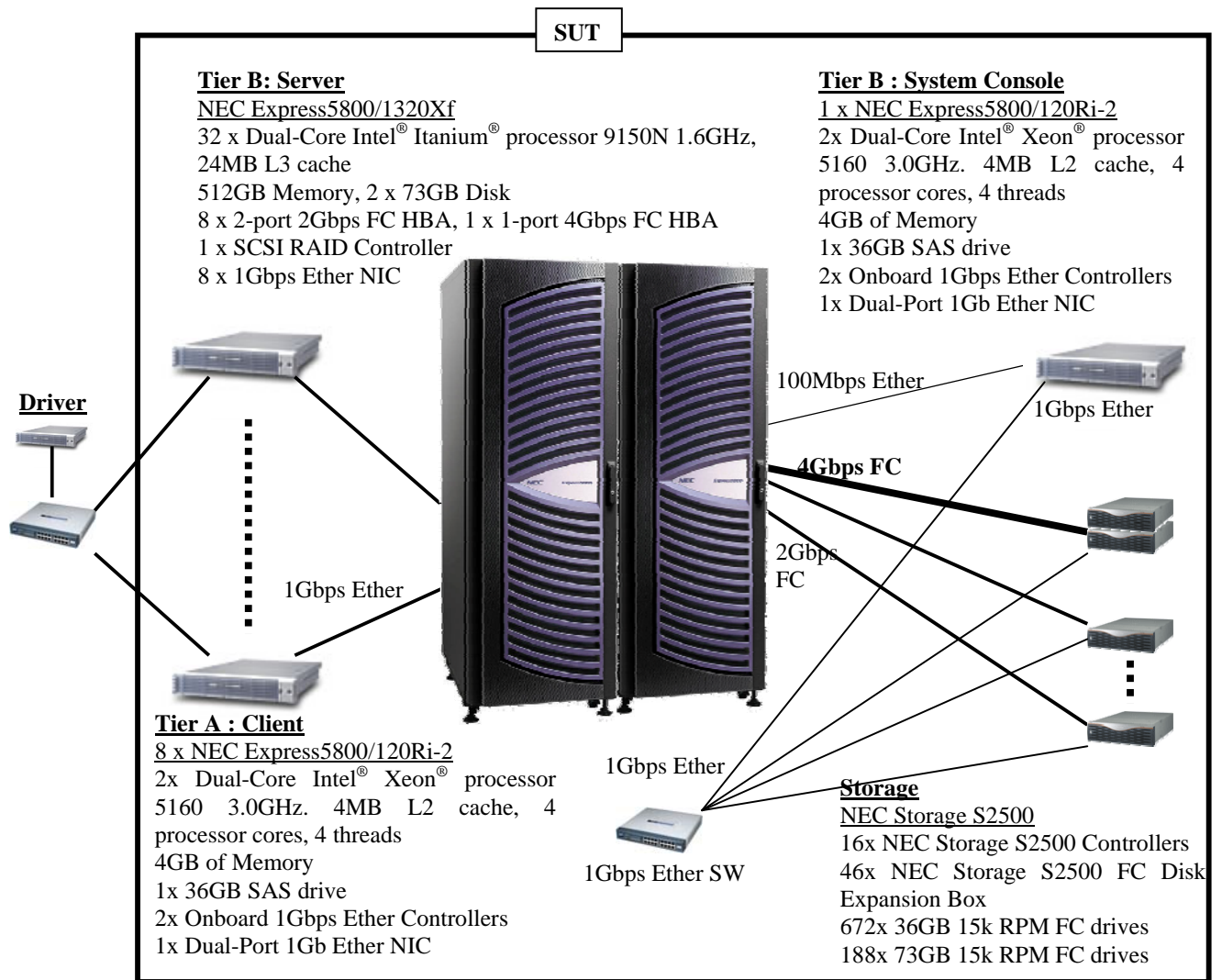
## Difference between Measured and Priced Configurations

The configuration diagram for the measured and priced system are provided as Figure 1.1 and Figure 1.2 respectively. 672 spindles of 36GB/15k rpm FC drives have been substituted in the priced configuration for the same number of 73GB/15k rpm FC drives. There is no other difference between the measured and priced system.

## Measured Configuration

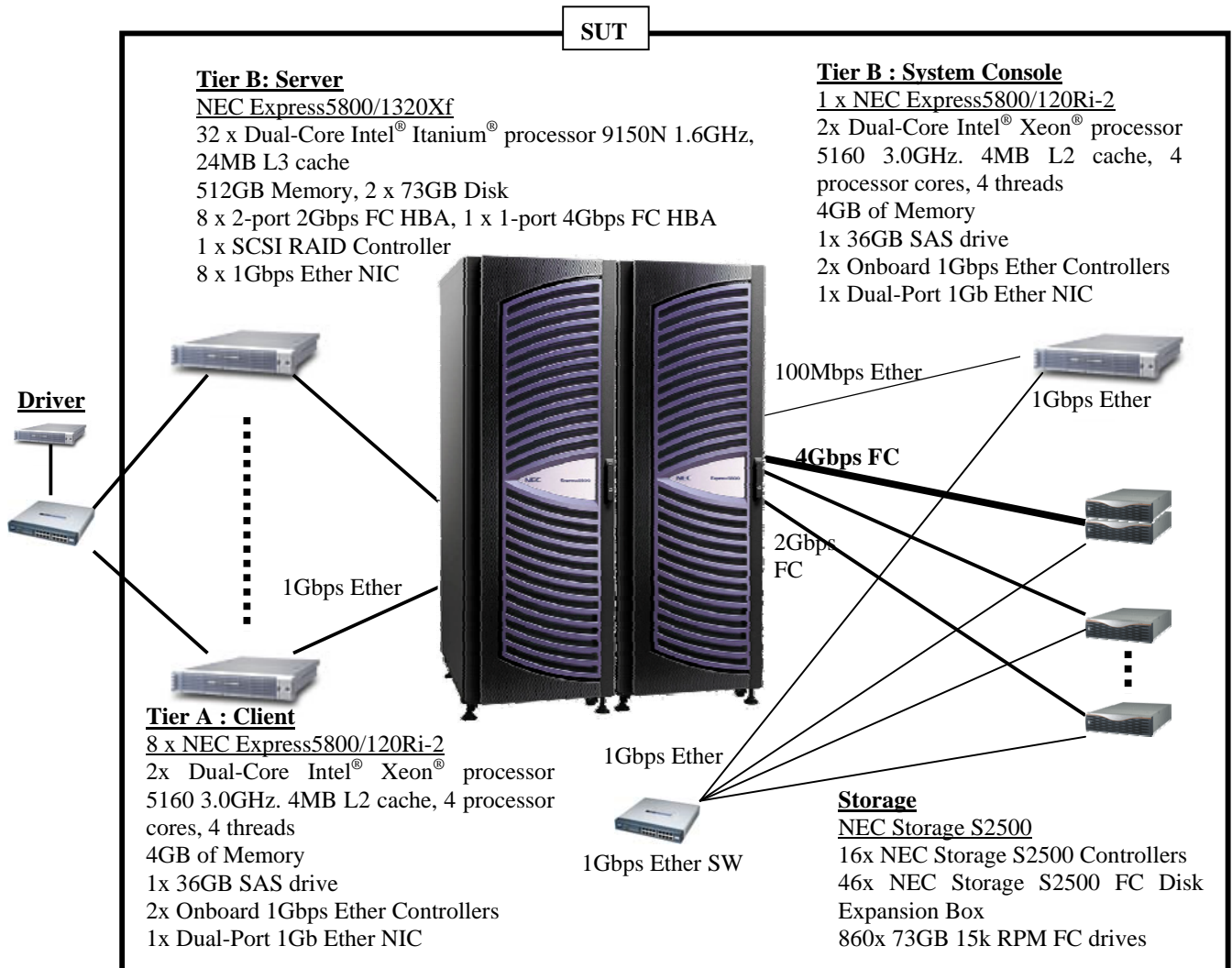
The following figure represents the measured configuration.

**Figure1.1: Express5800/1320Xf, Measured Configuration Diagram**



The following figure depicts the priced system, whose cost determines the normalized price per tpsE reported for the test.

**Figure1.2: Express5800/1320Xf, Priced Configuration Diagram**



## 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. This includes, but is not limited to:

- A description of any firmware updates or patches to the hardware.
- A description of any GUI configuration used to configure the system hardware.
- A description of exactly how the hardware is combined to create the complete system. For example, if the SUT description lists a base chassis with 1 processor, a processor update package of 3 processors, a NIC controller and 3 disk controllers, a description of where and how the processors, NIC and disk controllers are placed within the base chassis must be reported in the Report.
- 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. For example, only a description that Controller 1 in slot A is connected to Disk Tower 5 is required. The reader is assumed to be knowledgeable enough to determine what type of cable is required based upon the component descriptions and how to plug the cable into the components.

## Driver

The driver is not included in the priced configuration or SUT. In this benchmark, the NEC Express5800/120Ri-2 was used. A GbE cable is connected to a 24-port GbE switch, which is not in the priced configuration or SUT either. The driver machine was configured with an IP address of 10.10.1.250.

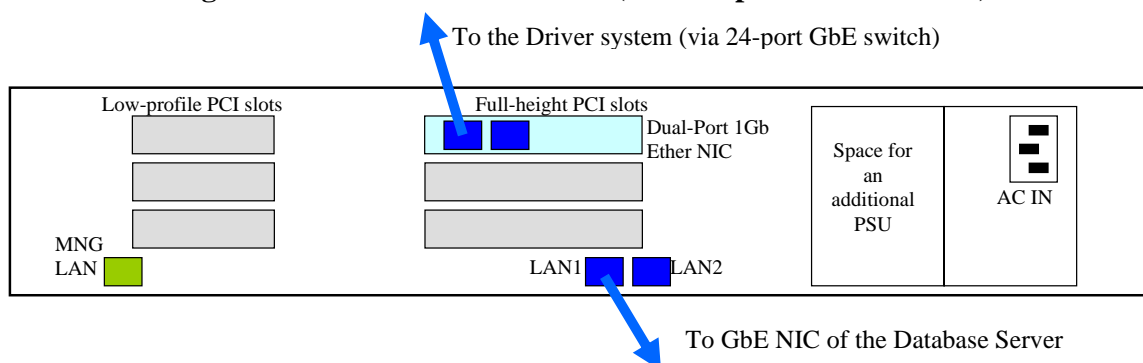
## 24-port GbE switch

There is a 24-port GbE switch between the Driver and Tier-A, which consists of 8x machines. The 24-port GbE switch is not included in the priced configuration or SUT.

## Tier-A installation / configuration

The NEC Express5800/120Ri-2 has 2x Dual-Core Intel® Xeon® processor 5160, 4GB of Memory, 1x 36GB SAS drive. One external USB floppy disk drive, which is priced, is temporarily necessary when OS is to be installed. Tier-A consists of 8x NEC Express5800/120Ri-2, all of which have the same hardware configuration. Each Tier-A machine is connected to the database server and to 24-port GbE switch with a GbE cable respectively.

**Figure1.3: Rear view of a Client (NEC Express5800/120Ri-2)**

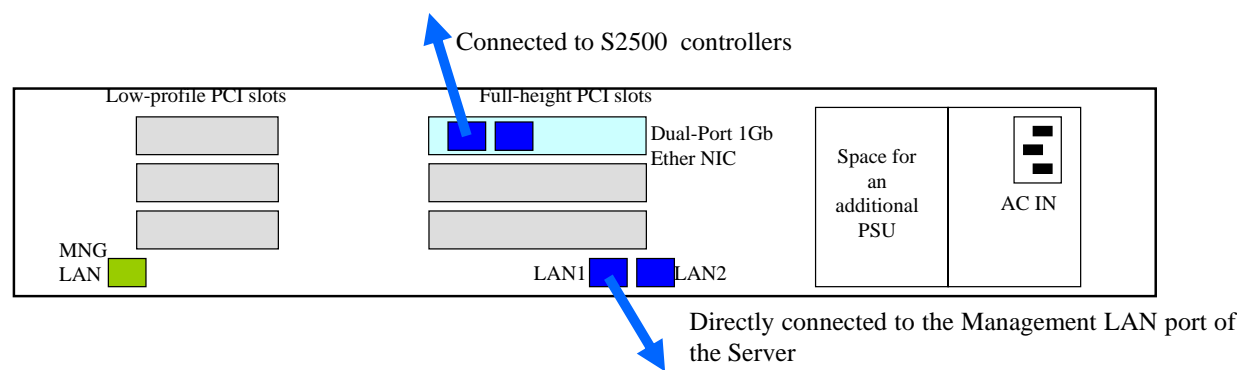


## Tier-B installation / configuration

Tier-B hardware consists of one NEC Express5800/1320Xf as the database server and one NEC Express5800/120Ri-2 as the System Console of NEC Express5800/1320Xf.

The hardware configuration of the System Console (NEC Express5800/120Ri-2) is same as that of a Client. The difference is the network configuration. This System Console is directly connected to the Management LAN port of the Database Server and S2500 controllers.

**Figure1.4: Rear view of the System Console (NEC Express5800/120Ri-2)**



The NEC Express5800/1320Xf has 32x Dual-Core Intel® Itanium® processor 9150N 1.6GHz/24MB Cache, 256x 2GB DIMMs, 1x boot SCSI RAID controller, 8x GbE NIC, 1x 1-port 4G bps FC HBA, 8x 2-port 2G bps FC HBAs and 2x 73GB SCSI drive with Microsoft® Windows Server® 2008 for Itanium-Based Systems installed.

The SCSI RAID controller, GbE NIC, 1-port 4G bps FC HBA and 8x 2-port 2G bps HBAs were installed to the PCI-X IO boxes of NEC Express5800/1320Xf and connected to the clients or storage subsystem as follows;

**---- IO box #0 ----**

PCI 1:SCSI RAID CARD	to internal 2x 73GB SCSI drive
PCI 2: GbE NIC	to GbE NIC of Client#1
PCI 5:1-port 4G bps FC HBA	to S2500 Controller #0
PCI 7: GbE NIC	to GbE NIC of Client#2

**---- IO box#1 ----**

PCI 1:2-port 2G bps FC-HBA	Port-1 to S2500 Controller #1	Port-2 to S2500 Controller #2
PCI 3:2-port 2G bps FC-HBA	Port-1 to S2500 Controller #3	Port-2 to S2500 Controller #4
PCI 5:2-port 2G bps FC-HBA	Port-1 to S2500 Controller #5	Port-2 to S2500 Controller #6
PCI 7:2-port 2G bps FC-HBA	Port-1 to S2500 Controller #7	Port-2 to S2500 Controller #8

**---- IO box #2 ----**

PCI 1:2-port 2G bps FC-HBA	Port-1 to S2500 Controller #9	Port-2 to S2500 Controller #10
PCI 3:2-port 2G bps FC-HBA	Port-1 to S2500 Controller #11	Port-2 to S2500 Controller #12
PCI 5:2-port 2G bps FC-HBA	Port-1 to S2500 Controller #13	

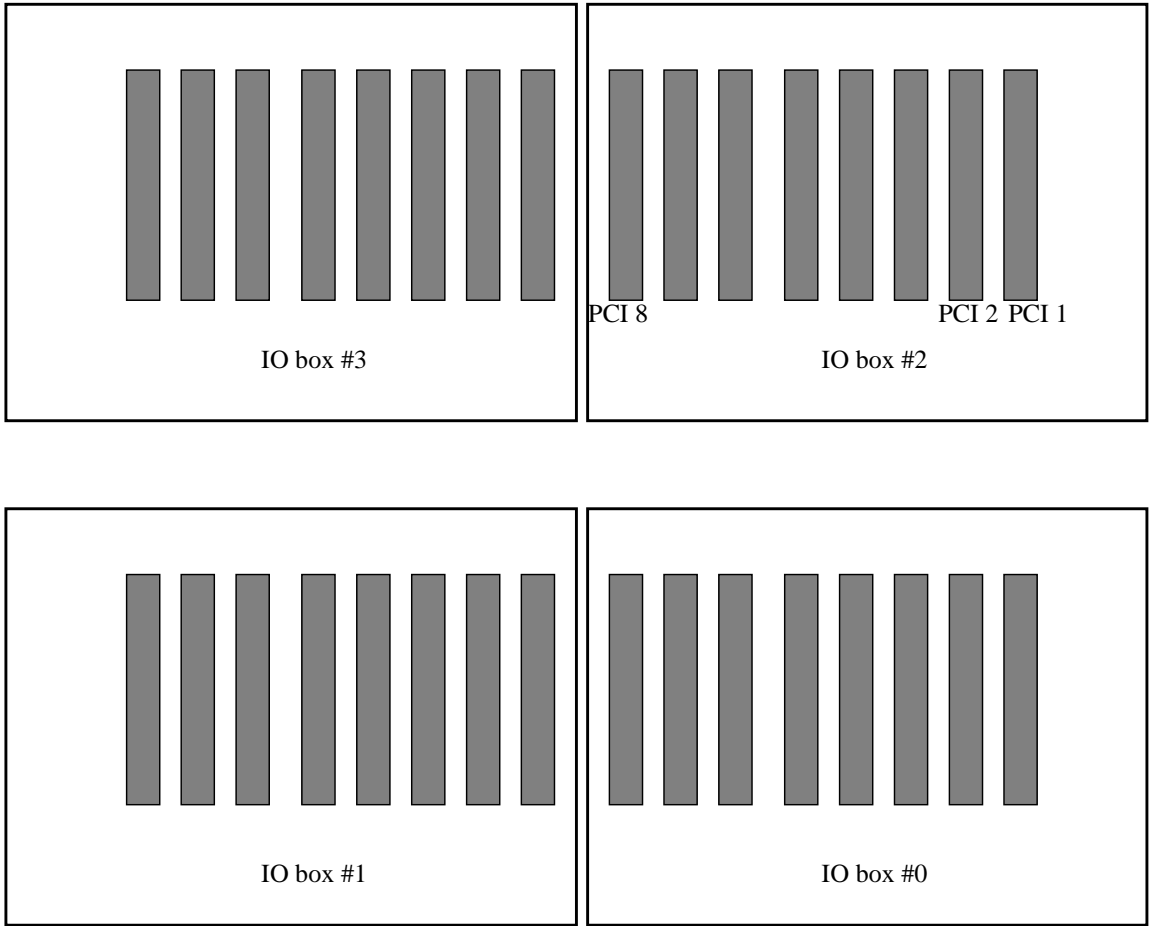


	Port 2 to S2500 Controller #14
PCI 7:2-port 2G bps FC-HBA	Port-1 to S2500 Controller #15
	Port-2: Not used

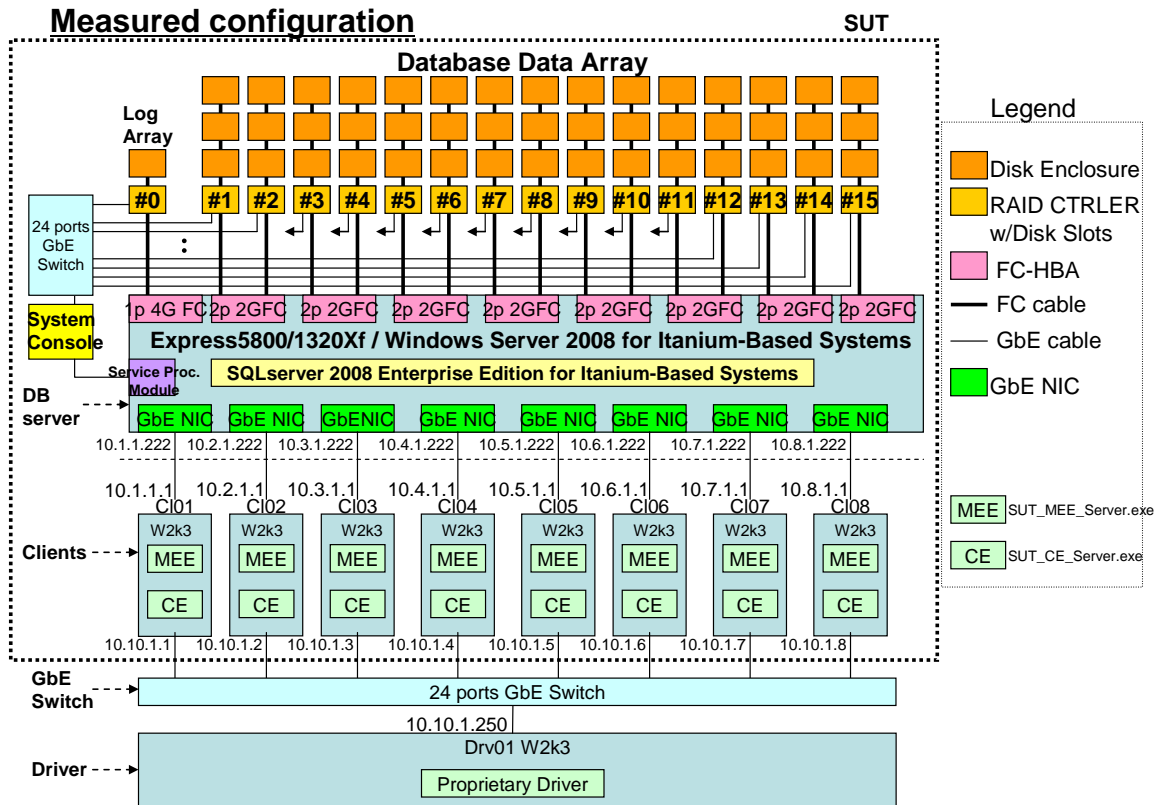
---- IO box #3 ----

PCI 1:GbE NIC	to GbE NIC of Client#3
PCI 2:GbE NIC	to GbE NIC of Client#4
PCI 4:GbE NIC	to GbE NIC of Client#5
PCI 5:GbE NIC	to GbE NIC of Client#6
PCI 7:GbE NIC	to GbE NIC of Client#7
PCI 8:GbE NIC	to GbE NIC of Client#8

**Figure1.5: Rear view of the IO boxes of the Server (NEC Express5800/1320Xf)**



**Figure1.6: Overview of the whole system connections**



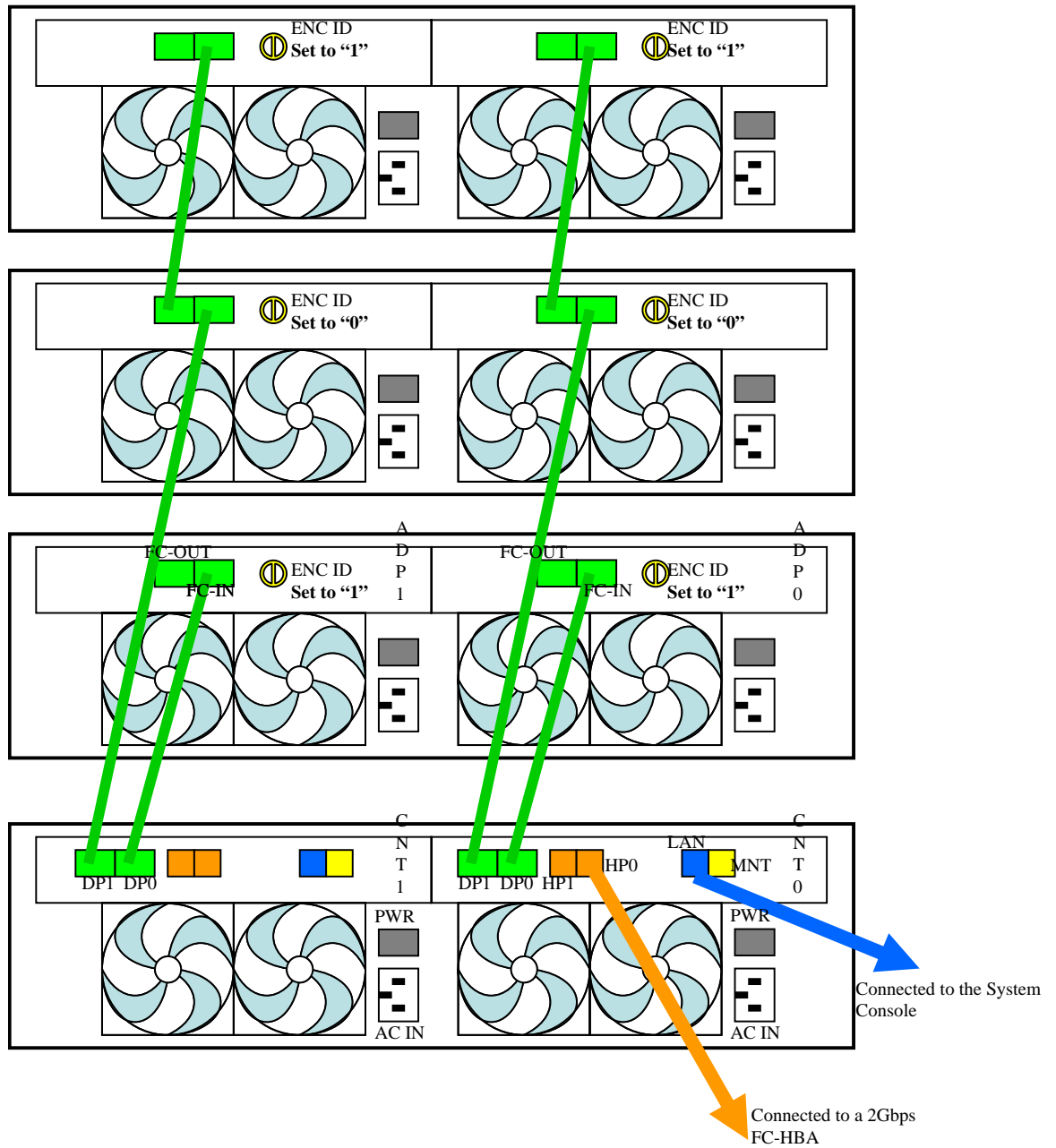
### **Connect S2500 controllers to disk expansion box.**

The Storage consists of two types of disk array systems. One is Database Data Array and the other is Log Array.

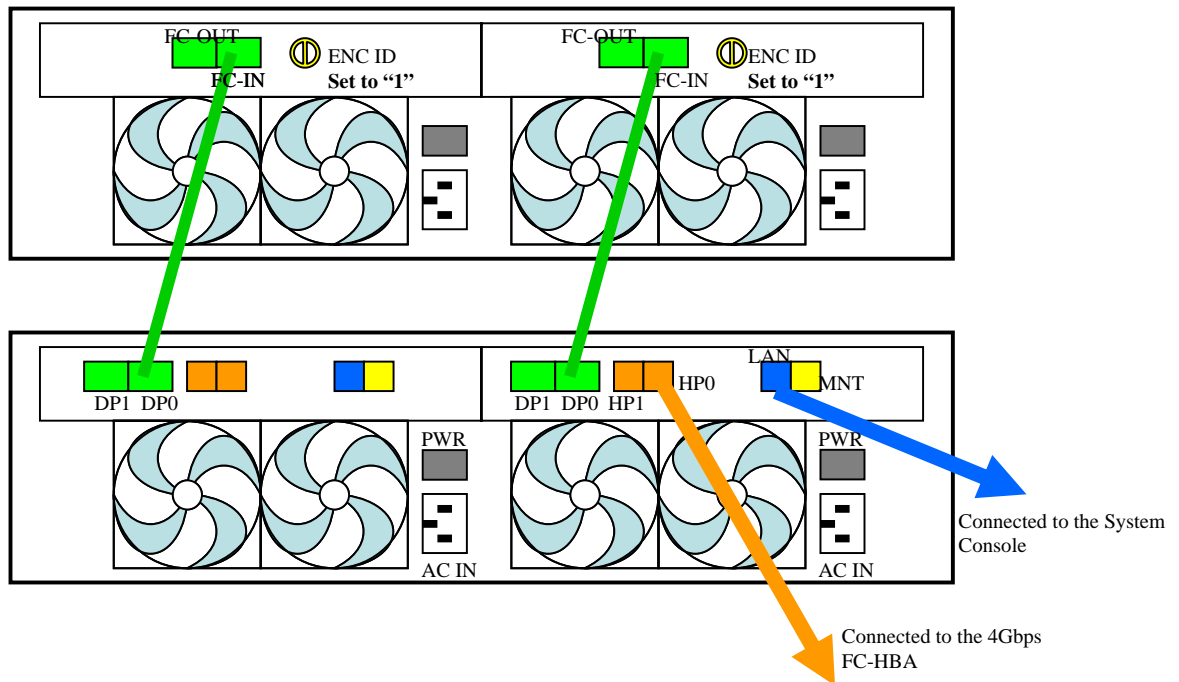
Database Data Array has fifteen S2500 controllers and each controller is connected to a 2Gbps FC HBA of the Database Server and three S2500 disk expansion boxes. See Figure 1.7 to check the connection diagram.

Log Array has one S2500 controller and the controller is connected to the 4Gbps FC HBA of the Database Server and one S2500 disk expansion box. See Figure 1.8 to check the connection diagram.

**Figure1.7: S2500 controller and disk expansion boxes for Database Data Array**



**Figure1.8: S2500 controller and disk expansion box for Database Log Array**



## 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. This includes, but is not limited to:

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

## Driver

The driver is not included in the priced configuration or SUT. In this benchmark, the driver machine runs Microsoft Windows Server 2003 R2 Standard Edition. Proprietary driver was installed on the machine.

## Tier-A

### OS Installation

**Step.1:** Create an "OEM disk"

1. Prepare a CDROM medium attached to a NEC Express5800/120Ri-2 which contains a setup utility called "NEC EXPRESSBUILDER".
2. Put the EXPRESSBUILDER CD medium into the DVD ROM drive of the NEC Express5800/120Ri-2.
3. Connect a USB Floppy Disk Drive to the NEC Express5800/120Ri-2 and power-on it, then EXPRESSBUILDER tool boots from CDROM.
4. Select "Tools" from EXPRESSBUILDER Main Menu.
5. Insert a blank medium into the Floppy Disk Drive.
6. Select "Create Support Disk".

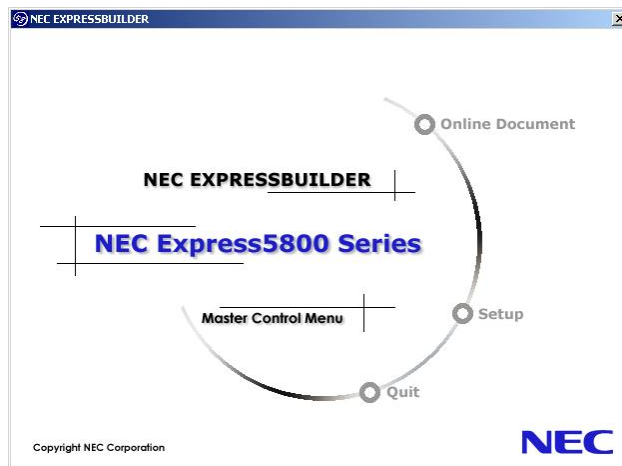
7. Select "Windows Server 2003 OEM-DISK for EXPRESSBUILDER"
8. Wait for the creation completed
9. Remove the EXPRESSBUILDER CDROM from the DVD ROM drive, and power off the NEC Express5800/120Ri-2.

**Step.2:** Install "Windows Server 2003 R2 SP2"

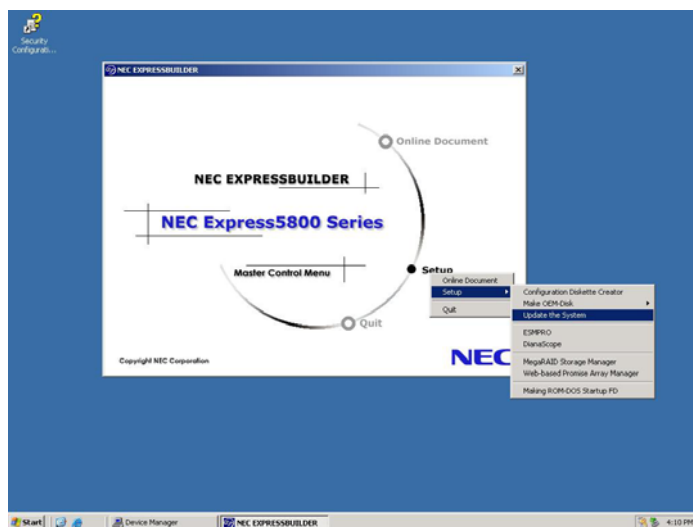
1. Put an OS install medium into the DVD ROM drive of the NEC Express5800/120Ri-2.
2. Power on the NEC Express5800/120Ri-2 with a USB Floppy Disk Drive attached, then "Windows Setup" boots from the OS install medium.
3. When you see "Press F6, If you need..." on the bottom of the windows setup screen, press "F6" key and confirm that there is the OEM-DISK in the Floppy Disk Drive.
4. When Windows Setup program requires, press "S" key and select "LSI Logic Fusion MPT SAS Driver (Server 2003 32bit)" from driver list.
5. continue normal Windows installation.

**Step.3:** Install driver

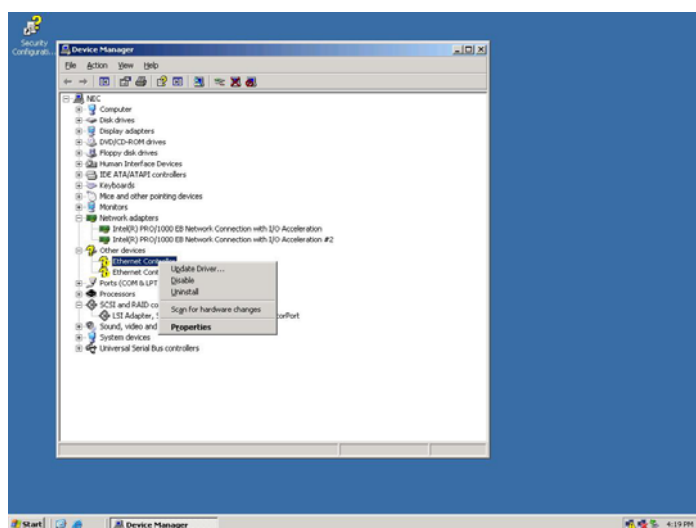
1. After Windows installation completes, put EXPRESSBUILDER CD medium into the DVD ROM drive of the NEC Express5800/120Ri-2.
2. A dialog below is displayed.



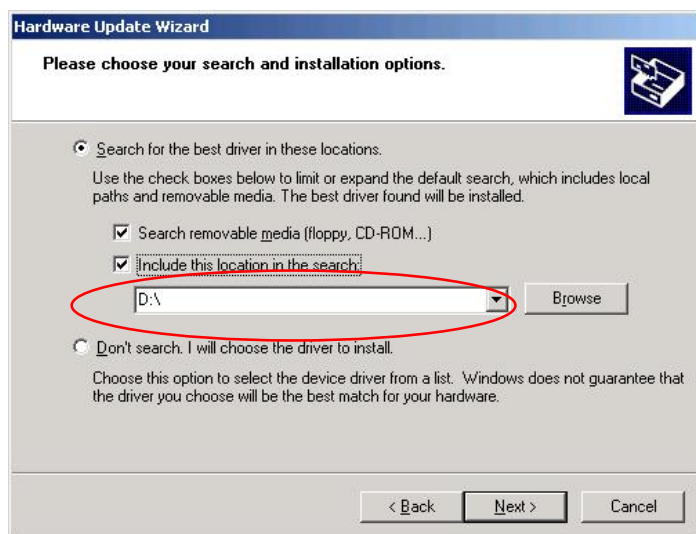
3. Select "setup" -> "setup" -. "Update the System"



4. When "Update the system" is finished, remove EXPRESSBUILDER CD medium from the DVD ROM drive and reboot the NEC Express5800/120Ri-2.
5. After Windows Server 2003 R2 starts, put EXPRESSBUILDER CD medium into the DVD ROM drive.
6. Launch "Device Manager" to update the driver of "Ethernet Controller"



7. Specify the DVD ROM drive letter



## OS Configuration

Assign IP addresses to Ethernet cards

### Step.1: Connection to the Database server

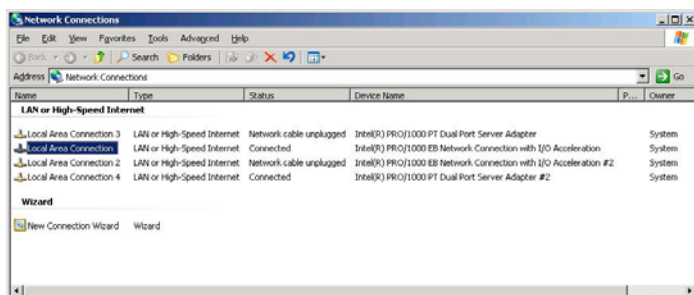
“Local Area Connection” is used for this connection. Assign IP address “10.1.1.x”.

“x” represents the Client number.

### Step.2: Connection to the Driver system (via 24-port GbE switch)

“Local Area Connection 4” is used for this connection. Assign IP address “10.10.1.x”.

“x” represents the Client number.



## Benchmark module Installation

After the OS installed, install the VCREDIST\_X86.EXE, SUT\_CE\_Server.exe and SUT\_MEE\_Server.exe.

## Tier-B

Tier-B hardware consists of one NEC Express5800/1320Xf as the database server and one NEC Express5800/120Ri-2 as the System Console of NEC Express5800/1320Xf.

### Tier-B : The System Console

#### OS Installation

The OS installation procedure on the System Console, NEC Express5800/120Ri-2, is the same as described in Tier-A portion of this clause.

#### OS Configuration

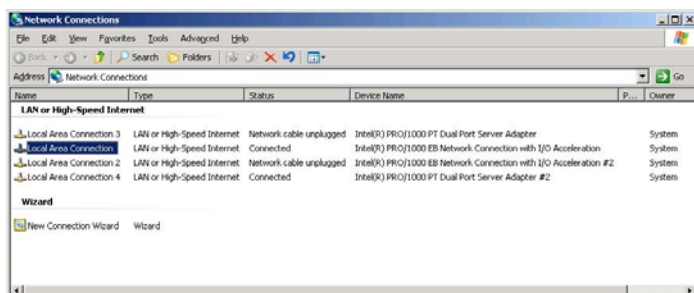
Assign IP addresses to Ethernet connections

##### **Step.1: Connection to the Management LAN port of the Database Server**

“Local Area Connection” is used for this. Assign IP address “192.168.0.201”.

##### **Step.2: Connection to S2500 controllers**

“Local Area Connection 4” is used for this. Assign IP address “192.168.10.249”.



### Tier-B : The Database Server

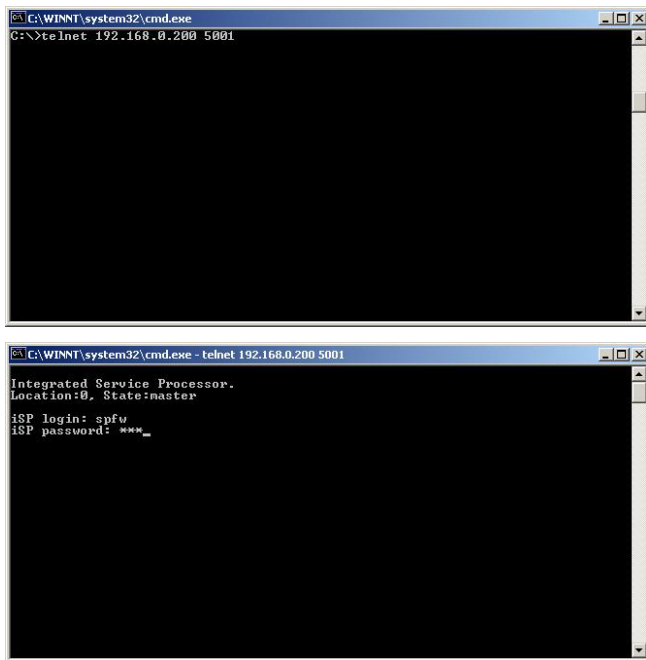
#### **Power up the database server, Express5800/1320Xf**

The System Console is connected from its GbE port to the network port of the Service Processor Module in the database server, NEC Express5800/1320Xf with a “crossing” GbE cable in P2P connection. The Service Processor Module controls the fundamental operation of the server and the operation is done with physically separated system from any operations done on OS with Intel® Itanium® Dual-Core Processors.

**Step.1:** Turn on all the three circuit breakers for power source located in back bottom of two cabinets of the database server, NEC Express5800/1320Xf. Following steps are executed on the System Console.

**Step.2:** Start up “Command Prompt.”

**Step.3:** Connect to the Service Processor Module with a proper IP address and "port number = 5001".

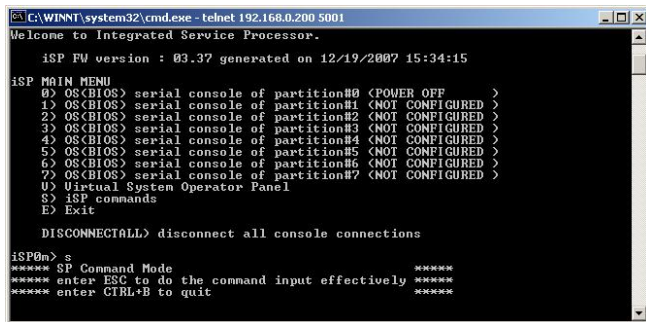


The first screenshot shows a Windows Command Prompt window with the title "C:\WINNT\system32\cmd.exe". The command prompt shows the command "telnet 192.168.0.200 5001" being entered. The second screenshot shows the same Command Prompt window after the connection is established. The title bar now includes "- telnet 192.168.0.200 5001". The output shows "Integrated Service Processor. Location:0, State:master". It then prompts for "iSP login: spfu" and "iSP password: \*\*\*".

(The IP address , login ID and password of the Service Processor Module are to be configured by NEC.)

**Step.4:** Input “s”

**Step.5:** Press [ESC] key to enter “iSP commands” prompt.



The screenshot shows the iSP Main Menu. The title bar is "C:\WINNT\system32\cmd.exe - telnet 192.168.0.200 5001". The output shows "Welcome to Integrated Service Processor." and "iSP FW version : 03.37 generated on 12/19/2007 15:34:15". The menu options are: 0) OS<BIOS> serial console of partition#0 <POWER OFF >, 1) OS<BIOS> serial console of partition#1 <NOT CONFIGURED >, 2) OS<BIOS> serial console of partition#2 <NOT CONFIGURED >, 3) OS<BIOS> serial console of partition#3 <NOT CONFIGURED >, 4) OS<BIOS> serial console of partition#4 <NOT CONFIGURED >, 5) OS<BIOS> serial console of partition#5 <NOT CONFIGURED >, 6) OS<BIOS> serial console of partition#6 <NOT CONFIGURED >, 7) OS<BIOS> serial console of partition#7 <NOT CONFIGURED >, U) Virtual System Operator Panel, S) iSP commands, E) Exit. Below the menu, it says "DISCONNECTALL> disconnect all console connections". The user has entered "s" and the prompt has changed to "iSP0m>". Below this, it says "\*\*\*\*\* SP Command Mode \*\*\*\*\*", "\*\*\*\*\* enter ESC to do the command input effectively \*\*\*\*\*", and "\*\*\*\*\* enter CTRL+B to quit \*\*\*\*\*".

**Step.6:** Input “up”

**Step.7:** Input “0”

**Step.8:** Input “y”



```

C:\WINNT\system32\cmd.exe - telnet 192.168.0.200 5001
1) OS(BIOS) serial console of partition#1 <NOT CONFIGURED >
2) OS(BIOS) serial console of partition#2 <NOT CONFIGURED >
3) OS(BIOS) serial console of partition#3 <NOT CONFIGURED >
4) OS(BIOS) serial console of partition#4 <NOT CONFIGURED >
5) OS(BIOS) serial console of partition#5 <NOT CONFIGURED >
6) OS(BIOS) serial console of partition#6 <NOT CONFIGURED >
7) OS(BIOS) serial console of partition#7 <NOT CONFIGURED >
U) Virtual System Operator Panel
S) iSP commands
E) Exit

DISCONNECTALL) disconnect all console connections

iSP0m> s
***** SP Command Mode *****
***** enter ESC to do the command input effectively *****
***** enter CTRL+B to quit *****

iSP0m:--> up
This command will bring up the specified partition.
Enter partition number <0-7/all/CR=exit> : 0
Execute OK? <g/ln> : y

```

**Step.9:** Then the database server is booting up OS automatically.

## OS Installation

The database server has already had its OS, Microsoft® Windows Server® 2008 for Itanium-Based Systems installed.

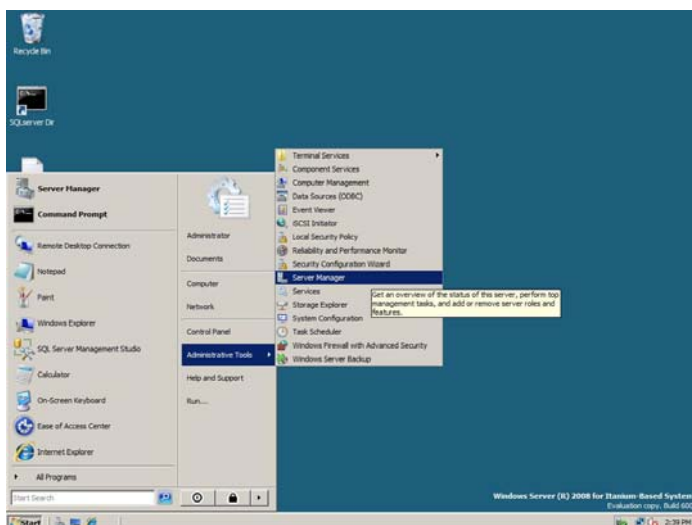
## OS Configuration

To configure the OS of the Database Server, follow the procedures below.

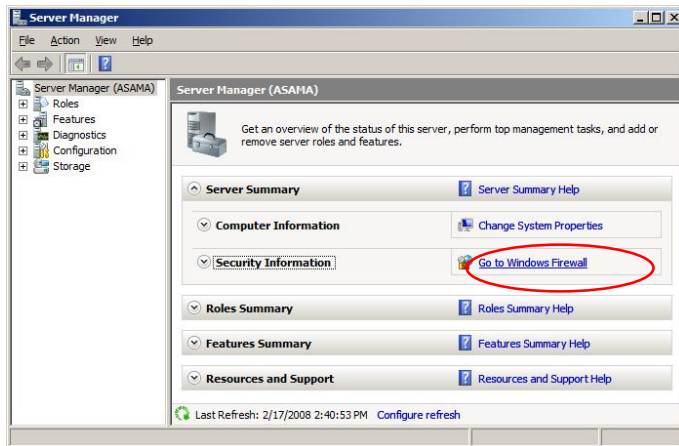
### Disable “Windows Firewall”

To connect the Database Server to the Clients, disable "Windows Firewall" using "server manager".

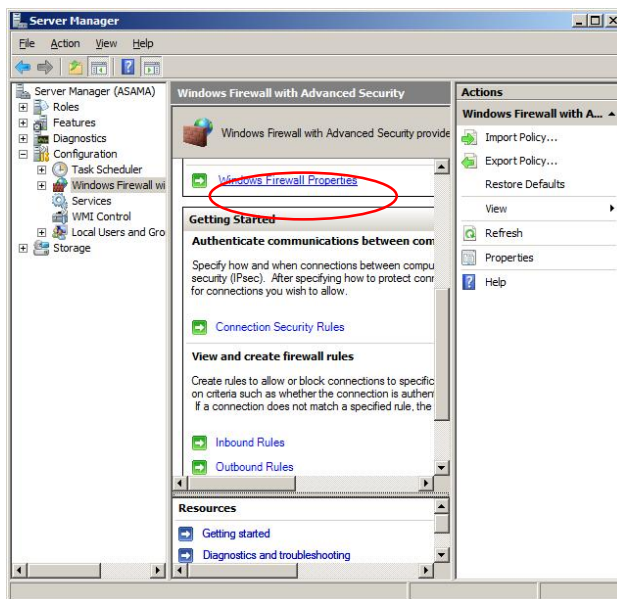
1. Launch "Administrator Tools" -> "Server Manager"



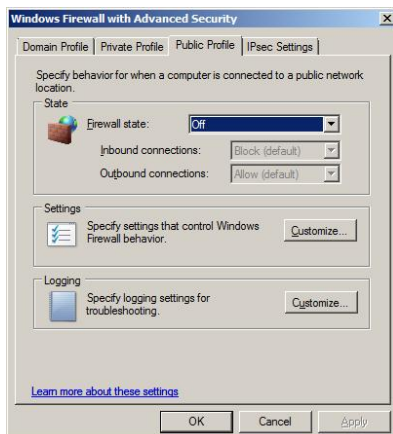
2. Click "Go to Windows Firewall"



3. Click "Windows Firewall properties"



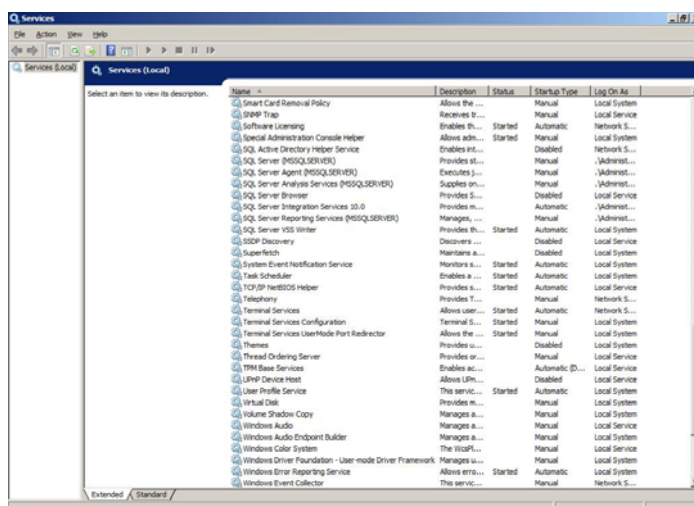
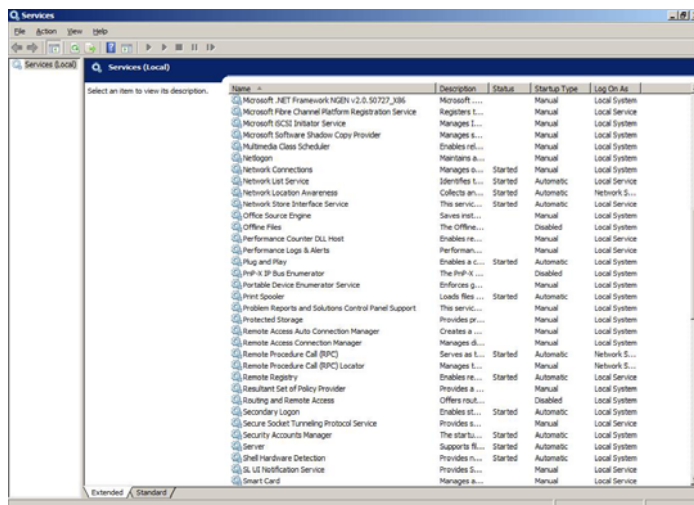
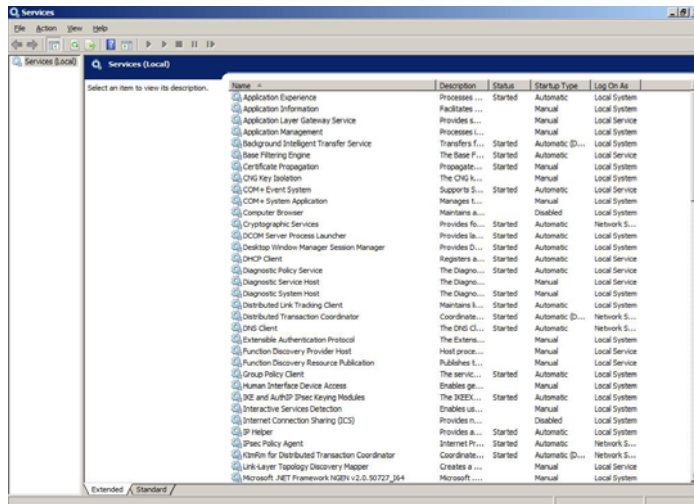
4. Change the "Firewall state" from On to Off.

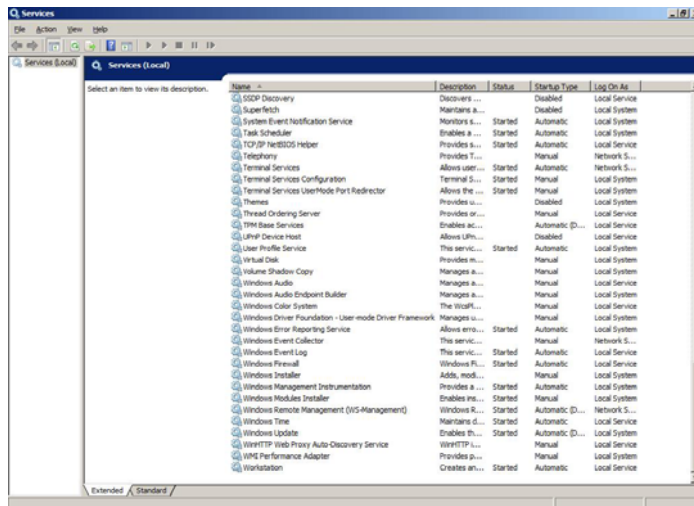


## Configure "services"

1. Run "services.msc" from "Run..." of "Start" menu.

## 2. Configure each OS service as shown below.

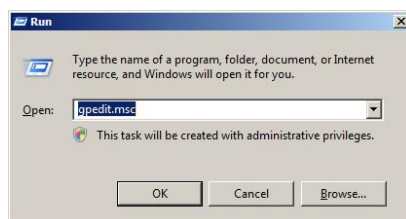




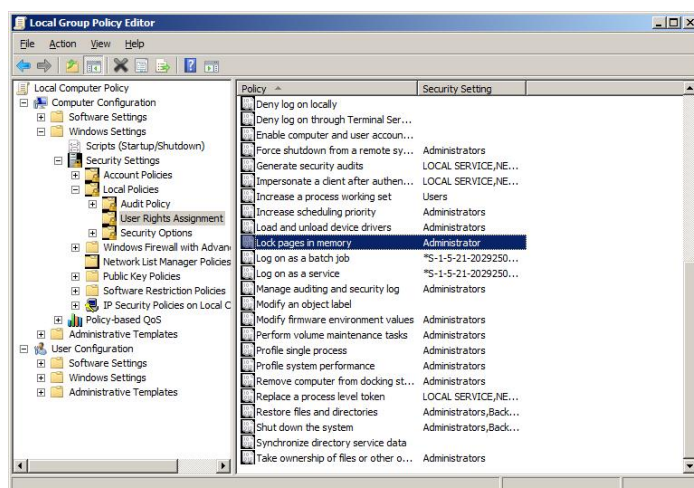
3. Reboot OS to reflect new configuration.

## **Configure “Lock pages in memory”**

1. Run configuration tool "gpedit.msc" from "Run..." of "Start" menu.



2. Select "Local Computer Policy" -> "Computer configuration" -> "Windows Settings"-> "Security Settings" -> "Local Policies" -> "User Right Assignment" in the left window.

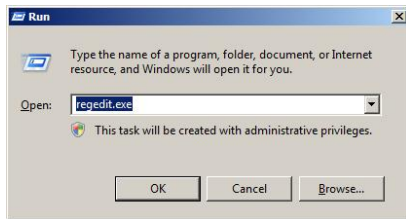


3. Double-click "Lock pages in memory" in the right window to open dialog, then add administrator into this policy.
4. Logoff to reflect new configuration.

## **Configure “Registry”**

To enable "code in large page" configuration controlled by the OS, and add registry key. OS will load sqlbinary in large pages.

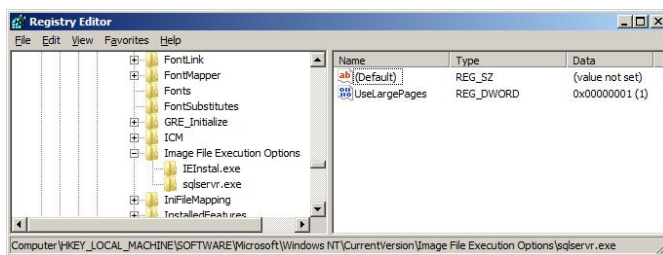
1. Start "regedit.exe" from "Run..." of "Start" Menu



2. Select "HKEY\_LOCAL\_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Image File Execution Options"
3. Add a key "sqlserver.exe" and select this key.
4. Right click it, then open menu.
5. And Select "New "-> "DWORD(32-bit) Value"
6. Configure as follows

Name UseLargePages

Value 1



7. Reboot OS to reflect new configuration.

## RAID Configuration for the storage subsystem

Step by Step instruction is shown in StorageSetup.doc (included in the support files).

## Configure Partitions for Database Server

### Step.1: Create Partitions

Use "Disk Management" to create partitions as shown below



Disk Management				
File	Action	View	Help	
File	File	File	File	File
Disk 0				
Basic	200 MB	(C:)	47.85 GB NTFS	
48.00 GB	Healthy (EFI System Partition)	Healthy (Boot, Page File, Crash Dump, Primary Partition)		
Disk 1				
Basic	device (Z:)	300.00 GB RAW	300.00 GB RAW	300.00 GB RAW
256.00 GB	Healthy (Primary Partition)	Healthy (Primary Partition)	Healthy (Primary Partition)	156.00 GB Unallocated
Disk 2				
Basic	90.00 GB RAW	5.00 GB RAW	25.00 GB RAW	Backup_01
465.00 GB	Healthy (Primary Partition)	Healthy (Primary Partition)	Healthy (Primary Partition)	246.00 GB NTFS
Disk 3				
Basic	90.00 GB RAW	5.00 GB RAW	25.00 GB RAW	Backup_02
465.00 GB	Healthy (Primary Partition)	Healthy (Primary Partition)	Healthy (Primary Partition)	246.00 GB NTFS
Disk 4				
Basic	90.00 GB RAW	5.00 GB RAW	25.00 GB RAW	Backup_03
465.00 GB	Healthy (Primary Partition)	Healthy (Primary Partition)	Healthy (Primary Partition)	246.00 GB NTFS
Disk 5				
Basic	90.00 GB RAW	5.00 GB RAW	25.00 GB RAW	Backup_04
465.00 GB	Healthy (Primary Partition)	Healthy (Primary Partition)	Healthy (Primary Partition)	246.00 GB NTFS
Disk 6				
Basic	90.00 GB RAW	5.00 GB RAW	25.00 GB RAW	Backup_05
465.00 GB	Healthy (Primary Partition)	Healthy (Primary Partition)	Healthy (Primary Partition)	246.00 GB NTFS
Disk 7				
Basic	90.00 GB RAW	5.00 GB RAW	25.00 GB RAW	Backup_06
465.00 GB	Healthy (Primary Partition)	Healthy (Primary Partition)	Healthy (Primary Partition)	246.00 GB NTFS
Disk 8				
Basic	90.00 GB RAW	5.00 GB RAW	25.00 GB RAW	Backup_07
465.00 GB	Healthy (Primary Partition)	Healthy (Primary Partition)	Healthy (Primary Partition)	246.00 GB NTFS
Disk 9				
Basic	90.00 GB RAW	5.00 GB RAW	25.00 GB RAW	Backup_08
465.00 GB	Healthy (Primary Partition)	Healthy (Primary Partition)	Healthy (Primary Partition)	246.00 GB NTFS
Disk 10				
Basic	90.00 GB RAW	5.00 GB RAW	25.00 GB RAW	Backup_09
465.00 GB	Healthy (Primary Partition)	Healthy (Primary Partition)	Healthy (Primary Partition)	246.00 GB NTFS
Disk 11				
Basic	90.00 GB RAW	5.00 GB RAW	25.00 GB RAW	Backup_10
465.00 GB	Healthy (Primary Partition)	Healthy (Primary Partition)	Healthy (Primary Partition)	246.00 GB NTFS
Disk 12				
Basic	90.00 GB RAW	5.00 GB RAW	25.00 GB RAW	Backup_11
465.00 GB	Healthy (Primary Partition)	Healthy (Primary Partition)	Healthy (Primary Partition)	246.00 GB NTFS
Disk 13				
Basic	90.00 GB RAW	5.00 GB RAW	25.00 GB RAW	Backup_12
465.00 GB	Healthy (Primary Partition)	Healthy (Primary Partition)	Healthy (Primary Partition)	246.00 GB NTFS
Disk 14				
Basic	90.00 GB RAW	5.00 GB RAW	25.00 GB RAW	Backup_13
233.00 GB	Healthy (Primary Partition)	Healthy (Primary Partition)	Healthy (Primary Partition)	113.00 GB NTFS
Disk 15				
Basic	90.00 GB RAW	5.00 GB RAW	25.00 GB RAW	Backup_14
233.00 GB	Healthy (Primary Partition)	Healthy (Primary Partition)	Healthy (Primary Partition)	113.00 GB NTFS
Disk 16				
Basic	90.00 GB RAW	5.00 GB RAW	25.00 GB RAW	Backup_15
233.00 GB	Healthy (Primary Partition)	Healthy (Primary Partition)	Healthy (Primary Partition)	113.00 GB NTFS
Disk 17				
Basic	90.00 GB RAW	5.00 GB RAW	25.00 GB RAW	Backup_16
233.00 GB	Healthy (Primary Partition)	Healthy (Primary Partition)	Healthy (Primary Partition)	113.00 GB NTFS
Disk 18				
Basic	90.00 GB RAW	5.00 GB RAW	25.00 GB RAW	Backup_17
233.00 GB	Healthy (Primary Partition)	Healthy (Primary Partition)	Healthy (Primary Partition)	113.00 GB NTFS
Disk 19				
Basic	90.00 GB RAW	5.00 GB RAW	25.00 GB RAW	Backup_18
233.00 GB	Healthy (Primary Partition)	Healthy (Primary Partition)	Healthy (Primary Partition)	113.00 GB NTFS
Disk 20				
Basic	90.00 GB RAW	5.00 GB RAW	25.00 GB RAW	Backup_19
233.00 GB	Healthy (Primary Partition)	Healthy (Primary Partition)	Healthy (Primary Partition)	113.00 GB NTFS
Disk 21				
Basic	90.00 GB RAW	5.00 GB RAW	25.00 GB RAW	Backup_20
233.00 GB	Healthy (Primary Partition)	Healthy (Primary Partition)	Healthy (Primary Partition)	113.00 GB NTFS
Disk 22				
Basic	90.00 GB RAW	5.00 GB RAW	25.00 GB RAW	Backup_21
233.00 GB	Healthy (Primary Partition)	Healthy (Primary Partition)	Healthy (Primary Partition)	113.00 GB NTFS
Disk 23				
Basic	90.00 GB RAW	5.00 GB RAW	25.00 GB RAW	Backup_22
233.00 GB	Healthy (Primary Partition)	Healthy (Primary Partition)	Healthy (Primary Partition)	113.00 GB NTFS
Disk 24				
Basic	90.00 GB RAW	5.00 GB RAW	25.00 GB RAW	Backup_23
233.00 GB	Healthy (Primary Partition)	Healthy (Primary Partition)	Healthy (Primary Partition)	113.00 GB NTFS
Disk 25				
Basic	90.00 GB RAW	5.00 GB RAW	25.00 GB RAW	Backup_24
233.00 GB	Healthy (Primary Partition)	Healthy (Primary Partition)	Healthy (Primary Partition)	113.00 GB NTFS

Disk Management				
File Action View Help				
<b>...Disk 40</b> Basic 133.00 GB Online	90.00 GB RAW healthy (Primary Partition)	5.00 GB RAW healthy (Primary Partition)	25.00 GB RAW healthy (Primary Partition)	<b>Backup_39</b> 113.00 GB NTFS healthy (Primary Partition)
<b>...Disk 41</b> Basic 133.00 GB Online	90.00 GB RAW healthy (Primary Partition)	5.00 GB RAW healthy (Primary Partition)	25.00 GB RAW healthy (Primary Partition)	<b>Backup_40</b> 113.00 GB NTFS healthy (Primary Partition)
<b>...Disk 42</b> Basic 133.00 GB Online	90.00 GB RAW healthy (Primary Partition)	5.00 GB RAW healthy (Primary Partition)	25.00 GB RAW healthy (Primary Partition)	<b>Backup_41</b> 113.00 GB NTFS healthy (Primary Partition)
<b>...Disk 43</b> Basic 133.00 GB Online	90.00 GB RAW healthy (Primary Partition)	5.00 GB RAW healthy (Primary Partition)	25.00 GB RAW healthy (Primary Partition)	<b>Backup_42</b> 113.00 GB NTFS healthy (Primary Partition)
<b>...Disk 44</b> Basic 133.00 GB Online	90.00 GB RAW healthy (Primary Partition)	5.00 GB RAW healthy (Primary Partition)	25.00 GB RAW healthy (Primary Partition)	<b>Backup_43</b> 113.00 GB NTFS healthy (Primary Partition)
<b>...Disk 45</b> Basic 133.00 GB Online	90.00 GB RAW healthy (Primary Partition)	5.00 GB RAW healthy (Primary Partition)	25.00 GB RAW healthy (Primary Partition)	<b>Backup_44</b> 113.00 GB NTFS healthy (Primary Partition)
<b>...Disk 46</b> Basic 133.00 GB Online	90.00 GB RAW healthy (Primary Partition)	5.00 GB RAW healthy (Primary Partition)	25.00 GB RAW healthy (Primary Partition)	<b>Backup_45</b> 113.00 GB NTFS healthy (Primary Partition)
<b>...Disk 47</b> Basic 133.00 GB Online	90.00 GB RAW healthy (Primary Partition)	5.00 GB RAW healthy (Primary Partition)	25.00 GB RAW healthy (Primary Partition)	<b>Backup_46</b> 113.00 GB NTFS healthy (Primary Partition)
<b>...Disk 48</b> Basic 133.00 GB	144.00 GB RAW primary partition	5.00 GB RAW	75.00 GB RAW	<b>Backup_47</b> 113.00 GB NTFS

Unallocated
 Primary partition



## Step.2: Create Junction Points

Create junction points using mkmp.cmd (the file is included in the supporting files).

## Step.3: Assign Mount Points

Assign mount points using diskpart command. Execute “diskpart /s mount.txt” from the command line. (the script file “mount.txt” is included in the supporting files).

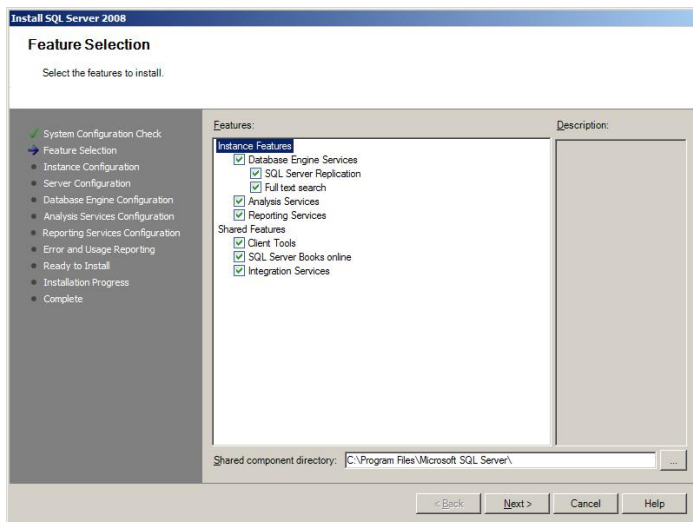
## SQL Server Installation

Install Microsoft® SQL Server® 2008 Enterprise Edition for Itanium-based Systems. Here are the notes for the installation.

### Step.1: “Feature Selection”

Select all Features.

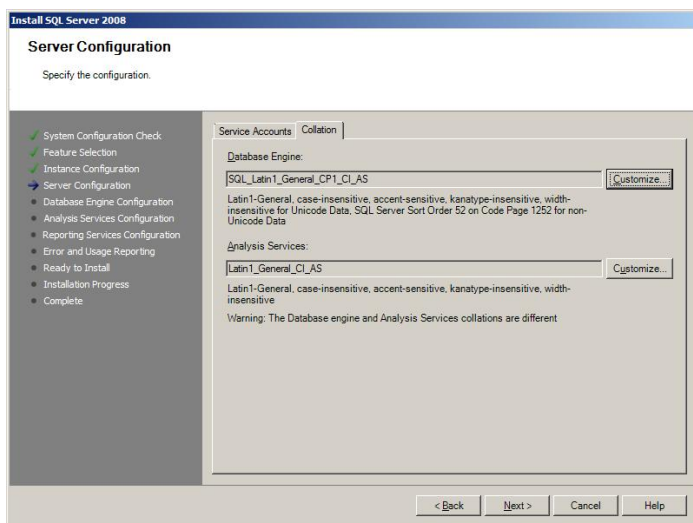




## Step.2: “Server Configuration”

select “Collation” tab

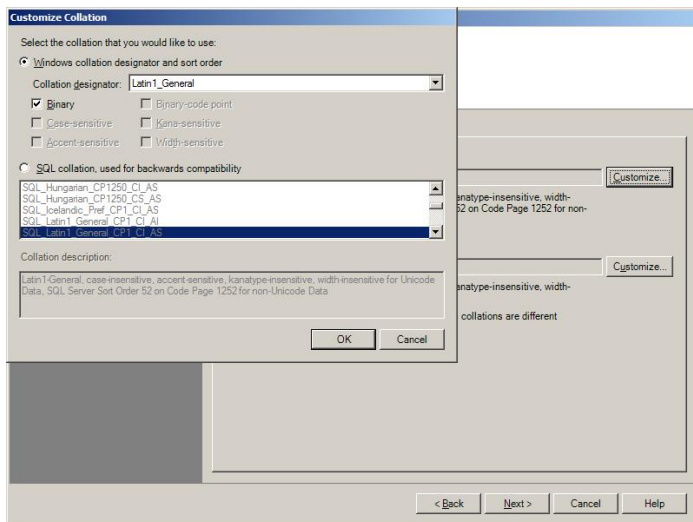
click “Customize” of “Database Engine”



select “Windows collation designator and soft order”

select “Latin1\_General” as "collation designator”

select “Binary”



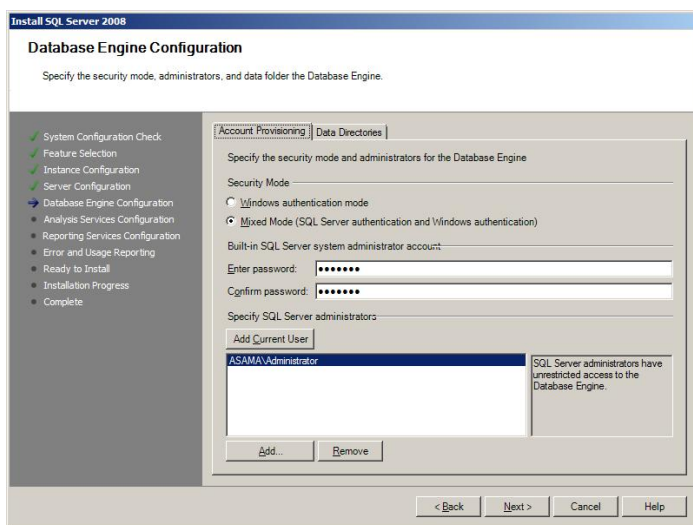
### Step.3: “Database Engine Configuration”

select “Account Provisioning” tab

select “Mixed Mode”

input password for SQL Server system administrator account

click "Add Current User"



## SQL Server Configuration

### Step.1: Startup Parameter

Start Microsoft® SQL Server® 2008 from the command line using startSQL.cmd (the file is included in the supporting files).

### Step.2: sp\_configure

name	minimum	maximum	config_value	run_value
-----	-----	-----	-----	-----
Ad Hoc Distributed Queries	0	1	0	0
affinity I/O mask	-2147483648	2147483647	0	0
affinity mask	-2147483648	2147483647	-1	-1

affinity64 I/O mask	-2147483648	2147483647	0	0
affinity64 mask	-2147483648	2147483647	-1	-1
Agent XPs	0	1	0	0
allow updates	0	1	1	1
awe enabled	0	1	0	0
backup compression default	0	1	0	0
blocked process threshold (s)	0	86400	0	0
c2 audit mode	0	1	0	0
clr enabled	0	1	0	0
common criteria compliance enabled	0	1	0	0
cost threshold for parallelism	0	32767	5	5
cross db ownership chaining	0	1	0	0
cursor threshold	-1	2147483647	-1	-1
Database Mail XPs	0	1	0	0
default full-text language	0	2147483647	1033	1033
default language	0	9999	0	0
default trace enabled	0	1	1	1
disallow results from triggers	0	1	0	0
EKM provider enabled	0	1	0	0
filestream access level	0	2	0	0
fill factor (%)	0	100	0	0
ft crawl bandwidth (max)	0	32767	100	100
ft crawl bandwidth (min)	0	32767	0	0
ft notify bandwidth (max)	0	32767	100	100
ft notify bandwidth (min)	0	32767	0	0
in-doubt xact resolution	0	2	0	0
index create memory (KB)	704	2147483647	0	0
lightweight pooling	0	1	1	1
locks	5000	2147483647	0	0
max degree of parallelism	0	64	1	1
max full-text crawl range	0	256	4	4
max server memory (MB)	16	2147483647	491520	491520
max text repl size (B)	-1	2147483647	65536	65536
max worker threads	128	32767	1400	1400
media retention	0	365	0	0
min memory per query (KB)	512	2147483647	1024	1024
min server memory (MB)	0	2147483647	0	16
nested triggers	0	1	1	1
network packet size (B)	512	32767	4096	4096
Ole Automation Procedures	0	1	0	0

open objects	0	2147483647	0	0
PH timeout (s)	1	3600	60	60
precompute rank	0	1	0	0
priority boost	0	1	1	1
query governor cost limit	0	2147483647	0	0
query wait (s)	-1	2147483647	-1	-1
recovery interval (min)	0	32767	32767	32767
remote access	0	1	1	1
remote admin connections	0	1	0	0
remote login timeout (s)	0	2147483647	20	20
remote proc trans	0	1	0	0
remote query timeout (s)	0	2147483647	600	600
Replication XPs	0	1	0	0
scan for startup procs	0	1	0	0
server trigger recursion	0	1	1	1
set working set size	0	1	0	0
show advanced options	0	1	1	1
SMO and DMO XPs	0	1	1	1
SQL Mail XPs	0	1	0	0
transform noise words	0	1	0	0
two digit year cutoff	1753	9999	2049	2049
user connections	0	32767	0	0
user options	0	32767	0	0
Web Assistant Procedures	0	1	0	0
xp_cmdshell	0	1	0	0

### **Step.3: Configure tempdb**

ALTER DATABASE tempdb MODIFY FILE

(NAME=tempdev, FILENAME='Z:\Device\TPCE\_TempDB\tempdb.mdf', SIZE=10240MB, FILEGROWTH=10%, MAXSIZE=102400MB)

GO

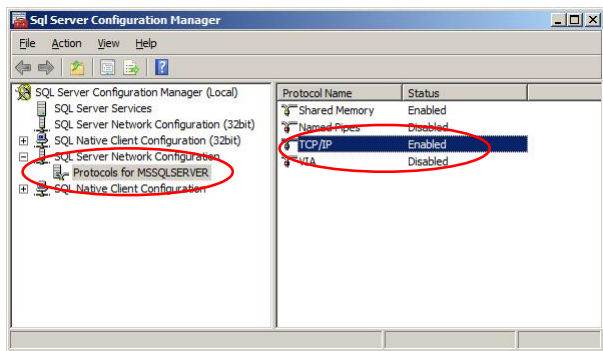
ALTER DATABASE tempdb MODIFY FILE

(NAME=templog, FILENAME='Z:\Device\TPCE\_TempLog\templog.ldf', SIZE=10240MB, FILEGROWTH=10%, MAXSIZE=102400MB)

GO

### **Step.4: Enable tcp/ip**

Enable TCP/IP Protocol using “SQL Server Configuration Manager”



## Clause 2 : Database Design, Scaling & Population Related Items

### 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.*

Create a folder 570000.cust\database. In the folder create a create\_database.sql script to create a TPC-E database with four filegroups. One filegroup called broker\_fg for the Broker-related TPC-E tables and one filegroup called market\_fg for the Market-related TPC-E tables and one filegroup called customer\_fg for the Customer-related TPC-E tables and the other filegroup called misc\_fg for all the other TPC-E tables. broker\_fg uses all the Z:\Device\Broker\_\* disk partitions. market\_fg uses all the Z:\Device\Market\_\* disk partitions. customer\_fg uses all the Z:\Device\Customer\_\* disk partitions. misc\_fg uses Z:\Device\Data\_01\TPCE\_Misc.ndf. The database log uses all the Z:\Device\TPCE\_Log\_\* partitions.

Run the Microsoft provided file TPCE\_Setup.cmd to start the database load (the file is included in the supporting files). Fill in 570000 for the number of customers to be loaded when prompted.

TPCE\_Setup.cmd calls files that are included in the supporting files to create and load the TPC-E database.

### Table Organization

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

Physical space was allocated to Microsoft SQL Server 2008 on the server disks as detailed in Table 2-2.

### Disclosure of 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.*

Partitioning was not used on any table in this benchmark.

### Replication of Tables

*Replication of tables, if used, must be reported in the Report (see Clause 2.3.4).*

No tables were replicated in this benchmark test.

### Additional and/or Duplicated Attributes in any Table

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

No duplications or additional attributes were used in this benchmark.

### 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.*

The TPC-E database was originally built with 570,000 customers.

**Table 2.1 Number of Rows for Server**

Table Name	Rows Loaded
<b>Scaling Tables</b>	
ACCOUNT PERMISSION	4,046,551

ADDRESS	855,004
BROKER	5,700
COMPANY	285,000
COMPANY COMPETITOR	855,000
CUSTOMER	570,000
CUSTOMER ACCOUNT	2,850,000
CUSTOMER TAXRATE	1,140,000
DAILY MARKET	509,537,250
FINANCIAL	5,700,000
LAST TRADE	390,450
NEWS ITEM	570,000
NEWS XREF	570,000
SECURITY	390,450
WATCH ITEM	57,069,639
WATCH LIST	570,000
<b>Growing Tables</b>	
CASH TRANSACTION	9,061,605,048
HOLDING	504,292,244
HOLDING HISTORY	13,200,169,644
HOLDING SUMMARY	28,352,062
SETTLEMENT	9,849,600,000
TRADE	9,849,600,000
TRADE HISTORY	23,639,047,628
TRADE REQUEST	0
<b>Fixed Tables</b>	
CHARGE	15
COMMISSION RATE	240
EXCHANGE	4
INDUSTRY	102
SECTOR	12
STATUS TYPE	5
TAX RATE	320
TRADE TYPE	5
ZIP CODE	14,741

## Distribution of Tables and Logs

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

Table 2.2 and 2.3 depict the distribution of the database over the disks of the tested and priced system. Figure 1.1, 1.2 shows the disk configuration for measured and priced system.

**Table 2.2 : Data Distribution for the Tested Configuration**

HBA#	Slot#	Disk#	Drives Enclosure model RAID level	Partition Filesystem	Size	Use
0	0-1	0	2x73GB, 10K, SCSI internal RAID10	C: (NTFS)	67.85GB	OS
1	0-5	1	15x73GB, 15K, FC S2500 Base model RAID50	Z: (NTFS) Z:\Device\TPCE_Log_01\ (RAW) Z:\Device\TPCE_Log_02\ (RAW) Z:\Device\TPCE_Log_03\ (RAW)	10GB 300GB 300GB 300GB	OS Log1 Log2 Log3
2a	1-1	2	14x73GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_01\ (RAW) Z:\Device\Market_01\ (RAW) Z:\Device\Customer_01\ (RAW) Z:\Device\Backup_01\ (NTFS) -> alias Z:\Device\Data_01\ (NTFS)	90GB 5GB 25GB 346GB (346GB)	Broker_01 Market_01 Customer_01 TPCE_Misc.ndf
		3	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_02\ (RAW) Z:\Device\Market_02\ (RAW) Z:\Device\Customer_02\ (RAW) Z:\Device\Backup_02\ (NTFS)	90GB 5GB 25GB 346GB	Broker_02 Market_02 Customer_02
		4	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_03\ (RAW) Z:\Device\Market_03\ (RAW) Z:\Device\Customer_03\ (RAW) Z:\Device\Backup_03\ (NTFS)	90GB 5GB 25GB 346GB	Broker_03 Market_03 Customer_03
		5	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_04\ (RAW) Z:\Device\Market_04\ (RAW) Z:\Device\Customer_04\ (RAW) Z:\Device\Backup_04\ (NTFS)	90GB 5GB 25GB 346GB	Broker_04 Market_04 Customer_04
		6	14x73GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_05\ (RAW) Z:\Device\Market_05\ (RAW) Z:\Device\Customer_05\ (RAW) Z:\Device\Backup_05\ (NTFS) -> alias Z:\Device\TPCE_TempDB\ (NTFS)	90GB 5GB 25GB 346GB (346GB)	Broker_05 Market_05 Customer_05 tempdb.mdf
		7	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_06\ (RAW) Z:\Device\Market_06\ (RAW) Z:\Device\Customer_06\ (RAW) Z:\Device\Backup_06\ (NTFS)	90GB 5GB 25GB 346GB	Broker_06 Market_06 Customer_06
		8	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_07\ (RAW) Z:\Device\Market_07\ (RAW) Z:\Device\Customer_07\ (RAW) Z:\Device\Backup_07\ (NTFS)	90GB 5GB 25GB 346GB	Broker_07 Market_07 Customer_07
		9	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_08\ (RAW) Z:\Device\Market_08\ (RAW) Z:\Device\Customer_08\ (RAW) Z:\Device\Backup_08\ (NTFS)	90GB 5GB 25GB 346GB	Broker_08 Market_08 Customer_08



**Table 2.2 : Data Distribution for the Tested Configuration (Cont)**

3a	1-3	10	14x73GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_09\ (RAW) Z:\Device\Market_09\ (RAW) Z:\Device\Customer_09\ (RAW) Z:\Device\Backup_09\ (NTFS) -> alias Z:\Device\TPCE_TempLog\ (NTFS)	90GB 5GB 25GB 346GB (346GB)	Broker_09 Market_09 Customer_09 templog.ldf
		11	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_10\ (RAW) Z:\Device\Market_10\ (RAW) Z:\Device\Customer_10\ (RAW) Z:\Device\Backup_10\ (NTFS)	90GB 5GB 25GB 346GB	Broker_10 Market_10 Customer_10
		12	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_11\ (RAW) Z:\Device\Market_11\ (RAW) Z:\Device\Customer_11\ (RAW) Z:\Device\Backup_11\ (NTFS)	90GB 5GB 25GB 346GB	Broker_11 Market_11 Customer_11
		13	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_12\ (RAW) Z:\Device\Market_12\ (RAW) Z:\Device\Customer_12\ (RAW) Z:\Device\Backup_12\ (NTFS)	90GB 5GB 25GB 346GB	Broker_12 Market_12 Customer_12
3b		14	14x36GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_13\ (RAW) Z:\Device\Market_13\ (RAW) Z:\Device\Customer_13\ (RAW) Z:\Device\Backup_13\ (NTFS)	90GB 5GB 25GB 113GB	Broker_13 Market_13 Customer_13
		15	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_14\ (RAW) Z:\Device\Market_14\ (RAW) Z:\Device\Customer_14\ (RAW) Z:\Device\Backup_14\ (NTFS)	90GB 5GB 25GB 113GB	Broker_14 Market_14 Customer_14
		16	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_15\ (RAW) Z:\Device\Market_15\ (RAW) Z:\Device\Customer_15\ (RAW) Z:\Device\Backup_15\ (NTFS)	90GB 5GB 25GB 113GB	Broker_15 Market_15 Customer_15
		17	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_16\ (RAW) Z:\Device\Market_16\ (RAW) Z:\Device\Customer_16\ (RAW) Z:\Device\Backup_16\ (NTFS)	90GB 5GB 25GB 113GB	Broker_16 Market_16 Customer_16
4a	1-5	18	14x36GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_17\ (RAW) Z:\Device\Market_17\ (RAW) Z:\Device\Customer_17\ (RAW) Z:\Device\Backup_17\ (NTFS)	90GB 5GB 25GB 113GB	Broker_17 Market_17 Customer_17
		19	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_18\ (RAW) Z:\Device\Market_18\ (RAW) Z:\Device\Customer_18\ (RAW) Z:\Device\Backup_18\ (NTFS)	90GB 5GB 25GB 113GB	Broker_18 Market_18 Customer_18
		20	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_19\ (RAW) Z:\Device\Market_19\ (RAW) Z:\Device\Customer_19\ (RAW) Z:\Device\Backup_19\ (NTFS)	90GB 5GB 25GB 113GB	Broker_19 Market_19 Customer_19
		21	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_20\ (RAW) Z:\Device\Market_20\ (RAW) Z:\Device\Customer_20\ (RAW) Z:\Device\Backup_20\ (NTFS)	90GB 5GB 25GB 113GB	Broker_20 Market_20 Customer_20
4b		22	14x36GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_21\ (RAW) Z:\Device\Market_21\ (RAW) Z:\Device\Customer_21\ (RAW) Z:\Device\Backup_21\ (NTFS)	90GB 5GB 25GB 113GB	Broker_21 Market_21 Customer_21
		23	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_22\ (RAW) Z:\Device\Market_22\ (RAW) Z:\Device\Customer_22\ (RAW) Z:\Device\Backup_22\ (NTFS)	90GB 5GB 25GB 113GB	Broker_22 Market_22 Customer_22
		24	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_23\ (RAW) Z:\Device\Market_23\ (RAW) Z:\Device\Customer_23\ (RAW) Z:\Device\Backup_23\ (NTFS)	90GB 5GB 25GB 113GB	Broker_23 Market_23 Customer_23
		25	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_24\ (RAW) Z:\Device\Market_24\ (RAW) Z:\Device\Customer_24\ (RAW) Z:\Device\Backup_24\ (NTFS)	90GB 5GB 25GB 113GB	Broker_24 Market_24 Customer_24

**Table 2.2 : Data Distribution for the Tested Configuration (Cont)**

5a	1-7	26	14x36GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_25\ (RAW) Z:\Device\Market_25\ (RAW) Z:\Device\Customer_25\ (RAW) Z:\Device\Backup_25\ (NTFS)	90GB 5GB 25GB 113GB	Broker_25 Market_25 Customer_25
		27	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_26\ (RAW) Z:\Device\Market_26\ (RAW) Z:\Device\Customer_26\ (RAW) Z:\Device\Backup_26\ (NTFS)	90GB 5GB 25GB 113GB	Broker_26 Market_26 Customer_26
		28	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_27\ (RAW) Z:\Device\Market_27\ (RAW) Z:\Device\Customer_27\ (RAW) Z:\Device\Backup_27\ (NTFS)	90GB 5GB 25GB 113GB	Broker_27 Market_27 Customer_27
		29	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_28\ (RAW) Z:\Device\Market_28\ (RAW) Z:\Device\Customer_28\ (RAW) Z:\Device\Backup_28\ (NTFS)	90GB 5GB 25GB 113GB	Broker_28 Market_28 Customer_28
5b	1-7	30	14x36GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_29\ (RAW) Z:\Device\Market_29\ (RAW) Z:\Device\Customer_29\ (RAW) Z:\Device\Backup_29\ (NTFS)	90GB 5GB 25GB 113GB	Broker_29 Market_29 Customer_29
		31	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_30\ (RAW) Z:\Device\Market_30\ (RAW) Z:\Device\Customer_30\ (RAW) Z:\Device\Backup_30\ (NTFS)	90GB 5GB 25GB 113GB	Broker_30 Market_30 Customer_30
		32	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_31\ (RAW) Z:\Device\Market_31\ (RAW) Z:\Device\Customer_31\ (RAW) Z:\Device\Backup_31\ (NTFS)	90GB 5GB 25GB 113GB	Broker_31 Market_31 Customer_31
		33	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_32\ (RAW) Z:\Device\Market_32\ (RAW) Z:\Device\Customer_32\ (RAW) Z:\Device\Backup_32\ (NTFS)	90GB 5GB 25GB 113GB	Broker_32 Market_32 Customer_32
6a	2-1	34	14x36GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_33\ (RAW) Z:\Device\Market_33\ (RAW) Z:\Device\Customer_33\ (RAW) Z:\Device\Backup_33\ (NTFS)	90GB 5GB 25GB 113GB	Broker_33 Market_33 Customer_33
		35	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_34\ (RAW) Z:\Device\Market_34\ (RAW) Z:\Device\Customer_34\ (RAW) Z:\Device\Backup_34\ (NTFS)	90GB 5GB 25GB 113GB	Broker_34 Market_34 Customer_34
		36	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_35\ (RAW) Z:\Device\Market_35\ (RAW) Z:\Device\Customer_35\ (RAW) Z:\Device\Backup_35\ (NTFS)	90GB 5GB 25GB 113GB	Broker_35 Market_35 Customer_35
		37	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_36\ (RAW) Z:\Device\Market_36\ (RAW) Z:\Device\Customer_36\ (RAW) Z:\Device\Backup_36\ (NTFS)	90GB 5GB 25GB 113GB	Broker_36 Market_36 Customer_36
6b	2-1	38	14x36GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_37\ (RAW) Z:\Device\Market_37\ (RAW) Z:\Device\Customer_37\ (RAW) Z:\Device\Backup_37\ (NTFS)	90GB 5GB 25GB 113GB	Broker_37 Market_37 Customer_37
		39	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_38\ (RAW) Z:\Device\Market_38\ (RAW) Z:\Device\Customer_38\ (RAW) Z:\Device\Backup_38\ (NTFS)	90GB 5GB 25GB 113GB	Broker_38 Market_38 Customer_38
		40	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_39\ (RAW) Z:\Device\Market_39\ (RAW) Z:\Device\Customer_39\ (RAW) Z:\Device\Backup_39\ (NTFS)	90GB 5GB 25GB 113GB	Broker_39 Market_39 Customer_39
		41	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_40\ (RAW) Z:\Device\Market_40\ (RAW) Z:\Device\Customer_40\ (RAW) Z:\Device\Backup_40\ (NTFS)	90GB 5GB 25GB 113GB	Broker_40 Market_40 Customer_40

**Table 2.2 : Data Distribution for the Tested Configuration (Cont)**

7a	2-3	42	14x36GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_41\ (RAW) Z:\Device\Market_41\ (RAW) Z:\Device\Customer_41\ (RAW) Z:\Device\Backup_41\ (NTFS)	90GB 5GB 25GB 113GB	Broker_41 Market_41 Customer_41
		43	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_42\ (RAW) Z:\Device\Market_42\ (RAW) Z:\Device\Customer_42\ (RAW) Z:\Device\Backup_42\ (NTFS)	90GB 5GB 25GB 113GB	Broker_42 Market_42 Customer_42
		44	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_43\ (RAW) Z:\Device\Market_43\ (RAW) Z:\Device\Customer_43\ (RAW) Z:\Device\Backup_43\ (NTFS)	90GB 5GB 25GB 113GB	Broker_43 Market_43 Customer_43
		45	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_44\ (RAW) Z:\Device\Market_44\ (RAW) Z:\Device\Customer_44\ (RAW) Z:\Device\Backup_44\ (NTFS)	90GB 5GB 25GB 113GB	Broker_44 Market_44 Customer_44
	7b	46	14x36GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_45\ (RAW) Z:\Device\Market_45\ (RAW) Z:\Device\Customer_45\ (RAW) Z:\Device\Backup_45\ (NTFS)	90GB 5GB 25GB 113GB	Broker_45 Market_45 Customer_45
		47	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_46\ (RAW) Z:\Device\Market_46\ (RAW) Z:\Device\Customer_46\ (RAW) Z:\Device\Backup_46\ (NTFS)	90GB 5GB 25GB 113GB	Broker_46 Market_46 Customer_46
		48	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_47\ (RAW) Z:\Device\Market_47\ (RAW) Z:\Device\Customer_47\ (RAW) Z:\Device\Backup_47\ (NTFS)	90GB 5GB 25GB 113GB	Broker_47 Market_47 Customer_47
		49	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_48\ (RAW) Z:\Device\Market_48\ (RAW) Z:\Device\Customer_48\ (RAW) Z:\Device\Backup_48\ (NTFS)	90GB 5GB 25GB 113GB	Broker_48 Market_48 Customer_48
8a	2-5	50	14x36GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_49\ (RAW) Z:\Device\Market_49\ (RAW) Z:\Device\Customer_49\ (RAW) Z:\Device\Backup_49\ (NTFS)	90GB 5GB 25GB 113GB	Broker_49 Market_49 Customer_49
		51	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_50\ (RAW) Z:\Device\Market_50\ (RAW) Z:\Device\Customer_50\ (RAW) Z:\Device\Backup_50\ (NTFS)	90GB 5GB 25GB 113GB	Broker_50 Market_50 Customer_50
		52	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_51\ (RAW) Z:\Device\Market_51\ (RAW) Z:\Device\Customer_51\ (RAW) Z:\Device\Backup_51\ (NTFS)	90GB 5GB 25GB 113GB	Broker_51 Market_51 Customer_51
		53	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_52\ (RAW) Z:\Device\Market_52\ (RAW) Z:\Device\Customer_52\ (RAW) Z:\Device\Backup_52\ (NTFS)	90GB 5GB 25GB 113GB	Broker_52 Market_52 Customer_52
	8b	54	14x36GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_53\ (RAW) Z:\Device\Market_53\ (RAW) Z:\Device\Customer_53\ (RAW) Z:\Device\Backup_53\ (NTFS)	90GB 5GB 25GB 113GB	Broker_53 Market_53 Customer_53
		55	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_54\ (RAW) Z:\Device\Market_54\ (RAW) Z:\Device\Customer_54\ (RAW) Z:\Device\Backup_54\ (NTFS)	90GB 5GB 25GB 113GB	Broker_54 Market_54 Customer_54
		56	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_55\ (RAW) Z:\Device\Market_55\ (RAW) Z:\Device\Customer_55\ (RAW) Z:\Device\Backup_55\ (NTFS)	90GB 5GB 25GB 113GB	Broker_55 Market_55 Customer_55
		57	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_56\ (RAW) Z:\Device\Market_56\ (RAW) Z:\Device\Customer_56\ (RAW) Z:\Device\Backup_56\ (NTFS)	90GB 5GB 25GB 113GB	Broker_56 Market_56 Customer_56

**Table 2.2 : Data Distribution for the Tested Configuration (Cont)**

9a	2-7	58	14x36GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_57\ (RAW) Z:\Device\Market_57\ (RAW) Z:\Device\Customer_57\ (RAW) Z:\Device\Backup_57\ (NTFS)	90GB 5GB 25GB 113GB	Broker_57 Market_57 Customer_57
		59	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_58\ (RAW) Z:\Device\Market_58\ (RAW) Z:\Device\Customer_58\ (RAW) Z:\Device\Backup_58\ (NTFS)	90GB 5GB 25GB 113GB	Broker_58 Market_58 Customer_58
		60	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_59\ (RAW) Z:\Device\Market_59\ (RAW) Z:\Device\Customer_59\ (RAW) Z:\Device\Backup_59\ (NTFS)	90GB 5GB 25GB 113GB	Broker_59 Market_59 Customer_59
		61	14x36GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_60\ (RAW) Z:\Device\Market_60\ (RAW) Z:\Device\Customer_60\ (RAW) Z:\Device\Backup_60\ (NTFS)	90GB 5GB 25GB 113GB	Broker_60 Market_60 Customer_60

**Table 2.3 : Data Distribution for the Priced Configuration**

HBA#	Slot#	Disk#	Drives Enclosure model RAID level	Partition Filesystem	Size	Use
0	0-1	0	2x73GB, 10K, SCSI internal RAID10	C: (NTFS)	67.85GB	OS
1	0-5	1	15x73GB, 15K, FC S2500 Base model RAID50	Z: (NTFS) Z:\Device\TPCE_Log_01\ (RAW) Z:\Device\TPCE_Log_02\ (RAW) Z:\Device\TPCE_Log_03\ (RAW)	10GB 300GB 300GB 300GB	OS Log1 Log2 Log3
2a	1-1	2	14x73GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_01\ (RAW) Z:\Device\Market_01\ (RAW) Z:\Device\Customer_01\ (RAW) Z:\Device\Backup_01\ (NTFS) -> alias Z:\Device\Data_01\ (NTFS)	90GB 5GB 25GB 346GB (346GB)	Broker_01 Market_01 Customer_01 TPCE_Misc.ndf
		3	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_02\ (RAW) Z:\Device\Market_02\ (RAW) Z:\Device\Customer_02\ (RAW) Z:\Device\Backup_02\ (NTFS)	90GB 5GB 25GB 346GB	Broker_02 Market_02 Customer_02
		4	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_03\ (RAW) Z:\Device\Market_03\ (RAW) Z:\Device\Customer_03\ (RAW) Z:\Device\Backup_03\ (NTFS)	90GB 5GB 25GB 346GB	Broker_03 Market_03 Customer_03
		5	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_04\ (RAW) Z:\Device\Market_04\ (RAW) Z:\Device\Customer_04\ (RAW) Z:\Device\Backup_04\ (NTFS)	90GB 5GB 25GB 346GB	Broker_04 Market_04 Customer_04
	2b	6	14x73GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_05\ (RAW) Z:\Device\Market_05\ (RAW) Z:\Device\Customer_05\ (RAW) Z:\Device\Backup_05\ (NTFS) -> alias Z:\Device\TPCE_TempDB\ (NTFS)	90GB 5GB 25GB 346GB (346GB)	Broker_05 Market_05 Customer_05 tempdb.mdf
		7	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_06\ (RAW) Z:\Device\Market_06\ (RAW) Z:\Device\Customer_06\ (RAW) Z:\Device\Backup_06\ (NTFS)	90GB 5GB 25GB 346GB	Broker_06 Market_06 Customer_06
		8	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_07\ (RAW) Z:\Device\Market_07\ (RAW) Z:\Device\Customer_07\ (RAW) Z:\Device\Backup_07\ (NTFS)	90GB 5GB 25GB 346GB	Broker_07 Market_07 Customer_07
		9	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_08\ (RAW) Z:\Device\Market_08\ (RAW) Z:\Device\Customer_08\ (RAW) Z:\Device\Backup_08\ (NTFS)	90GB 5GB 25GB 346GB	Broker_08 Market_08 Customer_08

**Table 2.3 : Data Distribution for the Priced Configuration (Cont)**

3a	1-3	10	14x73GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_09\ (RAW) Z:\Device\Market_09\ (RAW) Z:\Device\Customer_09\ (RAW) Z:\Device\Backup_09\ (NTFS) -> alias Z:\Device\TPCE_TempLog\ (NTFS)	90GB 5GB 25GB 346GB	Broker_09 Market_09 Customer_09 templog.ldf
		11	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_10\ (RAW) Z:\Device\Market_10\ (RAW) Z:\Device\Customer_10\ (RAW) Z:\Device\Backup_10\ (NTFS)	90GB 5GB 25GB 346GB	Broker_10 Market_10 Customer_10
		12	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_11\ (RAW) Z:\Device\Market_11\ (RAW) Z:\Device\Customer_11\ (RAW) Z:\Device\Backup_11\ (NTFS)	90GB 5GB 25GB 346GB	Broker_11 Market_11 Customer_11
		13	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_12\ (RAW) Z:\Device\Market_12\ (RAW) Z:\Device\Customer_12\ (RAW) Z:\Device\Backup_12\ (NTFS)	90GB 5GB 25GB 346GB	Broker_12 Market_12 Customer_12
3b		14	14x73GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_13\ (RAW) Z:\Device\Market_13\ (RAW) Z:\Device\Customer_13\ (RAW) Z:\Device\Backup_13\ (NTFS)	90GB 5GB 25GB 346GB	Broker_13 Market_13 Customer_13
		15	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_14\ (RAW) Z:\Device\Market_14\ (RAW) Z:\Device\Customer_14\ (RAW) Z:\Device\Backup_14\ (NTFS)	90GB 5GB 25GB 346GB	Broker_14 Market_14 Customer_14
		16	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_15\ (RAW) Z:\Device\Market_15\ (RAW) Z:\Device\Customer_15\ (RAW) Z:\Device\Backup_15\ (NTFS)	90GB 5GB 25GB 346GB	Broker_15 Market_15 Customer_15
		17	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_16\ (RAW) Z:\Device\Market_16\ (RAW) Z:\Device\Customer_16\ (RAW) Z:\Device\Backup_16\ (NTFS)	90GB 5GB 25GB 346GB	Broker_16 Market_16 Customer_16
4a	1-5	18	14x73GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_17\ (RAW) Z:\Device\Market_17\ (RAW) Z:\Device\Customer_17\ (RAW) Z:\Device\Backup_17\ (NTFS)	90GB 5GB 25GB 346GB	Broker_17 Market_17 Customer_17
		19	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_18\ (RAW) Z:\Device\Market_18\ (RAW) Z:\Device\Customer_18\ (RAW) Z:\Device\Backup_18\ (NTFS)	90GB 5GB 25GB 346GB	Broker_18 Market_18 Customer_18
		20	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_19\ (RAW) Z:\Device\Market_19\ (RAW) Z:\Device\Customer_19\ (RAW) Z:\Device\Backup_19\ (NTFS)	90GB 5GB 25GB 346GB	Broker_19 Market_19 Customer_19
		21	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_20\ (RAW) Z:\Device\Market_20\ (RAW) Z:\Device\Customer_20\ (RAW) Z:\Device\Backup_20\ (NTFS)	90GB 5GB 25GB 346GB	Broker_20 Market_20 Customer_20
4b		22	14x73GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_21\ (RAW) Z:\Device\Market_21\ (RAW) Z:\Device\Customer_21\ (RAW) Z:\Device\Backup_21\ (NTFS)	90GB 5GB 25GB 346GB	Broker_21 Market_21 Customer_21
		23	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_22\ (RAW) Z:\Device\Market_22\ (RAW) Z:\Device\Customer_22\ (RAW) Z:\Device\Backup_22\ (NTFS)	90GB 5GB 25GB 346GB	Broker_22 Market_22 Customer_22
		24	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_23\ (RAW) Z:\Device\Market_23\ (RAW) Z:\Device\Customer_23\ (RAW) Z:\Device\Backup_23\ (NTFS)	90GB 5GB 25GB 346GB	Broker_23 Market_23 Customer_23
		25	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_24\ (RAW) Z:\Device\Market_24\ (RAW) Z:\Device\Customer_24\ (RAW) Z:\Device\Backup_24\ (NTFS)	90GB 5GB 25GB 346GB	Broker_24 Market_24 Customer_24

**Table 2.3 : Data Distribution for the Priced Configuration (Cont)**

5a	1-7	26	14x73GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_25\ (RAW) Z:\Device\Market_25\ (RAW) Z:\Device\Customer_25\ (RAW) Z:\Device\Backup_25\ (NTFS)	90GB 5GB 25GB 346GB	Broker_25 Market_25 Customer_25
		27	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_26\ (RAW) Z:\Device\Market_26\ (RAW) Z:\Device\Customer_26\ (RAW) Z:\Device\Backup_26\ (NTFS)	90GB 5GB 25GB 346GB	Broker_26 Market_26 Customer_26
		28	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_27\ (RAW) Z:\Device\Market_27\ (RAW) Z:\Device\Customer_27\ (RAW) Z:\Device\Backup_27\ (NTFS)	90GB 5GB 25GB 346GB	Broker_27 Market_27 Customer_27
		29	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_28\ (RAW) Z:\Device\Market_28\ (RAW) Z:\Device\Customer_28\ (RAW) Z:\Device\Backup_28\ (NTFS)	90GB 5GB 25GB 346GB	Broker_28 Market_28 Customer_28
5b		30	14x73GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_29\ (RAW) Z:\Device\Market_29\ (RAW) Z:\Device\Customer_29\ (RAW) Z:\Device\Backup_29\ (NTFS)	90GB 5GB 25GB 346GB	Broker_29 Market_29 Customer_29
		31	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_30\ (RAW) Z:\Device\Market_30\ (RAW) Z:\Device\Customer_30\ (RAW) Z:\Device\Backup_30\ (NTFS)	90GB 5GB 25GB 346GB	Broker_30 Market_30 Customer_30
		32	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_31\ (RAW) Z:\Device\Market_31\ (RAW) Z:\Device\Customer_31\ (RAW) Z:\Device\Backup_31\ (NTFS)	90GB 5GB 25GB 346GB	Broker_31 Market_31 Customer_31
		33	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_32\ (RAW) Z:\Device\Market_32\ (RAW) Z:\Device\Customer_32\ (RAW) Z:\Device\Backup_32\ (NTFS)	90GB 5GB 25GB 346GB	Broker_32 Market_32 Customer_32
6a	2-1	34	14x73GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_33\ (RAW) Z:\Device\Market_33\ (RAW) Z:\Device\Customer_33\ (RAW) Z:\Device\Backup_33\ (NTFS)	90GB 5GB 25GB 346GB	Broker_33 Market_33 Customer_33
		35	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_34\ (RAW) Z:\Device\Market_34\ (RAW) Z:\Device\Customer_34\ (RAW) Z:\Device\Backup_34\ (NTFS)	90GB 5GB 25GB 346GB	Broker_34 Market_34 Customer_34
		36	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_35\ (RAW) Z:\Device\Market_35\ (RAW) Z:\Device\Customer_35\ (RAW) Z:\Device\Backup_35\ (NTFS)	90GB 5GB 25GB 346GB	Broker_35 Market_35 Customer_35
		37	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_36\ (RAW) Z:\Device\Market_36\ (RAW) Z:\Device\Customer_36\ (RAW) Z:\Device\Backup_36\ (NTFS)	90GB 5GB 25GB 346GB	Broker_36 Market_36 Customer_36
6b		38	14x73GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_37\ (RAW) Z:\Device\Market_37\ (RAW) Z:\Device\Customer_37\ (RAW) Z:\Device\Backup_37\ (NTFS)	90GB 5GB 25GB 346GB	Broker_37 Market_37 Customer_37
		39	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_38\ (RAW) Z:\Device\Market_38\ (RAW) Z:\Device\Customer_38\ (RAW) Z:\Device\Backup_38\ (NTFS)	90GB 5GB 25GB 346GB	Broker_38 Market_38 Customer_38
		40	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_39\ (RAW) Z:\Device\Market_39\ (RAW) Z:\Device\Customer_39\ (RAW) Z:\Device\Backup_39\ (NTFS)	90GB 5GB 25GB 346GB	Broker_39 Market_39 Customer_39
		41	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_40\ (RAW) Z:\Device\Market_40\ (RAW) Z:\Device\Customer_40\ (RAW) Z:\Device\Backup_40\ (NTFS)	90GB 5GB 25GB 346GB	Broker_40 Market_40 Customer_40

**Table 2.3 : Data Distribution for the Priced Configuration (Cont)**

7a	2-3	42	14x73GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_41\ (RAW) Z:\Device\Market_41\ (RAW) Z:\Device\Customer_41\ (RAW) Z:\Device\Backup_41\ (NTFS)	90GB 5GB 25GB 346GB	Broker_41 Market_41 Customer_41
		43	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_42\ (RAW) Z:\Device\Market_42\ (RAW) Z:\Device\Customer_42\ (RAW) Z:\Device\Backup_42\ (NTFS)	90GB 5GB 25GB 346GB	Broker_42 Market_42 Customer_42
		44	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_43\ (RAW) Z:\Device\Market_43\ (RAW) Z:\Device\Customer_43\ (RAW) Z:\Device\Backup_43\ (NTFS)	90GB 5GB 25GB 346GB	Broker_43 Market_43 Customer_43
		45	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_44\ (RAW) Z:\Device\Market_44\ (RAW) Z:\Device\Customer_44\ (RAW) Z:\Device\Backup_44\ (NTFS)	90GB 5GB 25GB 346GB	Broker_44 Market_44 Customer_44
7b	2-3	46	14x73GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_45\ (RAW) Z:\Device\Market_45\ (RAW) Z:\Device\Customer_45\ (RAW) Z:\Device\Backup_45\ (NTFS)	90GB 5GB 25GB 346GB	Broker_45 Market_45 Customer_45
		47	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_46\ (RAW) Z:\Device\Market_46\ (RAW) Z:\Device\Customer_46\ (RAW) Z:\Device\Backup_46\ (NTFS)	90GB 5GB 25GB 346GB	Broker_46 Market_46 Customer_46
		48	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_47\ (RAW) Z:\Device\Market_47\ (RAW) Z:\Device\Customer_47\ (RAW) Z:\Device\Backup_47\ (NTFS)	90GB 5GB 25GB 346GB	Broker_47 Market_47 Customer_47
		49	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_48\ (RAW) Z:\Device\Market_48\ (RAW) Z:\Device\Customer_48\ (RAW) Z:\Device\Backup_48\ (NTFS)	90GB 5GB 25GB 346GB	Broker_48 Market_48 Customer_48
8a	2-5	50	14x73GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_49\ (RAW) Z:\Device\Market_49\ (RAW) Z:\Device\Customer_49\ (RAW) Z:\Device\Backup_49\ (NTFS)	90GB 5GB 25GB 346GB	Broker_49 Market_49 Customer_49
		51	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_50\ (RAW) Z:\Device\Market_50\ (RAW) Z:\Device\Customer_50\ (RAW) Z:\Device\Backup_50\ (NTFS)	90GB 5GB 25GB 346GB	Broker_50 Market_50 Customer_50
		52	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_51\ (RAW) Z:\Device\Market_51\ (RAW) Z:\Device\Customer_51\ (RAW) Z:\Device\Backup_51\ (NTFS)	90GB 5GB 25GB 346GB	Broker_51 Market_51 Customer_51
		53	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_52\ (RAW) Z:\Device\Market_52\ (RAW) Z:\Device\Customer_52\ (RAW) Z:\Device\Backup_52\ (NTFS)	90GB 5GB 25GB 346GB	Broker_52 Market_52 Customer_52
8b	2-5	54	14x73GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_53\ (RAW) Z:\Device\Market_53\ (RAW) Z:\Device\Customer_53\ (RAW) Z:\Device\Backup_53\ (NTFS)	90GB 5GB 25GB 346GB	Broker_53 Market_53 Customer_53
		55	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_54\ (RAW) Z:\Device\Market_54\ (RAW) Z:\Device\Customer_54\ (RAW) Z:\Device\Backup_54\ (NTFS)	90GB 5GB 25GB 346GB	Broker_54 Market_54 Customer_54
		56	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_55\ (RAW) Z:\Device\Market_55\ (RAW) Z:\Device\Customer_55\ (RAW) Z:\Device\Backup_55\ (NTFS)	90GB 5GB 25GB 346GB	Broker_55 Market_55 Customer_55
		57	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_56\ (RAW) Z:\Device\Market_56\ (RAW) Z:\Device\Customer_56\ (RAW) Z:\Device\Backup_56\ (NTFS)	90GB 5GB 25GB 346GB	Broker_56 Market_56 Customer_56



**Table 2.3 : Data Distribution for the Priced Configuration (Cont)**

9a	2-7	58	14x73GB, 15K, FC S2500 Base model RAID10	Z:\Device\Broker_57\ (RAW) Z:\Device\Market_57\ (RAW) Z:\Device\Customer_57\ (RAW) Z:\Device\Backup_57\ (NTFS)	90GB 5GB 25GB 346GB	Broker_57 Market_57 Customer_57
		59	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_58\ (RAW) Z:\Device\Market_58\ (RAW) Z:\Device\Customer_58\ (RAW) Z:\Device\Backup_58\ (NTFS)	90GB 5GB 25GB 346GB	Broker_58 Market_58 Customer_58
		60	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_59\ (RAW) Z:\Device\Market_59\ (RAW) Z:\Device\Customer_59\ (RAW) Z:\Device\Backup_59\ (NTFS)	90GB 5GB 25GB 346GB	Broker_59 Market_59 Customer_59
		61	14x73GB, 15K, FC S2500 Disk Expansion Box RAID10	Z:\Device\Broker_60\ (RAW) Z:\Device\Market_60\ (RAW) Z:\Device\Customer_60\ (RAW) Z:\Device\Backup_60\ (NTFS)	90GB 5GB 25GB 346GB	Broker_60 Market_60 Customer_60

## Type of Database

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).

Microsoft® SQL Server® 2008, a relational database, was used in this benchmark. SQL Server® 2008 stored procedures were used and invoked through library function calls embedded in C++ code.

## Clause 3 : Transaction Related Items

### Vendor-Supplied Code

*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.*

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

### Database Footprint Requirements

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

The database footprint requirements were met.

## Clause 4: SUT, Driver, and Network Related Items

### Network configurations and Driver system

*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).*

There is no difference between the measured and priced configurations in the network configurations. The network configuration of the measured configuration is shown as Figure 1.1 and 1.6.

## Clause 5: EGen Related Items

### 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)*

EGen v1.4.0 was used in the benchmark.

### EGen Code

*A statement that all required TPC-provided EGen code was used in the benchmark must be reported in the Report. (9.5.3.2)*

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

### 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 in the Report.(9.3.5.3)*

A mismatch was found between the data produced by **EGen Loader** and **EGen Driver** in the benchmark configuration.

As a result, a **Trade-Order** transaction using a specific set of values for (exec\_f\_name, exec\_l\_name, exec\_tax\_id) will return an error when it cannot find an expected row in the ACCOUNT\_PERMISSION table. This should never happen – the data should always match.

#### The exact nature of the issue

The problem is caused by a difference in floating point precision between the two architectures used in the benchmark configuration.

The IA64 architecture of the DB server uses 80 bit precision for floating point operations.

The x64 architecture of the clients driver machines uses 64 bit.

The difference in precision between x64 and IA64 architectures can cause the same computation to produce different results for at least one particular value generated by **EGen**.

This difference occurs in the **EGen** routine **CRandom::RndInt64Range**. In the computation below, the highlighted code produced 3030340621.0000000 on IA64 and 3030340622.0000000 on x64 – off by 1. The computation was different by just enough in the value beyond 64-bits that it caused a different result after the cast to INT64.

```
INT64 CRandom::RndInt64Range( INT64 min, INT64 max)
{
    if ( min == max )
        return min;
    // Check on system symbol for 64-bit MAXINT
    //assert( max < MAXINT );
    // This assert would detect when the next line would
    // cause an overflow.
    max++;
    if ( max <= min )
        return max;

    return min + (INT64)(RndDouble() * (double)(max - min));
}
```

In the ACCOUNT\_PERMISSION table, we see the following row generated differently by EGenLoader:

**IA64:**

43001579202|0001|082YT3436CX937|Schmitz|Adina

**x64:**

43001579202|0001|773LX6769NK662|Sethi|Jesse

### The exact nature of the Proposed Fix

EGen was not modified. Instead, it was determined that only a single row in the ACCOUNT\_PERMISSION table was different between the x64 and IA64 generated tables.

The following query:

```
select * from ACCOUNT_PERMISSION where AP_CA_ID = 43001579202
```

produced this output for EGen run on x64:

AP_CA_ID	AP_ACL	AP_TAX_ID	AP_L_NAME	AP_F_NAME
43001579202	0000	341LA3656WT504	Mancia	Steven
43001579202	0001	773LX6769NK662	Sethi	Jesse

(2 row(s) affected)

and this output for EGen run on IA64:

AP_CA_ID	AP_ACL	AP_TAX_ID	AP_L_NAME	AP_F_NAME
43001579202	0000	341LA3656WT504	Mancia	Steven
43001579202	0001	082YT3436CX937	Schmitz	Adina

(2 row(s) affected)

The following post-load step was done to update ACCOUNT\_PERMISSION in a freshly built TPC-E database with EGen v1.4.0 as it is:

```
delete ACCOUNT_PERMISSION
where AP_CA_ID = 43001579202 and AP_TAX_ID = '082YT3436CX937'

insert ACCOUNT_PERMISSION
(AP_CA_ID, AP_ACL, AP_TAX_ID, AP_L_NAME, AP_F_NAME)
values (43001579202, '0001', '773LX6769NK662', 'Sethi', 'Jesse' )
```

These two statements were run using SQL Management Studio against the newly built TPC-E database to correct the data mismatch. After running the statements, the following query:

```
select * from ACCOUNT_PERMISSION where AP_CA_ID = 43001579202
```

Should produce this output:

AP_CA_ID	AP_ACL	AP_TAX_ID	AP_L_NAME	AP_F_NAME
43001579202	0000	341LA3656WT504	Mancia	Steven
43001579202	0001	773LX6769NK662	Sethi	Jesse

(2 row(s) affected)

**Note** that these two statements will need to be repeated each time a TPC-E database is newly built. This can be avoided by doing a backup of the database after a new build followed by the above fix.

## **EGenLoader Extentions**

*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 in the Report (see Clause 5.7.3) (9.3.5.4).*

No extentions were made to the EGenLoader for the benchmark.

## Clause 6 : Performance Metrics and Response Time Related Items

### EGenDriver Items

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

The number of EGenDriverMEE instance is eight. The number of EGenDriverCE instance is eight.

### Measured Throughput

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

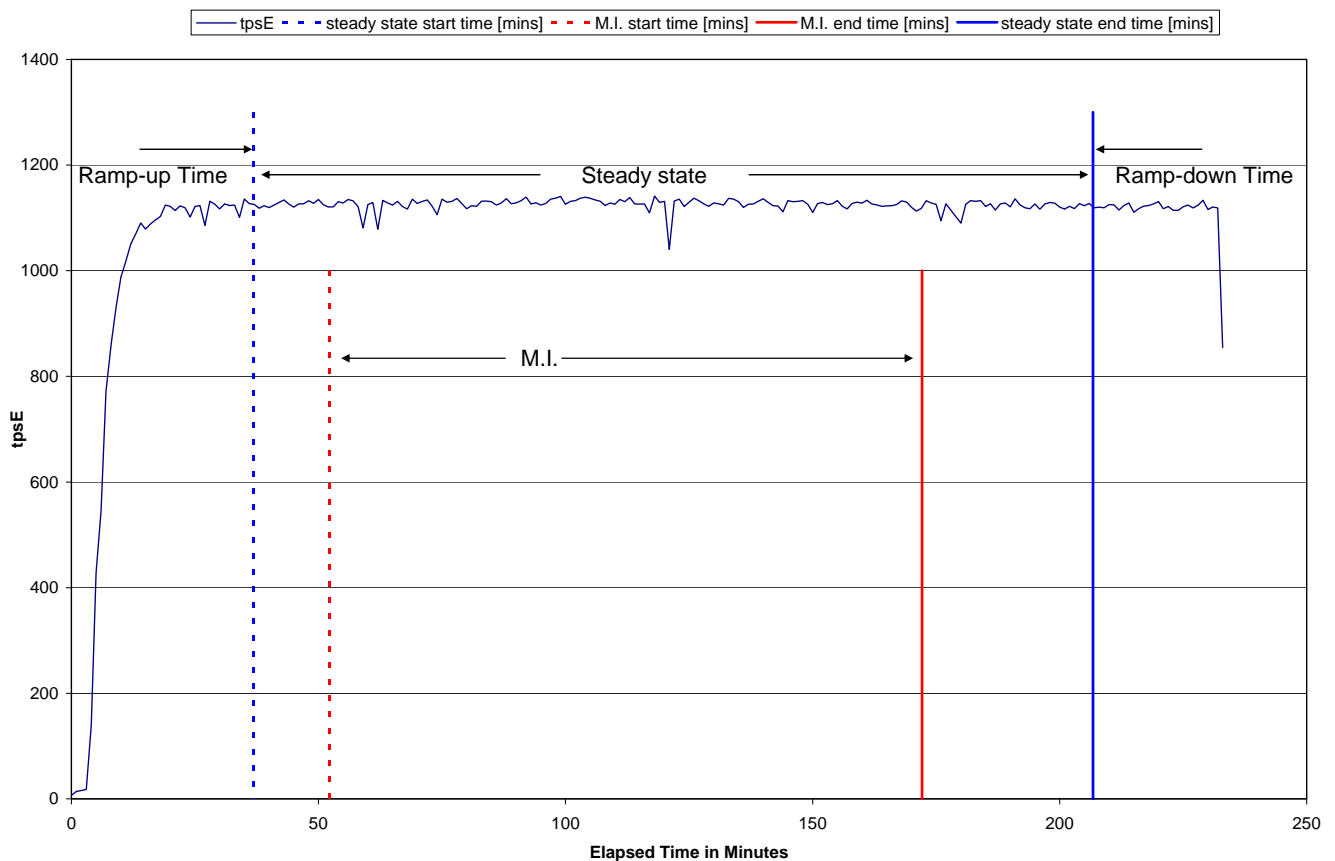
**Measured tpsE**

1126.49 tpsE

### Trade-Result Throughput vs. Elapsed Wall Clock Time

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).

**Figure 6.1 Test Run Graph**



## Steady State

*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.*

During the run, observation of the tpsE as the benchmark ran was used to determine steady state. After the run steady state was confirmed by:

1. Looked at the Test Run Graph and verified that tpsE was steady prior to commencing the Measurement Interval.
2. 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.
3. 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 that the maximum 10 minute average tpsE was not greater than 120% of the Reported Throughput.

## Work Performed During Steady State

*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.).*

A checkpoint in Microsoft® SQL Server® 2008 wrote to disk all updated memory pages that had not been yet actually written to disk. SQL Server® 2008 recovery interval parameter was set to the maximum allowable value to perform checkpoint at specific intervals. Checkpoints were automatically issued at specified duration (420 seconds) and specified intervals (450 seconds), once all users logged in and started sending transactions.

## 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 in the Report.*



Table 6.1 Transaction Averages

Input Parameter	Value	Actual Pct	Required Range
<b>Customer-Position</b>			
by_tax_id	1	50.00%	48% to 52%
get_history	1	49.98%	48% to 52%
<b>Market-Watch</b>			
Securities chosen by	Watch list	59.99%	57% to 63%
	Account ID	35.01%	33% to 37%
	Industry	5.00%	4.5% to 5.5%
<b>Security-Detail</b>			
access_lob	1	1.00%	0.9% to 1.1%
<b>Trade-Lookup</b>			
frame_to_execute	1	30.02%	28.5% to 31.5%
	2	29.96%	28.5% to 31.5%
	3	30.00%	28.5% to 31.5%
	4	10.01%	9.5% to 10.5%
<b>Trade-Order</b>			
Transactions requested by a third party		9.99%	9.5% to 10.5%
Security chosen by company name and issue		39.99%	38% to 42%
type_is_margin	1	8.00%	7.5% to 8.5%
roll_it_back	1	0.99%	0.94% to 1.04%
is_lifo	1	35.02%	33% to 37%
trade_qty	100	25.01%	24% to 26%
	200	24.99%	24% to 26%
	400	24.99%	24% to 26%
	800	25.02%	24% to 26%
trade_type	TMB	30.00%	29.7% to 30.3%
	TMS	30.01%	29.7% to 30.3%
	TLB	20.01%	19.8% to 20.2%
	TLS	9.98%	9.9% to 10.1%
	TSL	10.01%	9.9% to 10.1%
<b>Trade-Update</b>			
frame_to_execute	1	32.91%	31% to 35%
	2	33.01%	31% to 35%
	3	34.07%	32% to 36%

## Clause 7 : Transaction and System Properties Related Items

### 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.*

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 Atomicity, Consistency, Isolation and Durability (ACID). This section quotes the specification definition of each of those properties and describes the tests done as specified and monitored by the auditor, to demonstrate compliance.

### 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.*

Redundancy Level 1 was used for the storage system.

### Atomicity Tests

*The System Under Test must guarantee that Database Transactions are atomic; the system will either perform all individual operations on the data, or will ensure that no partially completed operations leave any effects on the data.*

*Perform a market Trade-Order Transaction with the roll\_it\_back flag set to 0. Verify that the appropriate rows have been inserted in the TRADE and TRADE\_HISTORY tables.*

*Perform a market Trade-Order Transaction with the roll\_it\_back flag set to 1. Verify that no rows associated with the rolled back Trade-Order have been added to the TRADE and TRADE\_HISTORY tables.*

#### EXECUTION OF ATOMICITY TESTS

1. Open a command prompt.
2. Change to the MSTPCE.1.4.0-1005\ACID\Atomicity directory.
3. Run Atomicity.cmd
  - a. Enter the database server name. The default is the current machine.
  - b. Enter the password for the 'sa' account. If you have not set the 'sa' password, please press enter to continue.
4. The output will be in Atomicity\_C.out and Atomicity\_RB.out.

Atomicity.cmd runs a Trade-Order with a commit and notes the new T\_ID. Then it does a select on TRADE and TRADE\_HISTORY to return the rows in those tables with the new T\_ID. The output will be in Atomicity\_C.out

Atomicity.cmd also runs a Trade-Order with a roll back and notes the new T\_ID. Then it does a select on TRADE and TRADE\_HISTORY to return the rows in those tables with the new T\_ID. No rows should be returned. The output will be in Atomicity\_RB.out

#### RESULTS OF ATOMICITY TESTS

The result files "Atomicity\_C.out" and "Atomicity\_RB.out" are placed in "SupportingFiles\Clause7\Atomicity".

### Consistency Tests

*Consistency is the property of the Application that requires any execution of a Database Transaction to take the database from one consistent state to another. A TPC-E database when first populated by EGenLoader must meet these consistency conditions. If data is replicated, as permitted under Clause 2.3.4, each copy must meet the consistency conditions defined in Clause 7.3.2.*

*Three consistency conditions are defined in the following clauses. Explicit demonstration that the conditions are satisfied is required for all three conditions.*

#### Consistency condition 1

*Entries in the BROKER and TRADE tables must satisfy the relationship:  $B\_NUM\_TRADES = count(*)$*

*For each broker defined by:  $(B\_ID = CA\_B\_ID)$  and  $(CA\_ID = T\_CA\_ID)$  and  $(T\_ST\_ID = "CMPT")$ .*

#### Consistency condition 2

Entries in the *BROKER* and *TRADE* tables must satisfy the relationship:  $B\_COMM\_TOTAL = \sum(T\_COMM)$

For each broker defined by:  $(B\_ID = CA\_B\_ID)$  and  $(CA\_ID = T\_CA\_ID)$  and  $(T\_ST\_ID = "CMPT")$ .

### **Consistency condition 3**

Entries in the *HOLDING\_SUMMARY* and *HOLDING* tables must satisfy the relationship:  $HS\_QTY = \sum(H\_QTY)$

For each holding summary defined by:  $(HS\_CA\_ID = H\_CA\_ID)$  and  $(HS\_S\_SYMB = H\_S\_SYMB)$ .

The three consistency conditions must be tested after initial database population and after any Business Recovery tests.

Consistency conditions one through three were tested using a script to issue queries to the database, and we executed it after initial database population and after Business Recovery test.

### **EXECUTION OF CONSISTENCY TESTS**

1. Open a command prompt.
2. Change to the MSTPCE. 1.4.0-1005\ACID\Consistency directory.
3. Run Consistency.cmd
4. Enter the database server name. The default is the current machine.
5. Enter the password for the 'sa' account. If you have not set the 'sa' password, please press enter to continue.
6. The output will be in Consistency.out.

### **RESULTS OF CONSISTENCY TESTS**

- For the test executed right after the initial database population, the result file "Consistency.out" is placed in "SupportingFiles\Clause7\Consistency".
- For the test executed right after the Business Recovery test, the result file "Consistency2.out" is placed in "SupportingFiles\Clause7\Durability\BusinessRecovery".

## **Isolation Tests**

Systems that implement Transaction isolation using a locking and/or versioning scheme must demonstrate compliance with the isolation requirements by executing the tests described in Clause 7.4.2.

The following isolation tests are designed to verify that the configuration and implementation of the System Under Test provides the Transactions with the required isolation levels defined in Clause 7.4.1.3.

We used SQL Server "osql" command and Windows "notepad.exe" for these Isolation Tests.

### **EXECUTION OF ISOLATION TEST #1 (P3 TEST IN READ-WRITE)**

1. Open 1st command prompt.
2. Execute Isolation1\_S1.  
"osql -E -iIsolation1\_S1.sql -oIso1\_S1.out"
3. Open "Iso1\_S1.out" with "notepad.exe".
4. Scroll to the bottom of the "Iso1\_S1.out" and record the "Trade ID Returned".
5. Open "Isolation1\_S2.sql" with "notepad.exe".
6. Copy the Customer Account Used to the @acct\_id variable near the top of "Isolation1\_S2.sql".
7. Copy the Symbol Used to the @symbol variable near the top of "Isolation1\_S2.sql".
8. Save "Isolation1\_S2.sql".
9. Execute Isolation1\_S2  
"osql -E -iIsolation1\_S2.sql -oIso1\_S2.out"
10. Open "Iso1\_S2.out" with "notepad.exe".

11. Scroll to the bottom of the "Iso1\_S2.out" and record the "Trade ID Returned".
12. Open "Isolation1\_S3.sql" with "notepad.exe".
13. Copy the Trade ID Used in the "Iso1\_S1.out" to the @trade\_id variable near the top of "Isolation1\_S3.sql".
14. Save "Isolation1\_S3.sql".
15. Open "Isolation1\_S4.sql" with "notepad.exe".
16. Copy the Trade ID Used in the "Iso1\_S2.out" to the @trade\_id variable near the top of "Isolation1\_S4.sql".
17. Save "Isolation1\_S4.sql".
18. Open 2nd command prompt.
19. Execute Isolation1\_S3 in 1st command prompt  
`"osql -E -iIsolation1_S3.sql -oIso1_S3.out"`
20. And then execute Isolation1\_S4 in 2nd command prompt  
`"osql -E -iIsolation1_S4.sql -oIso1_S4.out"`

Note, the SQL code and the instrumented stored procedure will do the appropriate pausing as required in the specification.

#### **VERIFICATION OF ISOLATION TEST #1 (P3 TEST IN READ-WRITE)**

1. Record the "Holding Summary After First Execution of Trade Result Frame 1:" value of HS\_QTY. This is found near the top of "Iso1\_S3.out". Verify that this is set to 0.
2. Record the "Holding Summary After Second Execution of Trade Result Frame 1:" value of HS\_QTY. This is found near the top of "Iso1\_S3.out". Verify that this is set to 0.
3. The Trade Result in Isolation1\_S3 should now block with the Trade Result in Isolation1\_S4.
4. Since the Isolation1\_S3 was blocked from continuing, the verification will use the "Case B" as defined in Clause 7.4.2.1, Items 6B and 7B.
5. Record the "Holding Summary After Trade Result Frame 1:" value of HS\_QTY. This is found near the top of "Iso1\_S4.out". It should be 0.

#### **RESULT OF ISOLATION TEST #1 (P3 TEST IN READ-WRITE)**

The result files "Iso1\_S1.out", "Iso1\_S2.out", "Iso1\_S3.out" and "Iso1\_S4.out" are placed in "SupportingFiles\Clause7\Isolation".

#### **EXECUTION OF ISOLATION TEST #2 (P2 TEST IN READ-WRITE)**

1. Open 1st command prompt.
2. Execute Isolation2\_S1.  
`"osql -E -iIsolation2_S1.sql -oIso2_S1.out"`
3. Open "Iso2\_S1.out" with "notepad.exe".
4. Scroll to the bottom of "Iso2\_S1.out" and record the "Holding Summary Quantity" and the "Trade ID Returned".
5. Open "Isolation2\_S2.sql" with "notepad.exe".
6. Copy the Customer Account Used from "Iso2\_S1.out" to the @acct\_id variable near the top of "Isolation2\_S2.sql".
7. Copy the Symbol Used from "Iso2\_S1.out" to the @symbol variable near the top of "Isolation2\_S2.sql".
8. Save "Isolation2\_S2.sql".
9. Execute Isolation2\_S2.  
`"osql -E -iIsolation2_S2.sql -oIso2_S2.out"`
10. Open "Iso2\_S2.out" with "notepad.exe".

11. Scroll to the bottom of "Iso2\_S2" and record the Trade ID Returned.
12. Open "Isolation2\_S3.sql" with "notepad.exe".
13. Copy the Trade ID Used in "Iso2\_S1.out" to the @trade\_id variable near the top of "Isolation2\_S3.sql".
14. Save "Isolation2\_S3.sql".
15. Open Isolation2\_S4.sql with "notepad.exe".
16. Copy the Trade ID Used in "Iso2\_S2.out" to the @trade\_id variable near the top of "Isolation2\_S4.sql".
17. Save "Isolation2\_S4.sql".
18. Open 2nd command prompt.
19. Execute Isolation2\_S3 in 1st command prompt.  
`"osql -E -iIsolation2_S3.sql -oIso2_S3.out"`
20. And then immediately execute Isolation2\_S4 in 2nd command prompt.  
`"osql -E -iIsolation2_S4.sql -oIso2_S4.out"`

Note, the SQL code and the instrumented stored procedure will do the appropriate pausing as required in the specification.

#### **VERIFICATION OF ISOLATION TEST #2 (P2 TEST IN READ-WRITE)**

1. Record the "Holding Summary After First Execution of Trade Result Frame 1:" value of HS\_QTY. This is found near the top of "Iso2\_S3.out".
2. Record the "Holding Summary After Second Execution of Trade Result Frame 1:" value of HS\_QTY. This is found near the top of "Iso2\_S3.out". This value should match the value returned in number 1 above.
3. Record the "Holding Summary After Trade Result Frame 1:" value of HS\_QTY. This is found near the top of "Iso2\_S4.out".
4. Since the Isolation2\_S4 stalls in Frame 2, the verification will use the "Case A" as defined in Clause 7.4.2.2, Items 6A and 7A.
5. Verify that the HS\_QTY remains the same for each read of HOLDING SUMMARY throughput Isolation2\_S3.

#### **RESULT OF ISOLATION TEST #2 (P2 TEST IN READ-WRITE)**

The result files "Iso2\_S1.out", "Iso2\_S2.out", "Iso2\_S3.out" and "Iso2\_S4.out" are placed in "SupportingFiles\Clause7\Isolation".

#### **EXECUTION OF ISOLATION TEST #3 (P1 TEST IN READ-WRITE)**

1. Open 1st command prompt.
  2. Execute Isolation3\_S1.  
`"osql -E -iIsolation3_S1.sql -oIso3_S1.out"`
- This script will initiate the Customer Position and execute two Trade Orders for the remainder of this isolation test to access.
3. Open "Iso3\_S1.out" with "notepad.exe".
  4. Scroll to the bottom of "Iso3\_S1.out" and record the "Customer ID Used" and the "Customer Account Balance".
  5. Open Isolation3\_S2.sql with "notepad.exe".
  6. Copy the first Trade ID Returned from "Iso3\_S1.out" to the top of "Isolation3\_S2.sql".
  7. Copy the Customer Account Used from "Iso3\_S1.out" to the top of "Isolation3\_S2.sql".
  8. Save "Isolation3\_S2.sql".
  9. Open Isolation3\_S3.sql with "notepad.exe".

10. Copy the second Trade ID Returned from "Iso3\_S1.out" to the top of "Isolation3\_S3.sql".
11. Copy the Customer Account Used from "Iso3\_S1.out" to the top of "Isolation3\_S3.sql".
12. Save "Isolation3\_S3.sql".
13. Open 2nd command prompt.
14. Execute Isolation3\_S2 in 1st command prompt.  
`"osql -E -iIsolation3_S2.sql -oIso3_S2.out"`
15. And then immediately execute Isolation3\_S3 in 2nd command prompt.  
`"osql -E -iIsolation3_S3.sql -oIso3_S3.out"`

Note, the SQL code and the instrumented stored procedure will do the appropriate pausing as required in the specification.

### **VERIFICATION OF ISOLATION TEST #3 (P2 TEST IN READ-WRITE)**

1. Record the Customer Account Balance from the bottom of "Iso3\_S1.out".
2. Record the Customer Account Balance and the Settlement Amount from the bottom of "Iso3\_S2.out".
3. Record the Customer Account Balance and the Settlement Amount from the bottom of "Iso3\_S3.out".
4. Since the Trade Result in Isolation3\_S3 blocks until Isolation3\_S2 completes, you may verify the results as follows:  
 $CA\_BAL \text{ (from Isolation3\_S1) } + \text{Settlement Amount (from Isolation3\_S2) } + \text{Settlement Amount (from Isolation3\_S3)}$   
 $= \text{Customer Account Balance (from Isolation3\_S3)}$

### **RESULT OF ISOLATION TEST #3 (P2 TEST IN READ-WRITE)**

The result files "Iso3\_S1.out", "Iso3\_S2.out" and "Iso3\_S3.out" are placed in "SupportingFiles\Clause7\Isolation".

### **EXECUTION OF ISOLATION TEST #4 (P1 TEST IN READ-ONLY)**

1. Open 1st command prompt.
  2. Execute Isolation4\_S1.  
`"osql -E -iIsolation4_S1.sql -oIso4_S1.out"`
- This script will initiate the Customer Position and execute a Trade Order for the remainder of this isolation test to access.
3. Open "Iso4\_S1.out" with "notepad.exe".
  4. Scroll to the bottom of "Iso4\_S1.out" and record the "Customer ID Used", "Customer Account ID Used", "Customer Account Balance", and the "Trade ID Returned".
  5. Open Isolation4\_S2.sql with "notepad.exe".
  6. Copy the "Customer Account ID Used" from "Iso4\_S1.out" to the @acct\_id variable near the top of "Isolation4\_S2.sql".
  7. Copy the "Trade ID Returned" from "Iso4\_S1.out" to the @trade\_id variable near the top of "Isolation4\_S2.sql".
  8. Save "Isolation4\_S2.sql".
  9. Open Isolation4\_S3.sql with "notepad.exe".
  10. Copy the "Customer ID" from "Iso4\_S1.out" to the @cust\_id variable near the top of "Isolation4\_S3.sql".
  11. Copy the "Customer Account ID Used" from "Iso4\_S1.out" to the @acct\_id variable near the top of "Isolation4\_S3.sql".
  12. Save "Isolation4\_S3.sql".
  13. Open 2nd command prompt.
  14. Execute Isolation4\_S2 in 1st command prompt.  
`"osql -E -iIsolation4_S2.sql -oIso4_S2.out"`

15. And then immediately execute Isolation4\_S3 in 2nd command prompt.

```
"osql -E -iIsolation4_S3.sql -oIso4_S3.out"
```

#### VERIFICATION OF ISOLATION TEST #4 (P1 TEST IN READ-ONLY)

1. Record the Customer Account Balance from the bottom of "Iso4\_S1.out".
2. Record the Customer Account Balance and the Settlement Amount from the bottom of "Iso4\_S2.out".
3. Record the Customer Account Balance from the bottom of "Iso4\_S3.out".
4. Since the Customer Position in Isolation4\_S3 blocks until Isolation4\_S2 completes, you may verify the results by CA\_BAL (from Isolation4\_S2) = Customer Account Balance (from Isolation4\_S3)

#### RESULT OF ISOLATION TEST #4 (P1 TEST IN READ-ONLY)

The result files "Iso4\_S1.out", "Iso4\_S2.out" and "Iso4\_S3.out" are placed in "SupportingFiles\Clause7\Isolation".

### Durability Tests

*The System Under Test must be configured to satisfy the requirements for Durability detailed in this clause. Durability is demonstrated by the SUT preserving Committed Transactions and maintaining the consistency of the database after the failures listed in Clause 7.5.2. Durability tests are conducted by inducing Catastrophic and Non-catastrophic failures of components within the SUT. The Non-catastrophic failures of Clause 7.5.5 test the ability of the SUT to maintain access to the data. The Catastrophic failures of Clause 7.5.6 test the SUT's capability of preserving the effects of Committed Transactions. The duration of the Catastrophic failure is reported as the Business Recovery Time in the Report. No system provides complete Durability (i.e., Durability under all possible types of failures). The specific set of single failures addressed in Clause 7.5.2 is defined sufficiently significant to justify demonstration of Durability across such failures. However, the limited nature of the tests listed must not be interpreted to allow other unrecoverable single points of failure.*

- *Permanent irrecoverable failure of any single Durable Medium.*
- *Instantaneous interruption (system crash/system hang) in processing that requires system reboot to recover.*
- *Failure of all or part of memory (loss of contents).*
- *Loss of all external power to the SUT for an indefinite time period (power failure). This must include at least all portions of the SUT that participate in the database portions of Transactions.*

### Durability Test for Data Accessibility

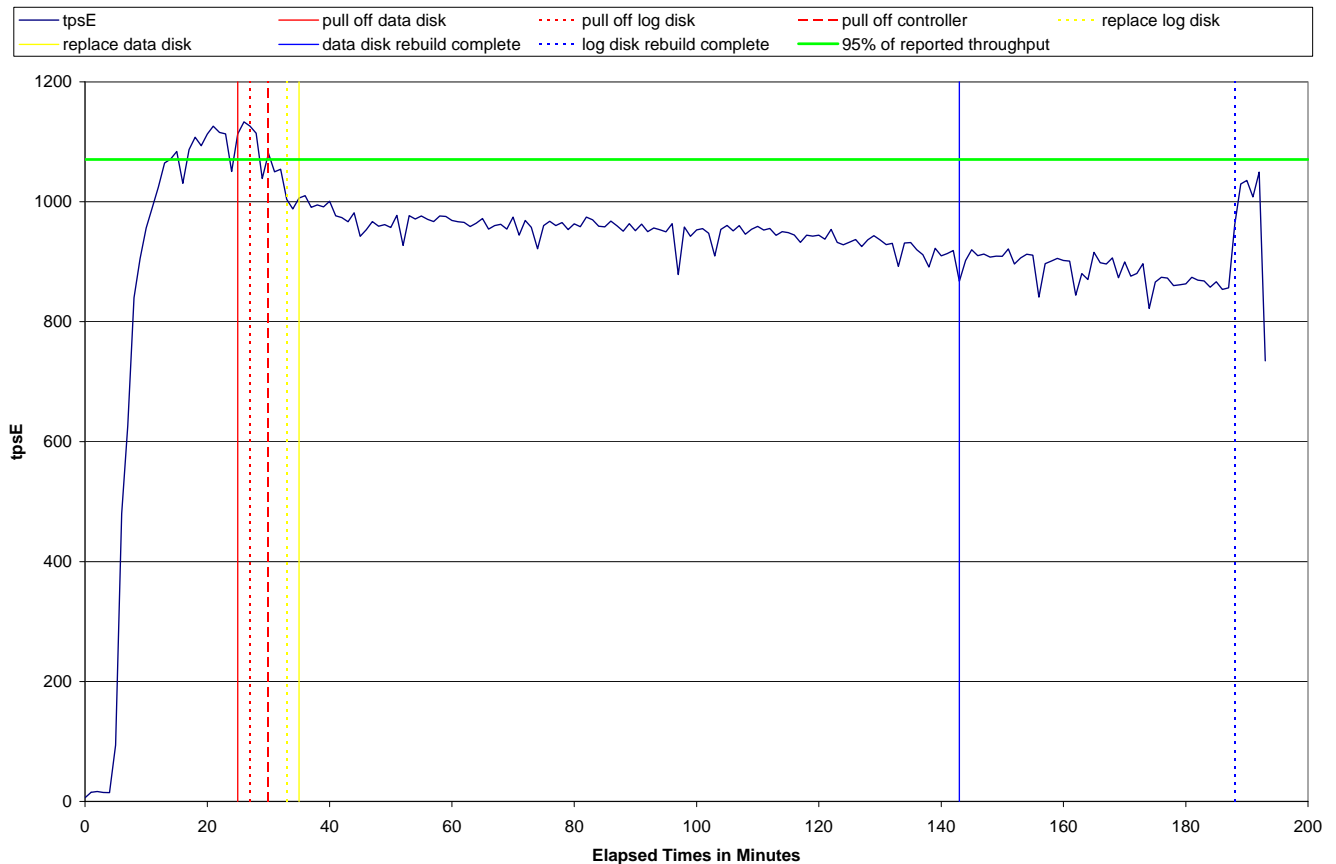
This benchmark result used Redundancy Level 1.

To prove Redundancy Level 1, the following steps were successfully performed. The test for Redundancy Level 1 is the test for Permanent Irrecoverable Failure of any single Durable Medium.

1. Determine the current number of completed trades in the database by running: *select count(\*) as count1 from SETTLEMENT*
2. Start submitting Transactions and ramp up to the Durability Throughput Requirements (as defined in Clause 7.5.3) and satisfy those requirements for at least 5 minutes.
3. Induce the failure described for the redundancy level being demonstrated. In this case fail a disk in a database data array, fail a disk in the database log array, and fail a controller module in the database log array controller. Transactions should continue processing since the database log array uses RAID-50, the database data array uses RAID-10 and the database log array controller has a mirrored cache module.
4. Begin the necessary recovery process, by replacing the failed drives in the database log array and the database data array. A rebuild on each replaced drive should start automatically.
5. Continue running the Driver until these arrays rebuilding is completed.
6. Terminate the run gracefully from the Driver.
7. Retrieve the new number of completed trades in the database by running: *select count(\*) as count2 from SETTLEMENT*
8. Compare the number of executed Trade-Result Transactions on the Driver to (count2 – count1). Verify that (count2 - count1) is equal to the number of successful Trade-Result Transaction records in the Driver log file.
9. Allow recovery process to complete as needed..

Following is a graph of the measured throughput versus elapsed time that must be reported for the run portions of the Data Accessibility tests:

**Figure 7.1 Data Accessibility Graph**



## Durability Test Procedure for Catastrophic Failures

The tests for “Instantaneous interrupt,” “Failure of all or part of memory,” and “Loss of external power to the SUT” were combined.

Note: UPS have been priced for the log array.

The following steps were successfully performed to meet the Durability Throughput Requirements of Clause 7.5.3:

1. Determine the current number of completed trades in the database by running: *select count(\*) as count1 from SETTLEMENT*
2. Start submitting Transactions and ramp up to the Durability Throughput Requirements (as defined in Clause 7.5.3) and satisfy those requirements for at least 20 minutes.
3. Induce all of the Catastrophic failures, in Clause 7.5.2.2, 7.5.2.3 and 7.5.2.4 with following procedure simultaneously;
  - tripping all the three circuit breakers for power source located in back bottom of two cabinets of the database server, NEC Express5800/1320Xf.
  - removing each power cord from each of eight clients, NEC Express5800/120Ri-2.
4. Stop the Driver.
5. Re-power and restart the database server, NEC Express5800/1320Xf. Re-power and restart eight clients, NEC Express5800/120Ri-2.
6. On the NEC Express5800/1320Xf when Windows has started, execute StartSQL.cmd to start up Microsoft SQL Server 2008. Then database recovery starts automatically. Microsoft SQL Server 2008 records timestamps out to the



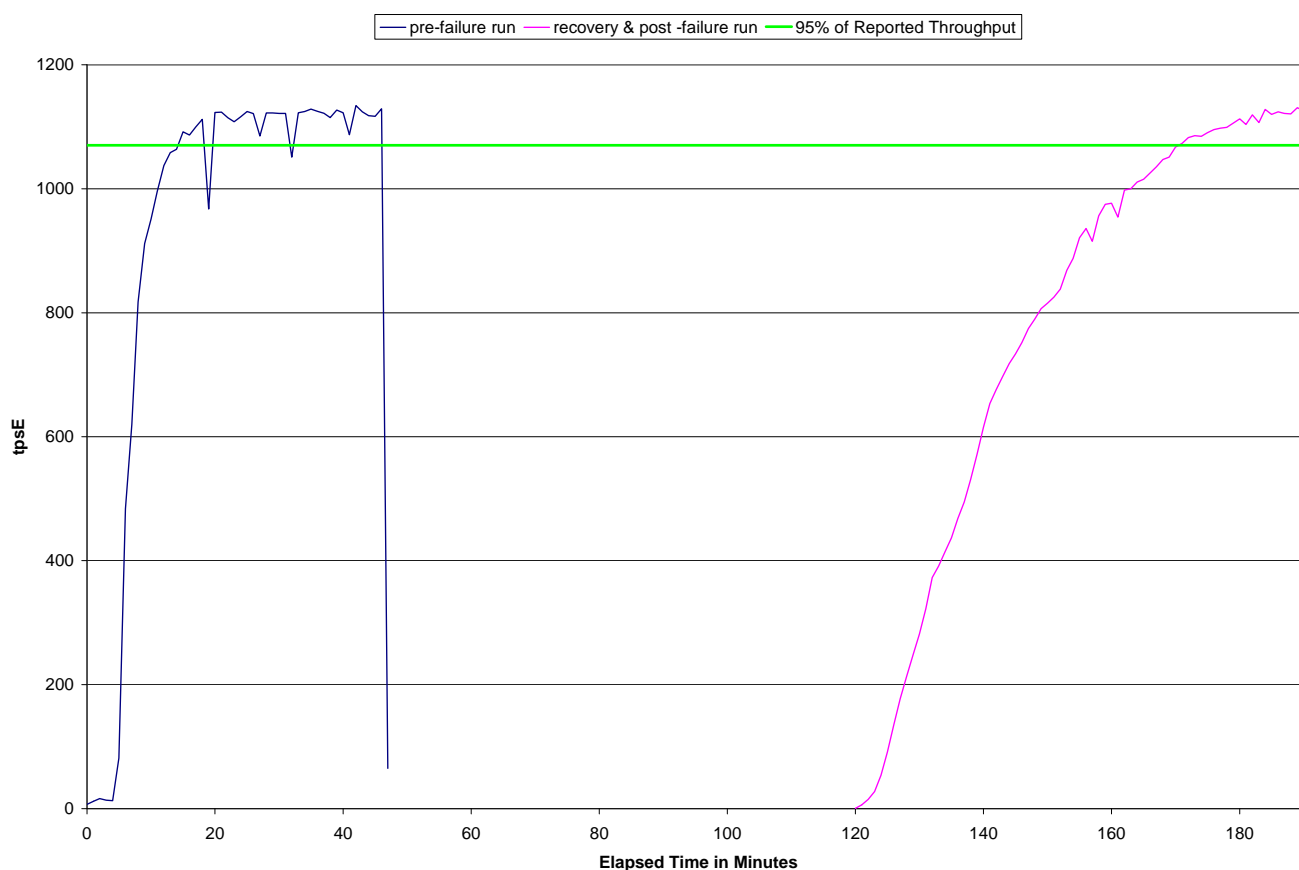
errorlog when the recovery procedure has begun. The timestamp defines the time when Business Recovery starts (see Clause 7.5.6.4).

7. Once the SUT will accept Transactions, start submitting Transactions and ramp up to a Durability Throughput Requirements (as defined in Clause 7.5.3) and satisfy those requirements for at least 20 minutes.
8. Note this time as the end of Business Recovery (see Clause 7.5.6.6).
9. Terminate the Driver gracefully.
10. Verify that no errors were reported by the Driver during steps 7 through 9.
11. Retrieve the new number of completed trades in the database by running: *select count(\*) as count2 from SETTLEMENT*
12. Compare the number of completed Trade-Result Transactions on the Driver to (count2 – count1). Verify that (count2 – count1) is greater or equal to the aggregate number of successful Trade-Result Transaction records in the Driver log file for the runs performed in step 2 and step 7. If there is an inequality, the SETTLEMENT table must contain additional records and the difference must be less than or equal to the maximum number of Transactions which can be simultaneously in-flight from the Driver to the SUT. This number is specific to the implementation of the Driver and configuration settings at the time of the crash.
13. Verify consistency conditions as specified in Clause 7.3.1.1..

The Business Recovery Time was 03:11:25

Following is a graph of the measured throughput versus elapsed time that must be reported for the run portions of the Business Recover Time test:

**Figure 7.2 Business Recover Time Graph**



1.

## Clause 8 : Pricing Related Items

### 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.

#### TPC-E Disk Space Requirements

Customers Used		Performance		1126.49 TpsE			
Broker File Group	Initial Rows	Data (KB)	Index size (KB)	Extra 5% (KB)	Total + 5% (KB)	After run (KB)	Growth (KB)
BROKER	5,700	320	608	46	974	1,280	352
CASH_TRANSACTION	9,061,605,048	898,644,688	1,894,792	45,026,974	945,566,454	926,805,072	26,265,592
CHARGE	15	8	8	1	17	16	-
COMMISSION_RATE	240	16	16	2	34	32	-
SETTLEMENT	9,849,600,000	483,361,888	1,020,128	24,219,101	508,601,117	508,745,696	24,363,680
TRADE	9,849,600,000	1,093,776,824	587,517,016	84,064,692	1,765,358,532	1,703,148,576	21,854,736
TRADE_HISTORY	23,639,047,628	677,822,376	1,767,784	33,979,508	713,569,668	682,458,736	2,868,576
TRADE_REQUEST	-	8	8	1	17	16	-
TRADE_TYPE	5	8	1,032	52	1,092	1,040	-
<b>Customer File Group</b>							
ACCOUNT_PERMISSION	4,046,551	404,880	2,672	20,378	427,930	407,552	-
CUSTOMER	570,000	96,720	26,456	6,159	129,335	123,216	40
CUSTOMER_ACCOUNT	2,850,000	264,848	316,464	29,066	610,378	581,312	-
CUSTOMER_TAXRATE	1,140,000	23,952	952	1,245	26,149	25,072	168
HOLDING	504,292,244	26,975,048	20,039,368	2,350,721	49,365,137	67,568,168	20,553,752
HOLDING_HISTORY	13,200,169,644	480,006,408	250,156,384	36,508,140	766,670,932	733,271,072	3,108,280
HOLDING_SUMMARY	28,352,062	970,336	4,304	48,732	1,023,372	1,951,576	976,936
WATCH_ITEM	57,069,639	1,579,528	6,568	79,305	1,665,401	1,586,440	344
WATCH_LIST	570,000	14,376	12,760	1,357	28,493	27,136	-
<b>Market File Group</b>							
COMPANY	285,000	62,168	18,432	4,030	84,630	80,616	16
COMPANY_COMPETITOR	855,000	23,120	19,824	2,147	45,091	42,944	-
DAILY_MARKET	509,537,250	26,280,168	11,202,568	1,874,137	39,356,873	37,484,208	1,472
EXCHANGE	4	8	8	1	17	16	-
FINANCIAL	5,700,000	670,816	2,400	33,661	706,877	673,536	320
INDUSTRY	102	8	40	2	50	48	-
LAST_TRADE	390,450	18,440	928	968	20,336	37,408	18,040
NEWS_ITEM	570,000	61,798,696	1,008	3,089,985	64,889,689	61,799,752	48
NEWS_XREF	570,000	14,376	912	764	16,052	15,288	-
SECTOR	12	8	24	2	34	32	-
SECURITY	390,450	61,696	28,400	4,505	94,601	90,104	8
STATUS_TYPE	5	8	8	1	17	16	-
<b>Misc File Group</b>							
ADDRESS	855,004	49,488	496	2,499	52,483	50,048	64
TAXRATE	320	24	16	2	42	56	16
ZIP_CODE	14,741	488	16	25	529	504	-
TOTALS (KB)		3,752,921,744	874,042,400	231,348,207	4,858,312,351		
Initial Database Size (MB)		4,518,520	4,413 GB				
<b>Db/Filegroups</b>	<b>LUN Count</b>	<b>Partition Size (KB)</b>	<b>Allocated Size (MB)</b>	<b>Loaded (MB)</b>	<b>Loaded + 5% (MB)</b>	<b>After Run (MB)</b>	<b>8 Hours (MB)</b>
misc_fg	1	362,807,296	354,304	49	52	49	50
broker_fg	60	94,371,840	5,529,600	3,658,015	3,840,916	3,731,602	3,814,508
market_fg	60	5,242,880	307,200	97,856	102,748	97,875	97,897
customer_fg	60	26,214,400	1,536,000	762,600	800,730	786,662	813,771
Settlements	15,255,429						
Initial Growing Space (MB)	4,417,927						
Final Growing Space (MB)	4,515,575	Data LUNS	60	Initial Log Size (MB)	3,079	Log LUNS	1
Delta (MB)	97,648	Disks per LUN	14	Final Log Size (MB)	153,706	Log Disks	20
Data Space per Trade (MB)	0.006400869	Disk Capacity (MB)	68,168	Log Growth (MB)	150,627	Disk Capacity (MB)	68,168
1 Day Data Growth (MB)	207,663	RAID10 Overhead	50%	Log Space per Trade (MB)	0.009873693448	RAID50 Overhead	20.0%
60 Day Space (MB)	16,978,289	Total Space (MB)	28,630,560	1 Day Log Space (MB)	320,331	Log Space (MB)	1,090,688

## Auditor's Attestation Letter

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



Keiichi Yamada  
NEC Corporation  
1-10 Nisshincho  
Fuchu-City, Tokyo 183-8501, Japan

February 23, 2008

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

Platform: NEC Express5800/1320Xf (32 SMP)  
Operating system: Microsoft Windows Server 2008 for Itanium-based Systems  
Database Manager: Microsoft SQL Server 2008 Enterprise Edition

The results were:

CPU's Speed	Memory	Disks	Trade-Result 90% Response Time	tpsE
Tier B, Server: NEC Express5800/1320Xf (32SMP)				
32 x Dual Core Intel Itanium 9150N (1.6GHz)	512 GB (24 MB L3)	860 x 73 GB 15K FC	0.21 Seconds	1,126.49
Tier A, Eight Clients: NEC Express5800/120Ri-2				
2 x Dual Core Intel Xeon 5160 (3.0GHz)	4 GB (4 MB L2)	1x 36 GB SAS	n/a	n/a

In my opinion, these performance results were produced in compliance with the TPC requirements for the benchmark.

The following verification items were given special attention:

- All EGen components were verified to be v1.4.0.
- The transactions were correctly implemented.
- The database was properly scaled and populated for 570,000 customers.
- The mandatory network between the driver and the SUT was configured.
- The ACID properties were met.

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- Input data was generated according to the specified percentages.
- The reported response times were correctly measured.
- All 90% response times were under the specified maximums.
- The measurement interval was representative of steady state conditions.
- The reported measurement interval was 120 minutes.
- The 60 day storage requirement was correctly computed and priced.
- The system pricing was verified for major components and maintenance.

Additional Audit Notes:

1. The measured system included (672) 36 GB disks drives that were substituted by one for one with 73 GB disks, in the priced configuration. Based on the specifications of these disks and on I/O data collected during testing, it is my opinion that this substitution has no significant effect on performance.
2. The IA64 architecture of the server uses 80 bit precision for floating point operations. The x64 architecture of the clients uses 64 bit. The difference in precision between x64 and IA64 architectures causes the same computation to produce different results for one of the values generated by EGen. This issue was addressed by updating the values populated in the database (on IA64) to match the values used by EGenDriver (on x64) during the measurement. Further details are provided in the Full Disclosure Report.

Respectfully Yours,



François Raab, President

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## Clause 9 : Supporting Files

### 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:

- 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.

Clause	Description	path	filename
Introduction	Disk Configuration	SupportingFiles/Introduction/Hardware/	S2500diagram.doc sydiskmap_[1..8].bmp mount.txt mkmp.cmd StorageSetup.doc
	TierB(server) cofiguration	SupportingFiles/Introduction/Hardware/	TierB_1320Xf_120Ri2_setup.doc
	TierA(client) setup	SupportingFiles/Introduction/Hardware/	TierA_120Ri2_setup.doc
	Parameters	SupportingFiles/Introduction/software/	sp_configure.out startSQL.cmd syostune.doc syhwTierB.out syhwTierA_1.out syhwTierA_2.out syhwTierA_3.out syhwTierA_4.out syhwTierA_5.out syhwTierA_6.out syhwTierA_7.out syhwTierA_8.out
	OS Tunable Parameters		
	Tier A Scripts	SupportingFiles/Introduction/software/	ce1.cmd ce2.cmd ce3.cmd ce4.cmd ce5.cmd ce6.cmd ce7.cmd ce8.cmd me1.cmd me2.cmd me3.cmd me4.cmd me5.cmd me6.cmd me7.cmd me8.cmd

Clause2	Table creation scripts	SupportingFiles/Clause2/DDL/	Create_Check_Constraints_Fixed.sql Create_Check_Constraints_Growing.sql Create_Check_Constraints_Scaling.sql Create_FK_Constraints.sql Create_Tables_Fixed.sql Create_Tables_Growing.sql Create_Tables_Scaling.sql Create_Tables_Scaling_Flat.sql Create_TPCE_Types.sql Convert_NI_ITEM_Data.sql Drop_FK_Constraints.sql Drop_Tables_and_Constraints_Fixed.sql Drop_Tables_and_Constraints_Growing.sql Drop_Tables_and_Constraints_Scaling.sql
	Index creation scripts		Create_Clustered_Indexes_Fixed.sql Create_Clustered_Indexes_Growing.sql Create_Clustered_Indexes_Scaling.sql Create_NC_Indexes_Fixed.sql Create_NC_Indexes_Growing.sql Create_NC_Indexes_Scaling.sql
	Load Transaction Frames	SupportingFiles/Clause2/DML/	BrokerVolume.sql CustomerPosition.sql DataMaintenance.sql MarketFeed.sql MarketWatch.sql SecurityDetail.sql TradeLookup.sql TradeOrder.sql TradeResult.sql TradeStatus.sql TradeUpdate.sql
	Create Database	SupportingFiles/Clause2/	Backup.sql Backup_devices.sql Count_Customers.sql Create_database.sql Create_DM_Audit_Table.sql Create_TID_Ranges_Tables.sql CreateTimerTable.sql Database_Options_1.sql Database_Options_2.sql Drop_and_Create_TPCE_INFO.sql EndLoadTimer.sql Get_Next_T_ID.sql InstallLoadTimerProc.sql Load_TPCE_Info.sql MSTPCE Database Setup Reference.pdf remove_database.sql restore.sql SQL_Server_Configuration.sql tempdb.sql Trade_Cleanup.sql Version.sql
	Database Space Scripts	SupportingFiles/Clause2/audit_scripts/Space/	SPfiles.sql SPlog.sql SPUsed.sql
	Database Audit Scripts	SupportingFiles/Clause2/audit_scripts/database/	DB_Check.sql DB_Tables.sql DB_Primary_Key_Check.SQL Create_DB_Audit_Tables.SQL Drop_DB_Audit_Tables.SQL Insert_Duplicates_Tests.sql Referential_Integrity_Tests.sql

Clause3	Transaction Frames	SupportingFiles/Clause3/	BrokerVolume.sql CustomerPosition.sql DataMaintenance.sql MarketFeed.sql MarketWatch.sql SecurityDetail.sql TradeLookup.sql TradeOrder.sql TradeResult.sql TradeStatus.sql TradeUpdate.sql
	BaseServer	SupportingFiles/Clause3/BaseServer/	BaseServer.cpp BaseServer.h BaseServer.vcproj stdafx.cpp stdafx.h SUTServersLocals.h
	SUT_CE_Server	SupportingFiles/Clause3/SUT_CE_Server/	CEServer.cpp CEServer.h CEServerMain.cpp PortDefinitions.h stdafx.cpp stdafx.h SUT_CE_Server.vcproj SUTServer.ncb SUTServer.sln SUTServer.suo SUTStructs.h
	SUT_MEE_Server	SupportingFiles/Clause3/SUT_MEE_Server/	MEEserver.cpp MEEserver.h MEEserverMain.cpp stdafx.cpp stdafx.h SUT_MEE_Server.vcproj
	TransactionsSP	SupportingFiles/Clause3/TransactionsSP/	BrokerVolumeDB_SP.cpp BrokerVolumeDB_SP.h CheckpointDB_SP.cpp CheckpointDB_SP.h CustomerPositionDB_SP.cpp CustomerPositionDB_SP.h DataMaintenanceDB_SP.cpp DataMaintenanceDB_SP.h MarketFeedDB_SP.cpp MarketFeedDB_SP.h MarketWatchDB_SP.cpp MarketWatchDB_SP.h SecurityDetailDB_SP.cpp SecurityDetailDB_SP.h stdafx.cpp stdafx.h TradeLookupDB_SP.cpp TradeLookupDB_SP.h TradeOrderDB_SP.cpp TradeOrderDB_SP.h TradeResultDB_SP.cpp TradeResultDB_SP.h TradeStatusDB_SP.cpp TradeStatusDB_SP.h TradeUpdateDB_SP.cpp TradeUpdateDB_SP.h TransactionsSP.vcproj TxnHarnessDBBase.cpp TxnHarnessDBBase.h TxnHarnessDBConn.cpp TxnHarnessDBConn.h
	TxnHarness	SupportingFiles/Clause3/TxnHarness/	TxnHarness.vcproj TxnHarness_stdafx.cpp TxnHarness_stdafx.h TxnHarnessSendToMarket.cpp TxnHarnessSendToMarket.h
Clause 4	Not Required		

Clause5	Egen modifications		
	EGenLoader extensions		
	EGenDriver Configuration	SupportingFiles/Clause5/	570000customes150x8drv_8cl.xml EGENLOG.xlt
	EGenLoader Parameters	SupportingFiles/Clause5/	BuildSteps.log EGenLoaderFrom1To8000.log EGenLoaderFrom8001To17000.log EGenLoaderFrom17001To26000.log EGenLoaderFrom26001To35000.log EGenLoaderFrom35001To44000.log EGenLoaderFrom44001To53000.log EGenLoaderFrom53001To62000.log EGenLoaderFrom62001To71000.log EGenLoaderFrom71001To80000.log EGenLoaderFrom80001To89000.log EGenLoaderFrom89001To97000.log EGenLoaderFrom97001To106000.log EGenLoaderFrom106001To115000.log EGenLoaderFrom115001To124000.log EGenLoaderFrom124001To133000.log EGenLoaderFrom133001To142000.log EGenLoaderFrom142001To151000.log EGenLoaderFrom151001To160000.log EGenLoaderFrom160001To169000.log EGenLoaderFrom169001To178000.log EGenLoaderFrom178001To187000.log EGenLoaderFrom187001To195000.log EGenLoaderFrom195001To204000.log EGenLoaderFrom204001To213000.log EGenLoaderFrom213001To222000.log EGenLoaderFrom222001To231000.log EGenLoaderFrom231001To240000.log EGenLoaderFrom240001To249000.log EGenLoaderFrom249001To258000.log EGenLoaderFrom258001To267000.log EGenLoaderFrom267001To276000.log EGenLoaderFrom276001To285000.log EGenLoaderFrom285001To293000.log EGenLoaderFrom293001To302000.log EGenLoaderFrom302001To311000.log EGenLoaderFrom311001To320000.log EGenLoaderFrom320001To329000.log EGenLoaderFrom329001To338000.log EGenLoaderFrom338001To347000.log EGenLoaderFrom347001To356000.log EGenLoaderFrom356001To365000.log EGenLoaderFrom365001To374000.log EGenLoaderFrom374001To382000.log EGenLoaderFrom382001To391000.log EGenLoaderFrom391001To400000.log EGenLoaderFrom400001To409000.log EGenLoaderFrom409001To418000.log EGenLoaderFrom418001To427000.log EGenLoaderFrom427001To436000.log EGenLoaderFrom436001To445000.log EGenLoaderFrom445001To454000.log EGenLoaderFrom454001To463000.log EGenLoaderFrom463001To472000.log EGenLoaderFrom472001To480000.log EGenLoaderFrom480001To489000.log EGenLoaderFrom489001To498000.log EGenLoaderFrom498001To507000.log EGenLoaderFrom507001To516000.log EGenLoaderFrom516001To525000.log EGenLoaderFrom525001To534000.log EGenLoaderFrom534001To543000.log EGenLoaderFrom543001To552000.log EGenLoaderFrom552001To561000.log EGenLoaderFrom561001To570000.log
	EGenBuildOptions		EGenLoader.vcproj EGenValidate.vcproj



Clause6	EGenValidate	SupportingFiles/Clause6/	EGenValidate.out
Clause7	ACID procedures	SupportingFiles/Clause7/AcidProcs/	AcidProc.cmd Remove_AcidProcs.cmd AcidProc.out
		SupportingFiles/Clause7/AcidProcs/Scripts/	AcidProc.vbs CustomerPosition_Iso3.sql CustomerPosition_Iso4.sql Drop_SPROC.sql Remove_AcidProcs.vbs TradeOrder_C.sql TradeOrder_Iso1_1.sql TradeOrder_Iso1_2.sql TradeOrder_Iso2.sql TradeOrder_Iso3.sql TradeOrder_Iso4.sql TradeOrder_RB.sql TradeResult_Iso1_1.sql TradeResult_Iso1_2.sql TradeResult_Iso2_1.sql TradeResult_Iso2_2.sql TradeResult_Iso3.sql TradeResult_Iso4.sql
	Atomicity Scripts	SupportingFiles/Clause7/Atomicity/ SupportingFiles/Clause7/Atomicity/Scripts/	Atomicity.cmd Atomicity_C.sql Atomicity_RB.sql atom.vbs
	Atomicity Output	SupportingFiles/Clause7/Atomicity/	Atomicity_C.out Atomicity_RB.out
	Consistency Scripts	SupportingFiles/Clause7/Consistency/ SupportingFiles/Clause7/Consistency/Scripts/	Consistency.cmd Consistency.sql Consistency.vbs
	Consistency Output	SupportingFiles/Clause7/Consistency/	Consistency.out
	Isolation Scripts	SupportingFiles/Clause7/Isolation/Scripts/	Isolation1_S1.sql Isolation1_S2.sql Isolation1_S3.sql Isolation1_S4.sql Isolation2_S1.sql Isolation2_S2.sql Isolation2_S3.sql Isolation2_S4.sql Isolation3_S1.sql Isolation3_S2.sql Isolation3_S3.sql Isolation4_S1.sql Isolation4_S2.sql Isolation4_S3.sql
			Iso1_S1.out Iso1_S2.out Iso1_S3.out Iso1_S4.out Iso2_S1.out Iso2_S2.out Iso2_S3.out Iso2_S4.out Iso3_S1.out Iso3_S2.out Iso3_S3.out Iso4_S1.out Iso4_S2.out Iso4_S3.out

	Durability Business Recovery	SupportingFiles/Introduction/Hardware/	count1BR.out Part1Step.xlt TxnReport20minsBRpre-failure.xls TxnReportWholeBRpost-failure.xls dblgBRpart1.out DsymTierBoslg.out DsymTierAoslg[1...8].out Part2Step.xlt TxnReport20minsBRpost-failure.xls TxnReportWholeBRpost-failure.xls dblgBRpart2.out count2BR.out Consistency2.out BusinessRecoveryTimeGraph.xls
	Durability Data Accessibility	SupportingFiles/Clause7/Durability/DataAccessibility/	count1.sql count1DA.out pulledDataDisk.bmp pulledLogDisk.bmp pulledLogCont.bmp rebuildingDataDisk.bmp rebuildingLogDisk.bmp rebuiltDataDisk.bmp rebuiltLogDisk.bmp SQLConsoleLog.DataAccessibility.txt count2.sql count2DA.out stepDA.xlt DataAccessibilityGraph.xls DataAccessibility_wholeRun_TxnReportE.xls
Clause8	60-Day Space Calculations	SupportingFiles/Clause8/	tpce_space.xls

## **Appendix A : Price Quotation**

Microsoft Corporation  
One Microsoft Way  
Redmond, WA 98052-6399

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

**Microsoft**

February 18, 2008

NEC Corporation  
Keiichi Yamada  
1-10 Nisshin-cho, Fuchu-shi  
Tokyo, Japan 1838501

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
	<b>SQL Server 2008 Enterprise Edition for Itanium-based systems</b> <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	32	\$749,824
P73-01972	<b>Windows Server 2003 R2 Standard Edition</b> <i>Server License Only - No CALs</i> <i>Discount Schedule: Open Program - No Level</i> <i>Unit Price reflects a 28% discount from the retail unit price of \$999.</i>	\$719	9	\$6,471
N/A	<b>Microsoft Problem Resolution Services</b> <i>Professional Support</i> <i>(1 Incident)</i>	\$245	1	\$245

Windows Server 2003 is 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=mn&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](mailto:jamiere@microsoft.com).




Reference ID: PEkeya0802180000009825.

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



800.750.4239

Shopping Cart

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Quantity	Product	CDW	Availability	Price	Ext. Price
14	 NEC AccuSync LCD52V 15" LCD Display	704053	In Stock	\$189.99	\$2,659.86
3	 VST/Smartdiac Technology SmartDisk USB Floppy Drive Black Edition	494301	In Stock	\$29.99	\$89.97
28	 Tripp Lite 25' Gray Cat5e or Cat5 RJ45 Molded 350mhz UTP Patch Cable	324516	In Stock	\$6.99	\$195.72
11	 Tripp Lite 10' Gray Cat5e or Cat5 Snagless Crossover Cable 10ft	324527	In Stock	\$5.99	\$65.89
3	 Linksys 24-Port 10/100/1000 Gigebit Switch	1012601	In Stock	\$282.99	\$848.97
1	 Verbatim Unformatted Floppy Disk	039031	In Stock	\$4.99	\$4.99
				Sub-Total	\$3,865.40