TPC Benchmark™ E
Full Disclosure Report

INSPUR® NF520D2

using

Microsoft® SQL Server 2008
Enterprise x64 Edition

and

Microsoft Windows® Server 2008
Enterprise x64 Edition

TPC-E Version 1.5.1

Submitted for Review
September 24 2008

INSPUR Group

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Abstract

Inspur Group conducted the TPC Benchmark[TM] E on the INSPUR NF520D2 configured as a client/server system with attached SANbloc S50. This report documents the full disclosure information required by the TPC-E Standard Specification, Revision 1.5.1,including the methodology used to achieve the reported results. All testing fully complied with this revision level.
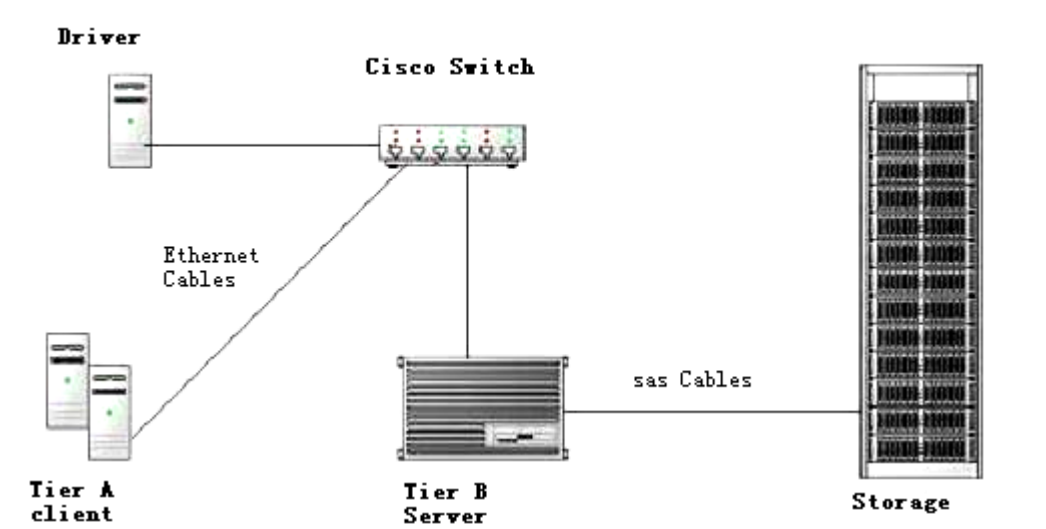
The software used on the Inspur NF520D2 system includes Microsoft Windows Server 2008 Enterprise x64 Edition operating system and Microsoft SQL Server 2008 Enterprise x64 Edition.

Standard metrics, transactions per second-E (tpsE), price per tpsE ($/tpsE) and Availability Date, are reported as required by the TPC Benchmark E Standard Specification.

The benchmark results are summarized in the following table.

Hardware	Software	Total System Cost	tpsE	CNY /tpsE	Total Solution Availability Date
Inspur NF520D2	Microsoft SQL Server 2008 Enterprise x64 Edition Microsoft Windows Server 2008 Enterprise x64 Edition	￥3,367,891	695.24	￥4844.22	November 30, 2008

The benchmark implementation and results were audited by Performance Metrics Inc. (http://www.perfmetrics.com). The auditor's attestation letter is contained in Section 9 of this report.

INSPUR 浪潮	**Inspur NF520D2** **Microsoft SQL Server 2008**		TPC-E Revision 1.5.1 TPC Pricing 1.3.0
			Report Date**:** September 26, 2008

TPC-E Throughput **695.24 tpsE**	Price/Performance **¥4844.22** **CNY per tpsE**	Availability Date **November 30, 2008**	Total System Cost **3,367,891 CNY**

Database Server Configuration			
Operating System **Microsoft Windows Server 2008 Enterprise x64 Edition**	Database Manager **Microsoft SQL Server 2008 Enterprise x64 Edition**	Processors/Cores/ Threads **4/24/24**	Memory **128GB**

Driver

Cisco Switch

Ethernet Cables

Tier A client

2 x Inspur NF280D
Each contains：
2 x Intel Xeon E5410
Processor 2.33GHz
（1 Processor，4cores，
4 Theads）
4GB of Memory
2 x 73GB SAS Drive
（raid-1 for OS，Onboard
RAID Controller，
Onboard Dual-Port
Gigabit Ethernet Controller）

Tier B Server

Inspur NF520D2
4 x Intel X7460
Processor 2.67GHz
（1 Processor，6cores,6 Theads
）
128GB of Memory
2 x 73GB SAS Drive
（raid-1 for OS，
Onboard RAID Controller，
Onboard Dual-Port
Gigabit Ethernet Controller），
4 x LSI8888ELp SAS HBA

sas Cables

Storage

29 x Adaptec SANbloc S50
JBOD
each contains:
12 x 73GB/146GB 15k rpm SAS
driver
(Total of 348 Drives
Arrayed as:
1 x 12-Disk(146GB) RAID-1,
28 x 12-Disk(73GB) RAID-5)

Initial Database Size **3,194 GB**	Redundancy Level: 1 **RAID-10 Log + RAID-5 Data**	Storage **336 x 73 GB 15K** **12 x 146 GB 15K**

<table>
<tr><td rowspan="3">INSPUR 浪潮</td><td rowspan="3">Inspur NF520D2
Microsoft SQL Server 2008</td><td>TPC-E Revision 1.5.1
TPC Pricing Spec 1.3.0</td></tr>
<tr><td>Report Date:
September 26, 2008</td></tr>
<tr><td>Availability Date:
November 30, 2008</td></tr>
</table>

Description	Part Number	Price Source	Unit Price	Qty	Extended Price	3 yr.Maint. Price
Server Hardware						
Inspur NF520D2 (4 x Intel X7460 Processor(2.67GHz), 128GB memory (32 x 4GB), Integrated RAID Controller, Onboard Dual-Port Gigabit Ethernet Controller, 2 x 73GB SAS driver, 1x USB mouse, USB keyboard, LCD monitor） plus ServicePac for 3-year 24 x 7 suport	SNF5202DR111	1*	331,003	1	331,003	
LSI Logic MegaRAID 8888ELP, Dual-Port	SUN117	1	7,600	4	30,400	
mSASx4 to SASx4 4m external Cable (2 spares)	SUN404	1	300	10	3,000	
				Subtotal	￥364,403	
Server Storage						
Adaptec SANbloc s50 JBOD (including Rack) plus ServicePac for 3-year 24 x 7 suport	AS50JPR	1	50,920	29	1,476,680	
APC UPS SU3000UXICH	SUN718	1	3,900	4	15,600	
73GB SAS drive (including 10% spare)	BSA006	1	1,860	370	688,200	
146GB SAS drive (including 10% spare)	BSA007	1	2,304	14	32,256	
				Subtotal	￥2,212,736	
Server Software						
SQL Server 2008 Enterprise x64 Edition	BGL108	1	160,978	4	643,912	
Windows Server 2008 Enterprise x64 server	BGL109	1	15,870	1	15,870	
Microsoft Problem Resolution Services	BGL110	1	1,683	1	1,683	
				Subtotal	￥661,465	
Client Hardware						
Inspur NF280D (2 x Intel Xeon E5410 (2.33GHz), 4GB memory (2 x 2GB),2 x 73GB SAS driver) Integrated RAID Controller, Onboard Dual-Port Gigabit Ethernet Controller, plus ServicePac for 3-year 24 x 7 suport	SNF2805PR734	1	26,740	2	53,480	
				Subtotal	￥53,480	
Client Software						
Windows Server 2008 Standard x64 Edition	BGL111	1	4,885	2	9,770	
				Subtotal	￥9,770	
Infastructure						
Cisco Switch 4948	AS60EPR	1	65,967	1	65,967	
Ethernet Cables (2 spares)	SUN407	1	10	7	70	
				Subtotal	￥66,037	
				Total	￥3,367,891	

<table>
<tr><td>Note:
* This component is not immediately orderable. See the FDR for more information.
Price Source: 1=Inspur
Order method: 86-800-860-6708　or 86-531-85105430</td><td>Three-Year Cost of Ownership CNY:　　￥3,367,891

TPC-E Throughput:　　695.24 tpsE

￥CNY/tpsE:　　￥4844.22</td></tr>
</table>

Audited by Lorna Livingtree,Performance Metrics Inc.

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

TPC-E Revision 1.5.1
TPC Pricing Spec 1.3.0

Report Date:
September 26, 2008

Availability Date:
November 30, 2008

**Inspur NF520D2
Microsoft SQL Server 2008**

Reported Throughput: 695.24 tpsE	Configured Customers: 360,000		
Response Time (in seconds)	**Minimum**	**Average**	**90th %-tile**	**Maximum**
Broker Volume	0.00	0.08	0.23	0.66
Customer Position	0.00	0.02	0.05	0.93
Market Feed	0.00	0.04	0.10	0.61
Market Watch	0.00	0.03	0.06	1.18
Security Detail	0.00	0.01	0.03	0.71
Trade Lookup	0.00	0.76	1.04	1.75
Trade Order	0.00	0.08	0.14	1.06
Trade Result	0.00	0.08	0.15	5.91
Trade Status	0.00	0.02	0.05	0.97
Trade Update	0.03	0.90	1.12	1.83
Data Maintenance	0.01	0.16	N/A	1.30

Transaction Mix	Transaction count	Mix%
Broker Volume	2,453,182	4.900
Customer Position	6,508,628	13.001
Market Feed	500,582	1.000
Market Watch	9,011,789	18.000
Security Detail	7,009,387	14.001
Trade Lookup	4,004,773	7.999
Trade Order	5,056,494	10.100
Trade Result	5,005,777	9.999
Trade Status	9,512,405	19.000
Trade Update	1,001,211	2.000
Data Maintenance	120	N/A

Test Duration and Timings	
Ramp-up Time	0:46:00
Measurement Interval	2:00:00
Business Recovery Time	00:53:42
Total Number of Transactions Completed in Measurement Interval	50,064,228

Table of Contents

Clause 0 – Preface

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 theapplication 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 pproximates the customer application. The relative performance of systems derived from this benchmark oes 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**.

Clause 1 – Introduction

Benchmark Sponsor

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

This benchmark was sponsored by Inspur Group.

Configuration Diagrams

Diagrams of both the measured and priced configurations must be reported, accompanied by a description of the differences. A description of the steps taken to configure all of the hardware and software must be reported.

There's no difference between the measured and priced configurations. The priced configuration is as same as measured configuration.

The configuration diagrams for the measured and priced system are provided on the following pages.

The TPC-E Driver used for these TPC Benchmark E tests is a Microsoft proprietary Driver. The Driver software needed to implement the Driving & Reporting is run on an INSPUR NF280D machine that is not part of the SUT. The Driver communicates with Tier A over an Ethernet network using the Driver machine's onboard 1Gb Ethernet card.

Tier A is on two Inspur NF280D servers, each with two Quad-Core Intel® Xeon® Processor E5410 (2.33GHz with 12MB L2 Cache), 4GB of memory, two internal 73GB SAS drives in a RAID-10 array for the operating system, which is Microsoft Windows Server 2008 Standard x64 Edition. Tier A communicates with Tier B and the Driver over an Ethernet network using the Inspur NF280D's onboard 1Gb Ethernet card.

Tier B is on an Inspur NF520D2. The NF520D2 has:
- Four Intel Processor X7460 (2.67GHz with 9MB L2 Cache)
- 128GB of memory
- Two 73GB 15K rpm 2.5" SAS internal drives in a RAID-10 array for the operating system, which is Microsoft Windows Server 2008 Enterprise x64 Edition with Microsoft SQL Server 2008 Enterprise x64 Edition
- Four LSI 8888ELP SAS HBA
- Onboard 1Gb Ethernet card.

Each LSI 8888ELP SAS HBA for INSPUR NF520D2 has two SAS cable connection. One of the cables is connected to only one Adaptec JBOD.Each of other serven cables from the HBAs is connected to four cascaded Adaptec JBOD. Each Adaptec JBOD has twelve 15Krpm SAS drives. One JBOD's drives are 146GB and others are 73GB.The 348 drives are organized as:
- One 12-disk(146GB) RAID-10 array for the database log
- Twenty-eight 12-disk(73GB) RAID-5 arrays for the database data

Each array is seen as one LUN by the operating system on the NF520D2. In Windows Disk Manager each of the LUNs from the RAID-5 arrays is configured to have a RAW partition for the big tables (CASH_TRANSACTION, HOLDING,HOLDING_SUMMARY, SETTLEMENT, TRADE, TRADE_HISTORY, TRADE_REQUEST) and another RAW partition for all the other TPC-E tables. The rest of the space on the LUN is an NTFS partition used for DB backups or the temp DB, or is not used at all.

Tier B communicates with Tier A over an Ethernet network using onboard Dual-port Ethernet card. One Ethernet cable comes out of on port and runs to a Cisco Ethernet switch that also has the Ethernet cables from the Tier A and Driver machines.

Measured and Priced Configuration
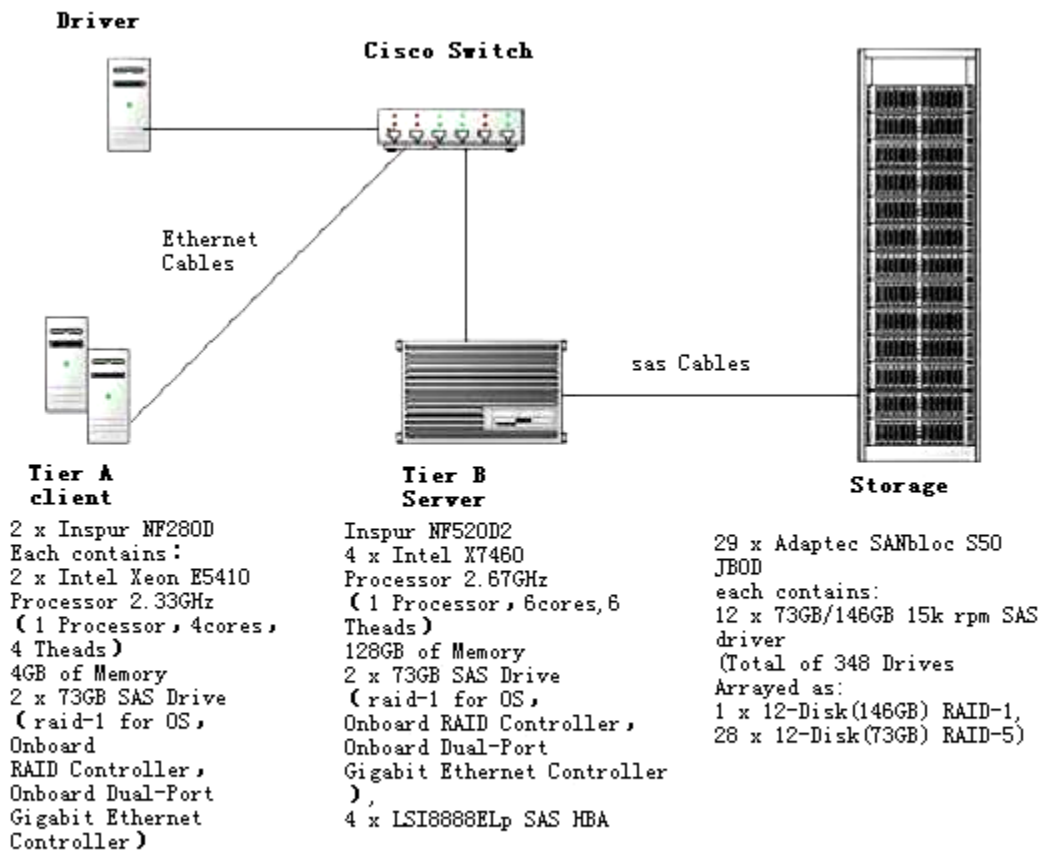
Figure 1-1 Measured Configuration
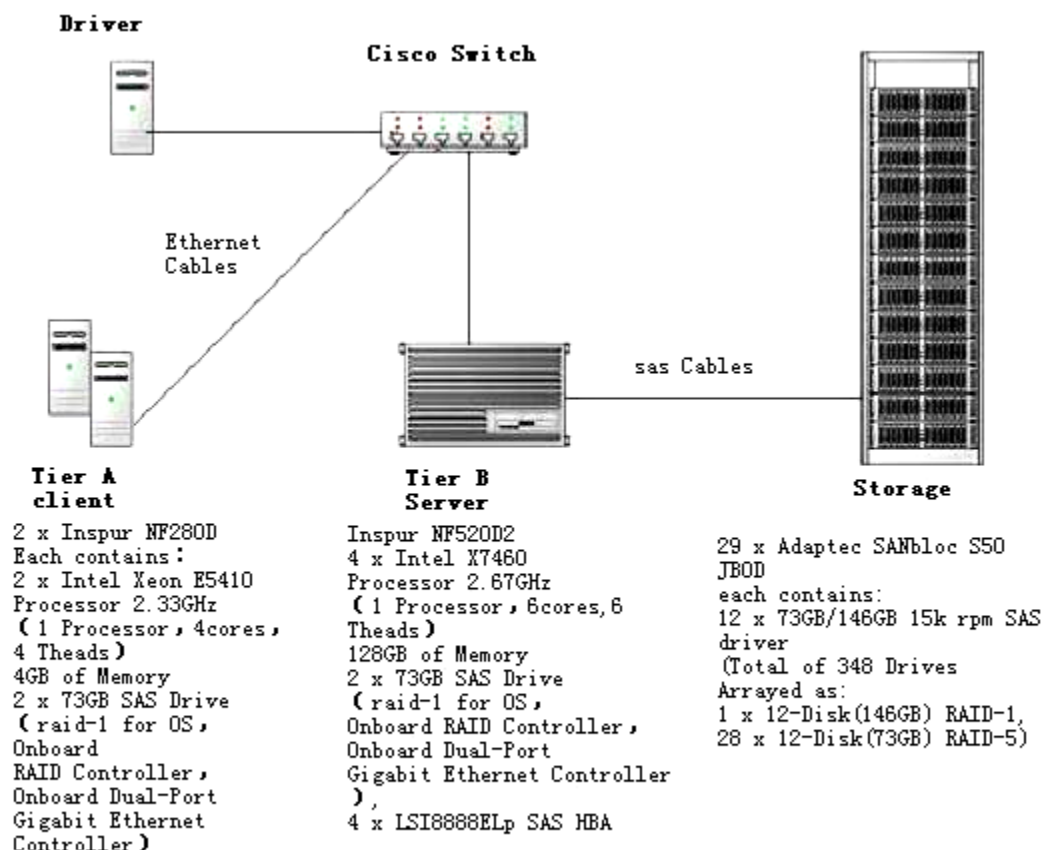
Figure 1-2 Priced Configuration

Hardware and Software Configuration

*A description of the steps taken to configure all the hardware must be **reported** in the **Report**.*
*A description of the steps taken to configure all the software must be **reported** in the **Report**.*

Driver

The Driver is not part of the priced configuration/System Under Test. For this result an INSPUR NF280D machine running Microsoft Windows Server 2008 Standard x64 Edition was used. The Microsoft Benchcraft proprietary driver was installed on the machine. An Ethernet cable was run from the machine's onboard Ethernet controller to the Cisco switch. The driver machine was configured with an IP address of 192.168.0.70.

Tier A – Inspur NF280D

The Inspur NF280D has two Quad-Core Intel Xeon E5410 Processors and 4GB of memory. Power on the Inspur NF280D.

> ➤ Install Windows Server 2008 Standard Edition
>> 1. As Bench machine doesn't have DVD drive, using the dvd drive from SUT-DB for the OS installation.
>> 2. Restart machine.
>> 3. Put "Windows Server 2008 RTM" DVD into the disc drive to boot into the installation procedure.
>> 4. Ignore the license input, and uncheck the automatical registration option.
>> 5. Choose the drive to install.
>> 6. Choose "Windows Server 2008 Standard Editition (Full installation)"
>> 7. Follow instructions to start installation.
>> 8. When installation is done, the NF280D will be restarted.
> ➤ Confiugure OS

1. The first time enter into Windows Server 2008 will be requested to change password, set password as "tpce.2008"
2. The "Initial Configuration Tasks" window is displayed. On the Date and Time tab set the Time Zone to GMT+08:00 Eastern Time (Beijing) [OK]
3. Switch to classic style,Right click on "Start" menu and choose "properties" item.In "Start menu" tab, choose "Classic start menu" and click "OK".
4. Computer description, set one cumputer name as "tpce-client-1".,another computer name as "tpce-client-2".A message is displayed that says the server must be restarted for the change to take effect so save open files. [OK]. Still in "System Properties" "Computer Name" tab click the "Advanced" tab.
5. Configure networking –Right click "Local Area Connection" – Properties – Select "Internet Protocol Version 4 (TPC/IP.4) – [Properties], Check the radio button "Use the following IP address" enter IP address 192.168.0.71 with a subnet mask of 255.255.255.0 for tpce-client-1. [OK] . And 192.168.0.72 for tpce-client-2 .
6. In the System Properties Window change from the "Advanced" tab to the "Remote" tab.Check the radio button to "Allow connections from computers running any version of Remote Desktop".A warning about enabling Remote Desk making the server less secure is displayed. [OK] [Close]. A message saying the computer must be restarted to apply these change is displayed. [Restart later]
7. Back in Initial Configuration Tasks window. "2 Update This Server" – "Enable automatic updating and feedback – [Manually configure settings]– Windows automatic updating [Change Setting…] – check the radio button for "Never check fo updates" – [OK]
8. Customer Experience Improvement Program – check the button "No, I don't want to participate" – [OK] [Close]
9. Download and install updates – leave as no checking for updates
10. Right click "My Computer" – Properties – Advanced – Environment Variables – User variables for Administrator – New.... – variable name[TPCE_KIT_DIR], variable value[C:\MSTPCE.1.5.1-1009] – [ok][close].
11. Windows Firewall – Change settings – Advanced tabe – Network Connections – uncheck. General tab – check the button "Off" – [Apply] [OK]
12. gpedit.msc (Global Policy Manager) – Computer Configuration – Windows Settings – Security Settings – Account Policies – Password Policy – Password must meet complexity requirements – disable – Maximum Password age – change from 42 to 0 which means your password never expires.
13. Enable autologon,Run control userpasswords2,Uncheck the "Users must enter a user name and password to use this computer" ,press Ctrl+Shift+A,input user Name,Password
14. Personal Settings – Screen Saver – Screen Save – (none).
15. Edit c:\windows\system32\drivers\etc\hosts, add one line as below "192.168.0.80   tpce-dtn" on "tpce-client-1" and "192.168.0.81 tpce-dtn" on "tpce-client-2", then save it.

➢ Install Microsoft SQL Server 2008
1. Put "Microsoft SQL Server 2008 " DVD into the disc drive.
2. Firstly, installer will request to install .Net 3.5 and windows installer 4.5.
3. Follow instruction to set each step.
4. In the component selection, choose "Client Connectivity" and "Management Studio"
➢ Install BenchCraft
1. Navigate to "C:\MSTPCE.1.5.1-1009\BenchCraft", double click "BenchcraftSetup.msi" ,choose "Benchcraft Slave" only.
2. Navigate to "C:\MSTPCE.1.5.1-1009\VS_Modules" and run "vcredist_x86.exe".

Storage Configuration

Documentation on how to configure the RAID can be obtained online:

RAID Configuration

MegaRAID SAS 8888 ELP: Installation
http://www.lsi.com/files/docs/techdocs/storage_stand_prod/sas/mr_sas_ug.pdf

MegaRAID SAS 8888 ELP: Configuration

Storage Enclosuer Configuration

Documentation on how to configure the SA2120 JBOD can be obtained in suportingfiles :

SANbloc S50 JBOD: Installation
http://download.adaptec.com/pdfs/quick_start_guides/sanbloc_S50_jbod_qsg.pdf

SANbloc S50 JBOD: Configuration
http://download.adaptec.com/pdfs/user_guides/sanbloc_S50_jbod_ug.pdf
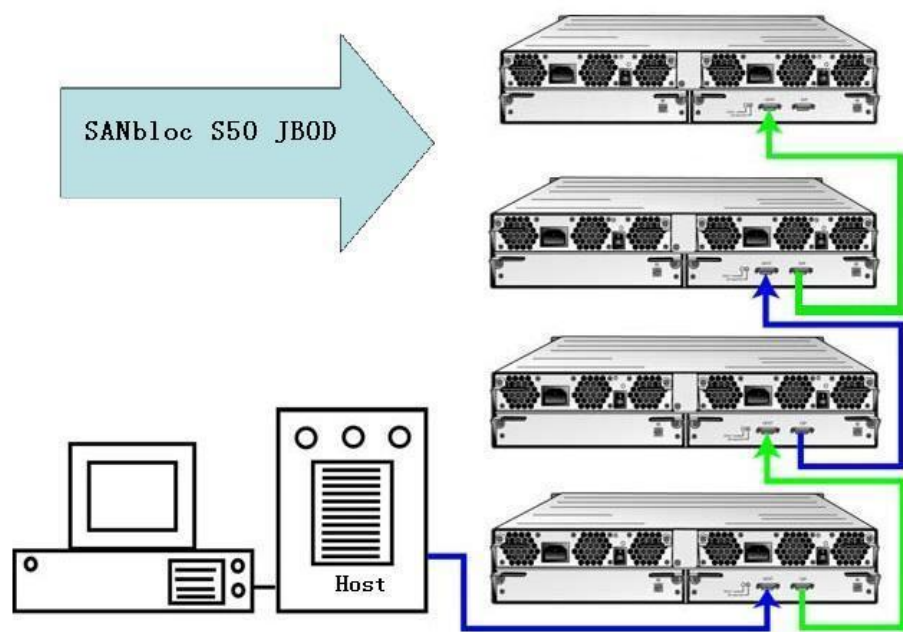
Figure 1-3.   SANbloc S50 JBOD cascaded cabling diagram

Start the MegaRAID Storage Manager on the NF520D2 and discover all the devices. In MegaRAID Storage Manager do the following:

1. Doubleclick the MegaRAID Storage Manager icon.
2. Create one 12-driver(146GB) RAID-1 arrays for database log. Twenty-eight 12-drive(73GB) RAID-5 arrays for the database data.
3. The key RAID-5 arrays configuration:
   cache I/O [direct],   Write Policy [write through],   Strip size [64KB]
4. The key RAID-1 arrays configuration:
   cache I/O [direct],   Write Policy [write through] ,   Strip size [64KB]

Tier B - INSPUR NF520D2

➢   **BIOS settings**
Press F2 while the NF520D2 is going through POST. This causes the server to drop into BIOS Setup. In BIOS Setup change the following   from their default values:
   1.   Set the correct date and time.
   2.   Advanced– Processor Configuration– make sure all items Disable.

3. Advanced– Memory Configuration– Memory RAS and Performance Configuration– FSB High Bandwidth Optimization   [Enable]
4. Press <F10> to save the BIOS change and restart NF520D2.

➢ **Install Windows Server 2008 Enterprise Edition**

Put the Microsoft Windows Server 2008 Enterprise x64 Edition DVD in the NF520D2's DVD/CDROM drive. Boot the NF520D2 from the DVD.

1. Select Boot section 0
2. Language to install – English
3. Time and currency formtat – English (United States)
4. Keyboard or input method – U.S.   [Next]
5. [Install Now]
6. Enter Product Key
7. Deselect "Automatically activate Windows when I'm online." [Next]
8. Windows Server 2008 Enterprise (Full Installation) x64 [Next]
9. Check "I accept the license terms" [Next]
10. Custom (advanced) install not upgrade
11. Where do you want to install Windows?
12. Disk 0 Unallocated Space 67GB
13. Disk 0 Partition 1 67GB Primary [Next]
14. Installing Windows… Your computer will restart several times during installation.
15. Before the first reboot remove the DVD. There are two reboots.

➢ **Confiugure OS**

1. The first time enter into Windows Server 2008 will be requested to change password, set password as "tpce.2008"
2. The "Initial Configuration Tasks" window is displayed. On the Date and Time tab set the Time Zone to GMT+08:00 Eastern Time (Beijing) [OK]
3. Switch to classic style,Right click on "Start" menu and choose "properties" item.In "Start menu" tab, choose "Classic start menu" and click "OK".
4.   Configure networking –Right click "Local Area Connection" – Properties – Select "Internet Protocol Version 4 (TPC/IP.4) – [Properties], Check the radio button "Use the following IP address" enter IP address 192.168.0.80,another port 192.168.0.81 with a subnet mask of 255.255.255.0 [OK]
5. Computer description, set cumputer name as "tpce-dtn". A message is displayed that says the server must be restarted for the change to take effect so save open files. [OK].
6. After reboot,Still in "System Properties" "Computer Name" tab click the "Advanced" tab.
7. On the "Advanced" tab - Performance – [Settings…] – Visual Effects tab – check radio button for "Adjust for best performance". On the "Advanced" leave the radio button for programs checked.
8. Startup and Recovery – [Settings…] – change the time to display a list of operating systems to 10 seconds instead of the default 30 seconds. In the System Failure section uncheck "Automatically restart". Change "Write debugging information" to "(none)". [OK]
9. In the System Properties Window change from the "Advanced" tab to the "Remote" tab.Check the radio button to "Allow connections from computers running any version of Remote Desktop".A warning about enabling Remote Desk making the server less secure is displayed. [OK] [Close]. A message saying the computer must be restarted to apply these change is displayed. [Restart later]
10. Back in Initial Configuration Tasks window. "2 Update This Server" – "Enable automatic updating and feedback – [Manually configure settings]– Windows automatic updating [Change Setting…] – check the radio button for "Never check fo updates" – [OK]
11. Windows Error Reporting – [Change Setting…] – check the button "I don't want to participate, and don't ask me again" – [OK]
12. Customer Experience Improvement Program – check the button "No, I don't want to participate" – [OK] [Close]
13. Download and install updates – leave as no checking for updates

14. Right click "My Computer" – Properties – Advanced – Environment Variables – User variables for Administrator – New.... – variable name[TPCE_KIT_DIR], variable value[C:\MSTPCE.1.5.1-1009] – [ok][close].
15. Windows Firewall – Change settings – Advanced tabe – Network Connections – uncheck. General tab – check the button "Off" – [Apply] [OK]
16. gpedit.msc (Global Policy Manager) – Computer Configuration – Windows Settings – Security Settings – Account Policies – Password Policy – Password must meet complexity requirements – disable – Maximum Password age – change from 42 to 0 which means your password never expires.
17. Still in gpedit.msc – Computer Configuration – Administrative Templates – System – right panel – Display shutdown event tracker – disable
18. Still in gpedit.msc – Computer Configuration – Windows Setting – Security Settings – Local Policies – User rights assignment – lock pages in memory add Administrators group.
19. Back on the initial settings page – check "do not show again"
20. Personal Settings – Screen Saver – Screen Save – (none) – Change power settings… - select the "High Performance" power plan – Choose when to turn off the display – Never – [Save Changes]
21. Regedit – HKLM\SYSTEM\CurrentControlSet\Services\TPCIP\Parameters – added DWORD MaxUserPort 40000 decimal
22. Enable autologon,Run control userpasswords2,Uncheck the "Users must enter a user name and password to use this computer" ,press Ctrl+Shift+A,input user Name,Password
23. Run regedit and set the keys below:
[HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Microsoft\Windows NT\CurrentVersion\Image File Execution Options\sqlservr.exe] "UseLargePages"=dword:00000001
[HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Image File Execution Options\sqlservr.exe] "UseLargePages"=dword:00000001

➢ **SQL Server 2008 Installation**

Install Microsoft SQL Server 2008 Enterprise x64 Edition.
1. Install – Server components, tools, Book online and samples
2. SQL Server 2008 Setup – accept the license terms [Next]
3. Setup Support Files [Install]
4. SQL Server Installation Center – New Installation – System Configuration Check – Execution completed – Passed: 7 Failed: 0, Warning 0 Skipped 0 [Next]
5. Feature Selection – check Database Engine Services
6. Shared Features – check Client Tools and SQL Server Book online [Next]
7. Instance Configuration – check Default instance, MSSQLServer, C:\Program Files\Microsoft SQL Server [Next]
8. Service Accounts – SQL Server Agent left as manual, change SQL Server (MSSQL..) from automatic to manual, change SQL Server Browser from Disabled to Manual, picked Administrator as the account and applied it to all [Next]
9. Collation – check Windows Collation designator and sort order, Collation designation – Latin1_General, check Binary sort order [OK]
10. Database Engine Configuration – Account Provisioning tab – check Mixed Mode, Built-in SQL Server system administrator account, enter sa password and confirm the password. Specify SQL Server administrators – [Add Current User] –TPCE-DTN\Administrator
11. Left the defaults on Data Directories and FILESTREAMING tabs [Next]
12. Error and Usage Reporting – uncheck "Send error reports to Microsoft or your corporate report server" and "Send anonymous feature usage data to Microsoft", [Next]
13. Ready to Install [Next]
14. Shows progress, when finished [Next]
15. Installation complete so [Close]

➢ **Connect NF520D2 to External Storage**

Power off the NF520D2.
1. Install LSI 8888ELP SAS Dual-Port PCI-E HBA in PCI-E slots.
2. Run a 3Gb SAS cable from each LSI 8888ELP Dual-Port PCI-E HBA to a Adaptec JBOD. Each 8888ELP controller has two external ports. So there are 8 ports in total. One port is connected to only one Adaptec

JBOD which contains database log. And each of other 7 external ports are connected to four cascaded JOBDs.

Power on the NF520D2. Download MegaRAID Storage Manager and the latest firmware and drivers for LSI 8888ELP SAS HBA from www.lsi.com. Install MegaRAID Storage Manager on the NF520D2, use MegaCLI to update the firmware on each HBA. Open Device Manager and under the Storage Controllers find the HBAs. Update the driver for each HBA. Reboot the NF520D2.

➢ **Mount Points and Disk Partitions**

1. In a command window, create mount points:
   Run c-mp.cmd (c-mp.cmd provided in the SupportingFiles)
2. Open Windows Disk Manager.
3. If the Wizard prompts you to initialize disks, do so; don't upgrade the disks.
4. From a command prompt, run diskpart.exe /s c-part-init.out (c-part-init.out provided in the SupportingFiles).
5. From a command prompt, run formats.cmd (formats.cmd provided in the SupportingFiles).
6. Close Windows Disk Manager: the disk partitions for the database have been created.

➢ **SQL Server configuration**

Start Microsoft SQL Server from the command line using sqlservr –c –x.

Run runconfig.sql to set the SQL Server sp_configure settings (the file is included in the SupportingFiles). Run tempdb.sql to increase the size of the temporary database, which is used during database load (the file
is included in the SupportingFiles). After database load, run tempdb-ext.sql to extend tempdb (the file is included in the SupportingFiles).

➢ **SQL Server softNUMA configuration**

1. To do so edit the registry:
   • HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Microsoft SQLServer\100\NodeConfiguration
   • Add keys named "Node0", "Node1" , "Node2", "Node3".
   • Under each of those keys, add a DWORD value called "CPUMask" and set it to the
   CPU mask of the node.
     ˙ Node0 -> CPUMask = dword:0000003F
     ˙ Node1 -> CPUMask = dword:00000FC0
     ˙ Node2 -> CPUMask = dword:0003F000
     ˙ Node3 -> CPUMask = dword:00FC0000
2. Now configure the TCP/IP ports so that one listens for each softNUMA node
   • Open the SQL Server Configuration Manager
   • Expand the SQL Server Network Configuration
   • Select "Protocols for MSSQLSERVER"
   • Shared Memory and TCP/IP should be enabled; the rest disabled
   • Open TCP/IP, Protocol tab
     ˙ Enabled = yes
     ˙ KeepAlive = 30000
     ˙ Listen All = Yes
   • IP Addresses Tab
     ˙ IPx(IP1,IP2,IP3,etc.)shouldallbedisabled(theyareonlyused
        ifListenAll=No)
     ˙ IPAll tab
        TCPPort.Thisiswhereyousettheport->softNUMA
        nodeaffinities.Inthisbenchmarkweuse1433,2001[0x1],2002[0x2],2003[0x4],2004[0x8]

Clause 2 –Database Design, Scaling and Population

Database Creation and Table Definitions

A description of the steps taken to create the database for the Reported Throughput must be reported in the Report.

Create a folder 360000.cust\database. In the folder, create a create_database.sql script to create a TPC-E database with two filegroups. One filegroup called big_fg for the big size TPC-E tables and the other filegroup called small_fg for all the other TPC-E tables. Big_fg uses all the c:\tpce\b* disk partitions. small_fg uses all the c:\tpce\s* disk partitions. The database log is on c:\tpce\tpcelog. Modify the files provided by Microsoft:

- ⬜ Create_Tables_Fixed.sql
- ⬜ Create_Tables_Scaling_Flat.sql
- ⬜ Create_Tables_Growing.sql
- ⬜ Create_Clustered_Indexes_Fixed.sql
- ⬜ Create_Clustered_Indexes_Scaling.sql
- ⬜ Create_Clustered_Indexes_Growing.sql
- ⬜ Create_NC_Indexes_Fixed.sql
- ⬜ Create_NC_Indexes_Scaling.sql
- ⬜ Create_NC_Indexes_Growing.sql
- ⬜ Create_TID_Ranges_Table.sql

Run the Microsoft file TPCE_Setup.cmd to start the database load (the file is included in the upportingFiles). When prompted, fill in 360000 for the number of customers to be loaded.TPCE_Setup.cmd calls files that are included in the SupportingFiles to create and load the TPC-E database.

Database Physical Organization

The physical organization of tables and indexes 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.

Horizontal/Vertical Partitioning

While there are few restrictions placed upon horizontal or vertical partitioning of tables and rows in the PC-E benchmark, any such partitioning must be reported.

Partitioning was not used in this benchmark. However, the TPC-E tables were distributed over multiple disk arrays by SQL Server because the file groups were spread over 28 disk arrays.

Replication

Replication of tables, if used, must be reported in the Report.

Replication was not used in this benchmark.

Table Attributes

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

No additional attributes were used in this benchmark.

Cardinality of Tables

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

The database was built with 360000 customers. Table 2-1 is on the following page.

Table Name	Rows
ACCOUNT_PERMISSION	2,555,672
ADDRESS	540,004
BROKER	3,600
CASH_TRANSACTION	5,723,149,115
CHARGE	15
COMMISSION_RATE	240
COMPANY	180,000
COMPANY_COMPETITOR	540,000
CUSTOMER	360,000
CUSTOMER_ACCOUNT	1,800,000
CUSTOMER_TAXRATE	720,000
DAILY_MARKET	321,813,000
EXCHANGE	4
FINANCIAL	3,600,000
HOLDING	318,576,550
HOLDING_HISTORY	8,336,913,474
HOLDING_SUMMARY	17,910,923
INDUSTRY	102
LAST_TRADE	246,600
NEWS_ITEM	360,000
NEWS_XREF	360,000
SECTOR	12
SECURITY	246,600
SETTLEMENT	6,220,800,000
STATUS_TYPE	5
TAXRATE	320
TRADE	6,220,800,000
TRADE_HISTORY	14,929,960,797
TRADE_REQUEST	0
TRADE_TYPE	5
WATCH_ITEM	36,004,138

WATCH_LIST	360,000
ZIP_CODE	14,741

Table 2-1. Initial Cardinality of Table

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.

The NF520D2 has four LSI 8888ELP SAS Dual-Port HBAs. Four MegaRAID SAS 8888ELP HBA were installed in 4 PCI-e slots and connected to 29 Adaptec JBODs , which can hold 12 disks each. Each LSI 8888ELP controller has two external ports. So there are 8 ports in total. One port is connected to only one Adaptec JBOD which contains database log. And each of other 7 external ports are connected to four casecaed JOBDs. Each LUN had 12 physical drives. The total number of physical drives used for the database was 348 SAS disks. In the measured and priced configuration 12 drives are 146GB 15K rpm 3Gbps SAS drives. Other 336 drives are 73GB 15K rpm 3Gbps SAS drives.

In the measured and priced configuration, the 12-Disk RAID-10 database log array has 146GB 15K rpm 3Gbps SAS drives. The other twenty-eight 12-disk RAID-5 arrays have 73GB 15K rpm 3Gbps SASl drives. Figure 2-2 and Figure 2-3 depict the database configuration of the measured and priced systems to meet the 8-hour steady state requirement.

Table 2-2. Data Distribution for the Measured Configuration

Disk #	Controller #	Target #	Drives Enclosure model RAID level	Partition/file system	Size(GB)	Use
0	2A	0	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B0\(RAW)	236.32	BIG0
				c:\tpce\S0\(RAW)	25.49	SMALL0
				c:\tpce\backup\k0(NTFS)	475.8	Backup0 Flat_out
1	2A	1	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B1\(RAW)	236.32	BIG1
				c:\tpce\S1\(RAW)	25.49	SMALL1
				c:\tpce\backup\k1(NTFS)	475.8	Backup1 Flat_out
2	2A	2	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32	BIG2
				c:\tpce\S2\(RAW)	25.49	SMALL2
				c:\tpce\backup\k2(NTFS)	475.8	Backup2 Flat_out
3	2A	3	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32	BIG3
				c:\tpce\S2\(RAW)	25.49	SMALL3
				c:\tpce\backup\k3(NTFS)	475.8	Backup3 Flat_out
4	2B	4	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG4
				c:\tpce\S2\(RAW)	25.49GB	SMALL4
				c:\tpce\backup\k4(NTFS)	475.80GB	Backup4 Flat_out
5	2B	5	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG5
				c:\tpce\S2\(RAW)	25.49GB	SMALL5
				c:\tpce\backup\k5(NTFS)	475.80GB	Backup5 Flat_out

6	2B	6	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG6
				c:\tpce\S2\(RAW)	25.49GB	SMALL6
				c:\tpce\backup\k6(NTFS)	475.80GB	Backup6 Flat_out
7	2B	7	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG7
				c:\tpce\S2\(RAW)	25.49GB	SMALL7
				c:\tpce\backup\k7(NTFS)	475.80GB	Backup7 Flat_out
8	1	0	12 x 73GB SAS Seagate 15Krpm RAID-10	C: (NTFS)	67.05GB	OS
9	4A	0	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG9
				c:\tpce\S2\(RAW)	25.49GB	SMALL9
				c:\tpce\backup\k9(NTFS)	475.80GB	Backup9 Flat_out
10	4A	1	12x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG10
				c:\tpce\S2\(RAW)	25.49GB	SMALL10
				c:\tpce\backup\k10(NTFS)	475.80GB	Backup10 Flat_out
11	4A	2	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG11
				c:\tpce\S2\(RAW)	25.49GB	SMALL11
				c:\tpce\backup\k11(NTFS)	475.80GB	Backup11 Flat_out
12	4A	3	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG12
				c:\tpce\S2\(RAW)	25.49GB	SMALL12
				c:\tpce\backup\k12(NTFS)	475.80GB	Backup12 Flat_out
13	4B	4	12 x 73GB SAS SANbloc S50 RAID-10	c:\tpce\tpcelog\ (RAW)	345.15GB	LOG
				U: (NTFS)	470.69GB	TempDB
14	5A	0	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG14
				c:\tpce\S2\(RAW)	25.49GB	SMALL14
				c:\tpce\backup\k14(NTFS)	475.80GB	Backup14 Flat_out
15	5A	1	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG15
				c:\tpce\S2\(RAW)	25.49GB	SMALL15
				c:\tpce\backup\k15(NTFS)	475.80GB	Backup15 Flat_out
16	5A	2	12x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG16
				c:\tpce\S2\(RAW)	25.49GB	SMALL16
				c:\tpce\backup\k16(NTFS)	475.80GB	Backup16 Flat_out
17	5A	3	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG17
				c:\tpce\S2\(RAW)	25.49GB	SMALL17
				c:\tpce\backup\k17(NTFS)	475.80GB	Backup17 Flat_out
18	5B	4	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG18
				c:\tpce\S2\(RAW)	25.49GB	SMALL18
				c:\tpce\backup\k18(NTFS)	475.80GB	Backup18 Flat_out
19	5B	5	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG19
				c:\tpce\S2\(RAW)	25.49GB	SMALL19
				c:\tpce\backup\k19(NTFS)	475.80GB	Backup19 Flat_out
20	5B	6	12 x 73GB SAS	c:\tpce\B2\(RAW)	236.32GB	BIG20

Disk #	Controller #	Target #	Drives Enclosure model RAID level	Partition/file system	Size(GB)	Use
			SANbloc S50 RAID-5	c:\tpce\S2\(RAW)	25.49GB	SMALL20
				c:\tpce\backup\k20(NTFS)	475.80GB	Backup20 Flat_out
21	6A	0	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG21
				c:\tpce\S2\(RAW)	25.49GB	SMALL21
				c:\tpce\backup\k21(NTFS)	475.80GB	Backup21 Flat_out
22	6A	1	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG22
				c:\tpce\S2\(RAW)	25.49GB	SMALL22
				c:\tpce\backup\k22(NTFS)	475.80GB	Backup22 Flat_out
23	6A	2	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG23
				c:\tpce\S2\(RAW)	25.49GB	SMALL23
				c:\tpce\backup\k23(NTFS)	475.80GB	Backup23 Flat_out
24	6A	3	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG24
				c:\tpce\S2\(RAW)	25.49GB	SMALL24
				c:\tpce\backup\k24(NTFS)	475.80GB	Backup24 Flat_out
25	6B	4	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG25
				c:\tpce\S2\(RAW)	25.49GB	SMALL25
				c:\tpce\backup\k25(NTFS)	475.80GB	Backup25 Flat_out
26	6B	5	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG26
				c:\tpce\S2\(RAW)	25.49GB	SMALL26
				c:\tpce\backup\k26(NTFS)	475.80GB	Backup26 Flat_out
27	6B	6	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG27
				c:\tpce\S2\(RAW)	25.49GB	SMALL27
				c:\tpce\backup\k27(NTFS)	475.80GB	Backup27 Flat_out
28	6B	7	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG28
				c:\tpce\S2\(RAW)	25.49GB	SMALL28
				c:\tpce\backup\k28(NTFS)	475.80GB	Backup28 Flat_out
29	5B	7	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG29
				c:\tpce\S2\(RAW)	25.49GB	SMALL29
				c:\tpce\backup\k29(NTFS)	475.80GB	Backup29 Flat_out

Table 2-3. Data Distribution for the Priced Configuration

Disk #	Controller #	Target #	Drives Enclosure model RAID level	Partition/file system	Size(GB)	Use
0	2A	0	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B0\(RAW)	236.32	BIG0
				c:\tpce\S0\(RAW)	25.49	SMALL0
				c:\tpce\backup\k0(NTFS)	475.8	Backup0

						Flat_out
1	2A	1	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B1\(RAW)	236.32	BIG1
				c:\tpce\S1\(RAW)	25.49	SMALL1
				c:\tpce\backup\k1(NTFS)	475.8	Backup1 Flat_out
2	2A	2	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32	BIG2
				c:\tpce\S2\(RAW)	25.49	SMALL2
				c:\tpce\backup\k2(NTFS)	475.8	Backup2 Flat_out
3	2A	3	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32	BIG3
				c:\tpce\S2\(RAW)	25.49	SMALL3
				c:\tpce\backup\k3(NTFS)	475.8	Backup3 Flat_out
4	2B	4	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG4
				c:\tpce\S2\(RAW)	25.49GB	SMALL4
				c:\tpce\backup\k4(NTFS)	475.80GB	Backup4 Flat_out
5	2B	5	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG5
				c:\tpce\S2\(RAW)	25.49GB	SMALL5
				c:\tpce\backup\k5(NTFS)	475.80GB	Backup5 Flat_out
6	2B	6	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG6
				c:\tpce\S2\(RAW)	25.49GB	SMALL6
				c:\tpce\backup\k6(NTFS)	475.80GB	Backup6 Flat_out
7	2B	7	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG7
				c:\tpce\S2\(RAW)	25.49GB	SMALL7
				c:\tpce\backup\k7(NTFS)	475.80GB	Backup7 Flat_out
8	1	0	12 x 73GB SAS Seagate 15Krpm RAID-10	C: (NTFS)	67.05GB	OS
9	4A	0	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG9
				c:\tpce\S2\(RAW)	25.49GB	SMALL9
				c:\tpce\backup\k9(NTFS)	475.80GB	Backup9 Flat_out
10	4A	1	12x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG10
				c:\tpce\S2\(RAW)	25.49GB	SMALL10
				c:\tpce\backup\k10(NTFS)	475.80GB	Backup10 Flat_out
11	4A	2	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG11
				c:\tpce\S2\(RAW)	25.49GB	SMALL11
				c:\tpce\backup\k11(NTFS)	475.80GB	Backup11 Flat_out
12	4A	3	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG12
				c:\tpce\S2\(RAW)	25.49GB	SMALL12
				c:\tpce\backup\k12(NTFS)	475.80GB	Backup12 Flat_out
13	4B	4	12 x 73GB SAS SANbloc S50 RAID-10	c:\tpce\tpcelog\ (RAW)	345.15GB	LOG
				U: (NTFS)	470.69GB	TempDB
14	5A	0	12 x 73GB SAS SANbloc S50	c:\tpce\B2\(RAW)	236.32GB	BIG14
				c:\tpce\S2\(RAW)	25.49GB	SMALL14

				RAID-5	c:\tpce\backup\k14(NTFS)	475.80GB	Backup14 Flat_out
15	5A	1	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG15
				c:\tpce\S2\(RAW)	25.49GB	SMALL15
				c:\tpce\backup\k15(NTFS)	475.80GB	Backup15 Flat_out
16	5A	2	12x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG16
				c:\tpce\S2\(RAW)	25.49GB	SMALL16
				c:\tpce\backup\k16(NTFS)	475.80GB	Backup16 Flat_out
17	5A	3	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG17
				c:\tpce\S2\(RAW)	25.49GB	SMALL17
				c:\tpce\backup\k17(NTFS)	475.80GB	Backup17 Flat_out
18	5B	4	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG18
				c:\tpce\S2\(RAW)	25.49GB	SMALL18
				c:\tpce\backup\k18(NTFS)	475.80GB	Backup18 Flat_out
19	5B	5	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG19
				c:\tpce\S2\(RAW)	25.49GB	SMALL19
				c:\tpce\backup\k19(NTFS)	475.80GB	Backup19 Flat_out
20	5B	6	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG20
				c:\tpce\S2\(RAW)	25.49GB	SMALL20
				c:\tpce\backup\k20(NTFS)	475.80GB	Backup20 Flat_out
21	6A	0	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG21
				c:\tpce\S2\(RAW)	25.49GB	SMALL21
				c:\tpce\backup\k21(NTFS)	475.80GB	Backup21 Flat_out
22	6A	1	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG22
				c:\tpce\S2\(RAW)	25.49GB	SMALL22
				c:\tpce\backup\k22(NTFS)	475.80GB	Backup22 Flat_out
23	6A	2	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG23
				c:\tpce\S2\(RAW)	25.49GB	SMALL23
				c:\tpce\backup\k23(NTFS)	475.80GB	Backup23 Flat_out
24	6A	3	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG24
				c:\tpce\S2\(RAW)	25.49GB	SMALL24
				c:\tpce\backup\k24(NTFS)	475.80GB	Backup24 Flat_out
25	6B	4	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG25
				c:\tpce\S2\(RAW)	25.49GB	SMALL25
				c:\tpce\backup\k25(NTFS)	475.80GB	Backup25 Flat_out
26	6B	5	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG26
				c:\tpce\S2\(RAW)	25.49GB	SMALL26
				c:\tpce\backup\k26(NTFS)	475.80GB	Backup26 Flat_out
27	6B	6	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG27
				c:\tpce\S2\(RAW)	25.49GB	SMALL27
				c:\tpce\backup\k27(NTFS)	475.80GB	Backup27 Flat_out
28	6B	7	12 x 73GB SAS	c:\tpce\B2\(RAW)	236.32GB	BIG28

				SANbloc S50 RAID-5	c:\tpce\S2\(RAW)	25.49GB	SMALL28
					c:\tpce\backup\k28(NTFS)	475.80GB	Backup28 Flat_out
29	5B	7	12 x 73GB SAS SANbloc S50 RAID-5	c:\tpce\B2\(RAW)	236.32GB	BIG29
				c:\tpce\S2\(RAW)	25.49GB	SMALL29
				c:\tpce\backup\k29(NTFS)	475.80GB	Backup29 Flat_out

Database Interface and Model Implemented

*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 Enterprise x64 Edition is a relational database. The interface used was Microsoft SQL Server stored procedures accessed with Remote Procedure Calls embedded in C++ code using the Microsoft ODBC interface.

Database Load Methodology

The methodology used to load the database must be reported in the Report.

The database was loaded using the FlatFiles option on the EGenLoader command line. This direct loads into a Microsoft SQL Server database. A further description is provided in the SupportingFiles in the file MSTPCE Database Setup Reference.pdf.

Clause 3 – Transaction Related Items

Vendor-Supplied Code

A statement that vendor-supplied code is functionally equivalent to Pseudo-code in the specification (seeClause 3.2.1.5) must be reported.

The SQL in the stored procedures for the transactions is functionally equivalent to the pseudo-code.

Database Footprint of Transactions

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

The database footprint requirements are met by the stored procedure code for the transactions.

Clause 4 – SUT, Driver and Network Related Items

EGen Instances

The number of EGenDriverMEE and EGenDriverCE instances used in the benchmark must be reported(see Clause 4.1.3).

A total of 744 EGenDriverCE instances was used in the benchmark. Four EGenDriverMEE instances were used in the benchmark.

Network Configuration

The Network configurations of both the measured and priced configurations must be described and reported. 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).

The Network configurations of both the measured and priced configurations were the same. The Driver machine used one of the ports on the onboard dual-port Gigabit Ethernet card. The port's IP address was192.168.0.70. The port was connected to the Cisco switch via an Ethernet cable. Other Ethernet cables ran from the Cisco Switch to a port on the onboard dual-port Gigabit Ethernet card in the two INSPUR NF280D machines that were used as the Tier A machines. That port on one NF280D was configured with the IP address 192.168.0.71 and 192.168.0.72 on the other NF280D. The network connection between the port with IP address 192.168.0.70 on the Driver and the ports with IP addresses 192.168.0.71 and 192.168.0.72 on the Tier A machines was the mandatory network.

There was also a network connection between the Tier A machines and the Tier B machine. The Tier B machine was the NF520D2. Two ports on the onboard dual-port Gigabit Ethernet card in the NF520D was configured with IP address 192.168.0.80 and 192.168.0.81 and were connected via an Ethernet cable to the Cisco switch.

Tier A used ODBC calls to Tier B.

Clause 5 – EGen Related Items

EGen Version

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

EGen v1.5.1 was used in the benchmark.

EGen Code and Modifications

A statement that all required TPC-provided EGen code was used in the benchmark must be reported. 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. If any of the changes to EGen do not have a formal waiver, that must also be reported. If the Test Sponsor extended EGenLoader, the use of the extended EGenLoader and the audit of the extension code by an Auditor must be reported (see Clause 5.7.3).

All required TPC-provided EGen code was used in the benchmark. EGen was not modified for use in this benchmark. EGenLoader was not extended for this benchmark.

Clause 6 – Performance Metrics and Response Time

Measured Throughput

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

Measured tpsE: 695.24 tpsE
Price per tpsE: ￥4844.22 CNY per tpsE

Throughput vs. Elapsed Time for Trade-Result Transaction

A Test Run Graph of throughput versus elapsed wall clock time must be reported for the Trade-Result Transaction (see Clause 6.7.2).
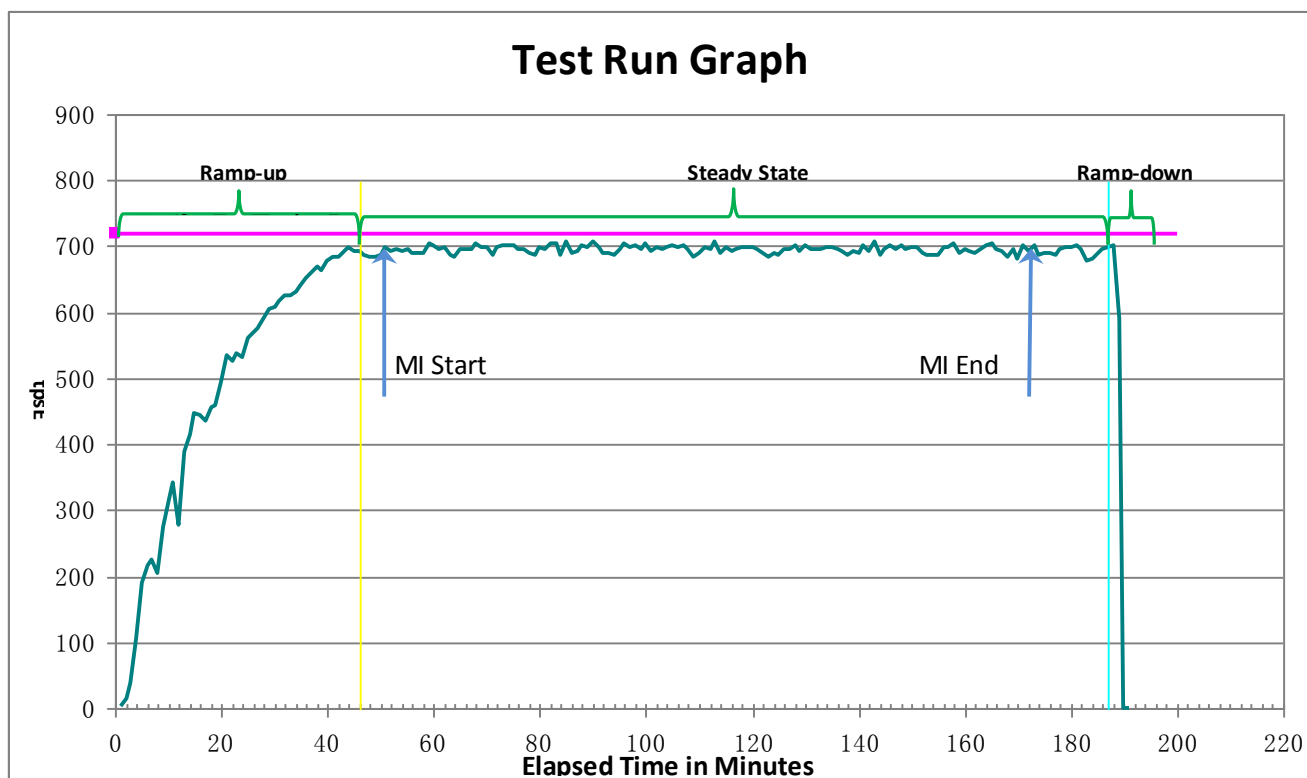
Figure 6-1. Test Run Graph

Steady State Methodology

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

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. Looking at the Test Run Graph and verifying 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 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 (e.g., checkpointing, writing Undo/Redo Log records).

Checkpoints were run once every 7 ½   minutes. Data-Maintenance was run every 60 seconds.

Transaction Statistics

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

Table 6-1 contains the transaction statistics.

Input Parameter	Value	Actul Pct	Required Range
Customer-Position			
by_tax_id	1	49.98%	48% to 52%
get_history	1	50.00%	48% to 52%
Market-Watch			
	Watch list	59.97%	57% to 63%
	Account ID	35.03%	33% to 37%
Securities chosen by	Industry	5.00%	4.5% to 5.5%
Security-Detail			
access_lob	1	1.00%	0.9% to 1.1%
Trade-Lookup			
	1	30.00%	28.5% to 31.5%
	2	29.98%	28.5% to 31.5%
	3	30.01%	28% to 31.5%
frame_to_execute	4	10.02%	9.5% to 10.5%
Trade-Order			
Transactions requested by a third party		10.01%	9.5% to 10.5%
Security chosen by company name and issue		40.03%	38% to 42%
type_is_margin	1	8.02%	7.5% to 8.5%
roll_it_back	1	0.99%	0.94% to 1.04% (*)
is_lifo	1	34.98%	33% to 37%
	100	25.00%	24% to 26%
	200	25.01%	24% to 26%
	400	24.99%	24% to 26%
trade_qty	800	25.00%	24% to 26%

	TMB	30.02%	29.7% to 30.3%
	TMS	29.98%	29.7% to 30.3%
	TLB	19.99%	19.8% to 20.2%
	TLS	10.01%	9.9% to 10.1%
trade_type	TSL	10.00%	9.9% to 10.1%
Trade-Update			
	1	32.98%	31% to 35%
	2	33.08%	31% to 35%
frame_to_execute	3	33.94%	32% to 36%

Table 6-1. Transaction Statistics

Clause 7 – Transaction and System Properties Related Items

The ACID (Atomicity, Consistency, Isolation, and Durability) properties of transaction processing systems must be supported by the System Under Test during the running of this benchmark. It is the intent of this section to define the ACID properties informally and to specify a series of tests that must be performed to demonstrate that these properties are met.

Atomicity Requirements

The system under test must guarantee that database transactions are atomic; the system will either perform all individual operations on the data, or will assure that no partially completed operations leave any effects on the data.

All ACID tests were conducted according to specification. The following steps were performed to verify the Atomicity of the Trade-Order transactions.

Perform a market Trade-Order Transaction with the roll_it_back flag set to false. 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 true. 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 MSTPCE.1.5.1-1009\ACID\Atomicity directory.
3. Run Atomicity.cmd
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.

Atomicity.cmd 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.

Consistency Requirements

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

Consistency conditions 1, 2 and 3 were tested using a batch file to issue queries to the database after the database was loaded and after the Business Recovery Test. The results of the queries demonstrated that the database was consistent for all three tests.

The specific procedure was:
1. Open a command prompt.
2. Change to the MSTPCE.1.5.1-1009\ACID\Consistency directory.
3. Run Consistency.cmd

4. The output will be in Consistency.out

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')

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')

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)

Isolation Requirements

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.

Execution of Isolation Test #1 (P3 Test in Read-Write)

The isolation tests require that you use the SQL Server Management Studio. You are required to copy values from one session to another and the Management Studio facilitates this. The instructions below assume that you are using the Management Studio.

1. Open the SQL Server Management Studio.
2. Open MSTPCE.1.5.1-1009\ACID\Isolation\Scripts\Isolation1_S1.sql in the Management Studio. When prompted, connect to the database server.
3. Ctrl-T to convert results to text.
4. Open MSTPCE.1.5.1-1009\ACID\Isolation\Scripts\Isolation1_S2.sql in the Management Studio. When prompted, connect to the database server.
5. Ctrl-T to convert results to text.
6. Open MSTPCE.1.5.1-1009\ACID\Isolation\Scripts\Isolation1_S3.sql in the Management Studio. When prompted, connect to the database server.
7. Ctrl-T to convert results to text.
8. Open MSTPCE.1.5.1-1009\ACID\Isolation\Scripts\Isolation1_S4.sql in the Management Studio. When prompted, connect to the database server.
9. Ctrl-T to convert results to text.
10. Execute Isolation1_S1.
11. Scroll to the bottom of the Results window and record the "Trade ID Returned."
12. Copy the Customer Account Used to the @acct_id variable near the top of Isolation1_S2.
13. Copy the Symbol Used to the @symbol variable near the top of Isolation1_S2.
14. Execute Isolation1_S2.
15. Scroll to the bottom of the Results window and record the "Trade ID Returned."
16. Copy the Trade ID Used in the Isolation1_S1 results window to the @trade_id variable near the top of Isolation1_S3.
17. Copy the Trade ID Used in the Isolation1_S2 results window to the @trade_id variable near the top of Isolation1_S4.
18. Execute Isolation1_S3 and then immediately execute Isolation1_S4. Note that 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 the results window of Isolation1_S3. 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 the results window of Isolation1_S3. Verify that this is set to 0.
3. Record the "Holding Summary After Trade Result Frame 1": value of HS_QTY. This is found near the top of the results window of Isolation1_S4. Verify that this is set to 0.
4. The Trade-Result in S4 completed, and the Trade-Result in S3 was selected as a deadlock victim.

Execution of Isolation Test #2 (P2 Test in Read-Write)

The isolation tests require that you use the SQL Server Management Studio. You are required to copy values from one session to another and the Management Studio facilitates this. The instructions below assume that you are using the Management Studio.

1. Open the SQL Server Management Studio.

2. Open MSTPCE.1.5.1-1009\ACID\Isolation\Scripts\Isolation2_S1.sql in the Management Studio. When prompted, connect to the database server.
3. Ctrl-T to convert results to text.
4. Open MSTPCE.1.5.1-1009\ACID\Isolation\Scripts\Isolation2_S2.sql in the Management Studio. When prompted, connect to the database server.
5. Ctrl-T to convert results to text.
6. Open MSTPCE.1.5.1-1009\ACID\Isolation\Scripts\Isolation2_S3.sql in the Management Studio. When prompted, connect to the database server.
7. Ctrl-T to convert results to text.
8. Open MSTPCE.1.5.1-1009\ACID\Isolation\Scripts\Isolation2_S4.sql in the Management Studio. When prompted, connect to the database server.
9. Ctrl-T to convert results to text.
10. Execute Isolation2_S1.
11. Scroll to the bottom of the Results window of Isolation2_S1 and record the "Holding Summary Quantity" and the "Trade ID Returned."
12. Copy the Customer Account Used from the Results window of Isolation2_S1 to the @acct_id variable near the top of Isolation2_S2.
13. Copy the Symbol Used from the Results window of Isolation2_S1 to the @symbol variable near the top of Isolation2_S2.
14. Execute Isolation2_S2.
15. Scroll to the bottom of the Results window of Isolation2_S2 and record the Trade ID Returned.
16. Copy the Trade ID Used in the Isolation2_S1 results window to the @trade_id variable near the top of Isolation2_S3.
17. Copy the Trade ID Used in the Isolation2_S2 results window to the @trade_id variable near the top of Isolation2_S4.
18. Execute Isolation2_S3 and then immediately execute Isolation2_S4. Note that 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 the results window of Isolation2_S3.
2. Record the "Holding Summary After Second Execution of Trade Result Frame 1": value of HS_QTY. This is found near the top of the results window of Isolation2_S3. This value should match the value returned in step 1 above.
3. Record the "Holding Summary After Trade Result Frame 1": value of HS_QTY. This is found near the top of the results window of Isolation2_S4. This value should match the value returned in step 1 above.
4. The Trade-Result in S4 ran to completion. The Trade-Result in S3 was selected as a deadlock victim.

Execution of Isolation Test #3 (P1 Test in Read-Write)
The isolation tests require that you use the SQL Server Management Studio. You are required to copy values from one session to another and the Management Studio facilitates this. The instructions below assume that you are using the Management Studio.

1. Open the SQL Server Management Studio.
2. Open MSTPCE.1.5.1-1009\ACID\Isolation\Scripts\Isolation3_S1.sql in the Management Studio. When prompted, connect to the database server.
3. Ctrl-T to convert results to text.
4. Open MSTPCE.1.5.1-1009\ACID\Isolation\Scripts\Isolation3_S2.sql in the Management Studio. When prompted, connect to the database server.
5. Ctrl-T to convert results to text.
6. Open MSTPCE.1.5.1-1009\ACID\Isolation\Scripts\Isolation3_S3.sql in the Management Studio. When prompted, connect to the database server.
7. Ctrl-T to convert results to text.

8. Execute Isolation3_S1. This script will initiate the Customer Position and execute two Trade Orders for the remainder of this isolation test to access.
9. Scroll to the bottom of the Results window of Isolation3_S1 and record the "Customer ID Used" and the "Customer Account Balance."
10. Copy the first Trade ID Returned from Isolation3_S1 to the top of Isoaltion3_S2.sql.
11. Copy the Customer Account Used from Isolation3_S1 to the top of Isoaltion3_S2.sql.
12. Copy the second Trade ID Returned from Isolation3_S1 to the top of Isoaltion3_S3.sql.
13. Copy the Customer Account Used from Isolation3_S1 to the top of Isoaltion3_S3.sql.
14. Execute Isolation3_S2, then immediately execute Isolation3_S3. Note that the SQL code and the instrumented stored procedure will do the appropriate pausing as required in the specification.
15. Scroll to the bottom of the Results window of Isolation3_S2 and record the Customer Account Balance and the Settlement Amount.
16. Scroll to the bottom of the Results window of Isolation3_S3 and record the Customer Account Balance and the Settlement Amount.

Verification of Isolation Test #3 (P1 Test in Read-Write)
1. Record the Customer Account Balance from the bottom of the Results window of Isolation3_S1.
2. Record the Customer Account Balance and the Settlement Amount from the bottom of the Results window of Isolation3_S2.
3. Record the Customer Account Balance and the Settlement Amount from the bottom of the Results window of Isolation3_S3.
4. Since the Trade Result in Isolation3_S3 blocks until Isolation3_S2 completes, you may verify the results as follows:
   a. CA_BAL (from Isolation3_S1) + Settlement Amount (from Isolation3_S2) + Settlement Amount (from Isolation3_S3) = Customer Account Balance (from Isoaltion3_S3)

Execution of Isolation Test #4 (P1 Test in Read-Only)
The isolation tests require that you use the SQL Server Management Studio. You are required to copy values from one session to another and the Management Studio facilitates this. The instructions below assume that you are using the Management Studio.

1. Open the SQL Server Management Studio.
2. Open MSTPCE.1.5.1-1009\ACID\Isolation\Scripts\Isolation4_S1.sql in the Management Studio. When prompted, connect to the database server.
3. Ctrl-T to convert results to text.
4. Open MSTPCE.1.5.1-1009\ACID\Isolation\Scripts\Isolation4_S2.sql in the Management Studio. When prompted, connect to the database server.
5. Ctrl-T to convert results to text.
6. Open MSTPCE.1.5.1-1009\ACID\Isolation\Scripts\Isolation4_S3.sql in the Management Studio.   When prompted, connect to the database server.
7. Ctrl-T to convert results to text.
8. Execute Isolation4_S1.   This script will initiate the Customer Position and execute a Trade Order for the remainder of this isolation test to access.
9. Scroll to the bottom of the Results window of Isolation4_S1 and record the "Customer ID Used," "Customer Account Used," "Customer Account Balance,"   and the "Trade ID Returned."
10. Copy the "Customer Account Used" from the Results window of Isolation4_S1 to the @acct_id variable near the top of Isolation4_S2.
11. Copy the "Trade ID Returned" from the Results window of Isolation4_S1 to the @trade_id variable near the top of Isolation4_S2.
12. Copy the "Customer ID" from the Results window of Isolation4_S1 to the @cust_id   variable near the top of Isolation4_S3.
13. Copy the "Customer Account Used" from the Results window of Isolation4_S1 to the @acct_id variable near the top of Isolation4_S3.

14. Execut Isolation4_S2 and after a few seconds to make sure Isolation4_S2 has started execute Isolation4_S3.

Verification of Isolation Test #4 (P1 Test in Read-Only)
1. Record the Customer Account Balance from the bottom of the Results window of Isolation4_S1.
2. Record the Customer Account Balance and the Settlement Amount from the bottom of the Results window of Isolation4_S2.
3. Record the Customer Account Balance from the bottom of the Results window of Isolation4_S3.
4. Since the Customer Position in Isolation4_S3 blocks until Isolation4_S2 completes, you may verify the results as follows:
    a. CA_BAL (from Isolation4_S1) + Settlement Amount (from Isolation4_S2)   = Customer Account Balance (from Isoaltion4_S3)

Durability Requirements

The tested system must guarantee durability: the ability to preserve the effects of committed transactions and ensure database consistency after recovery from any one of the failures listed in Clauses 7.5.2.2, 7.5.2.3 and 7.5.2.4.
v *Permanent irrecoverable failure of any single durable medium*
v *Instantaneous interruption (system crash/system hang) in processing that requires system reboot to recover*
v *Failure of all or part of memory (loss of contents)*
v *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.*

Data Accessibility Tests

This benchmark result used Redundancy Level 1.
> The **Test Sponsor** *must report in the* **Report** *the* **Redundancy Level** *(see clause 7.5.7.1) and describe   the test(s) used to demonstrate compliance. (9.3.7.2)*

To prove Redundancy Level 1, the following steps were successfully performed.

1. Count the current number of completed trades in the database by running CountSettlement.sql (included in SupportingFiles), record the settlement count as count1.
2. Start submitting Transactions and ramp up to the Durability Throughput Requirements (as defined in Clause 7.5.3).
3. Runing at steady state for at least five minutes.Induce the failure described for the redundancy level being demonstrated. In this case fail a disk in a database log array, then fail a disk in the database data array. Transactions should continue processing since the database log array has mirrored drives and the database data array uses RAID-5.
4. Begin the necessary recovery process, by replacing the failed drives in the database log array and the database data array. Wait a few minutes, rebuild on each replaced drive should start automatically.
5. Keep running for 20 minutes. Then terminate the run gracefully from the Driver.
6. Retrieve the new number of completed trades in the database by running CountSettlement.sql (included in SupportingFiles), record the settlement count as count2.
7. 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.
8. Allow recovery process to complete.

Following is a graph of the measured throughput versus elapsed time that must be reported for the run portions of the Data Accessibility tests:
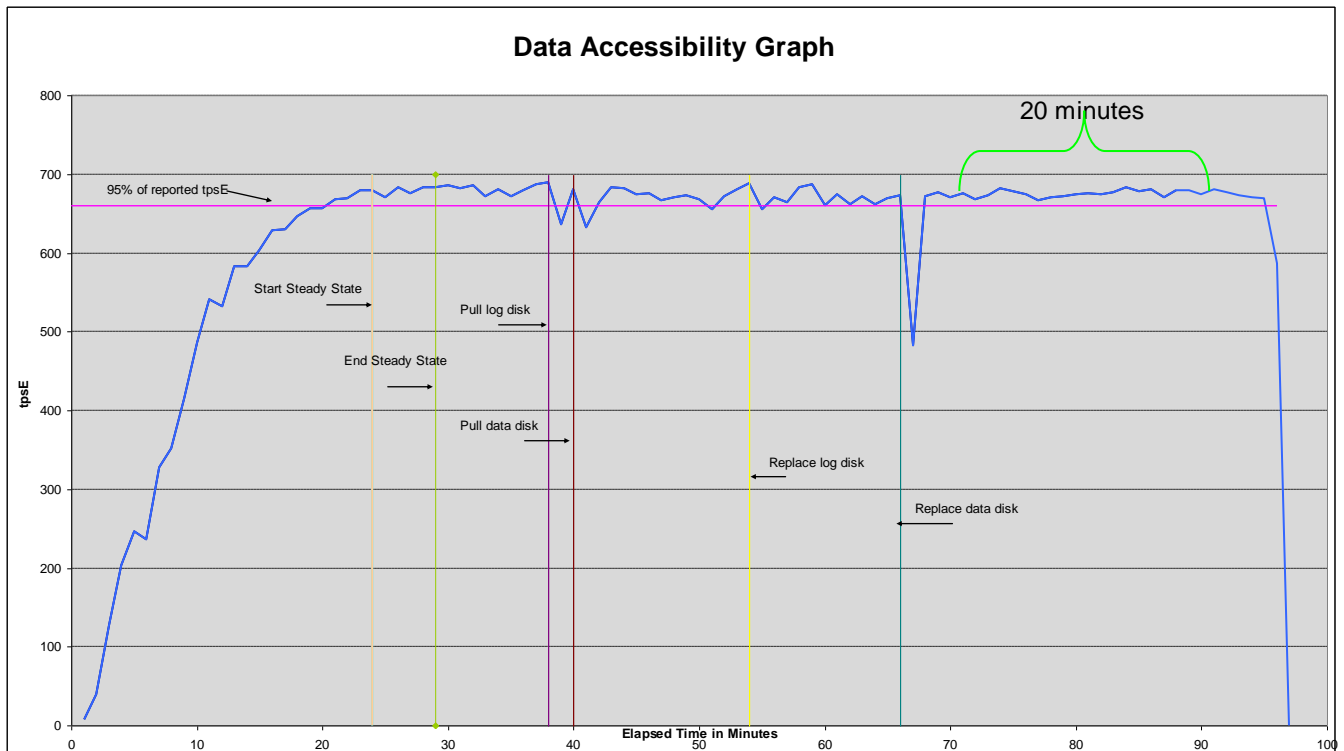
Figure 7-1. Data Accessibility Graph

Business Recovery Tests

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

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

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

1. Count the current number of completed trades in the database by running CountSettlement.sql (included in SupportingFiles).
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. The primary power to the Tier B server and the Tier A client was removed in the same time.
4. Stop the Driver.
5. Re-power and restart the NF520D2. Re-power and restart the two NF280D clients.
6. On the NF520D2 when Windows has started run StartSQL.cmd to start SQL Server and database recovery will automatically start. SQL Server writes timestamps out to the errorlog when it is started. This timestamp can be used as 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. The Driver was terminated gracefully.
10. 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 CountSettlement.sql (included in SupportingFiles).
12. Compare the number of completed Trade-Result Transactions on the Driver to (count2 – count1). Verify that (count2 - count1) is not less than the aggregate number of successful Trade-Result Transaction records in the driver log file for the runs performed in step 2 and step 7.
13. Finally, consistency conditions as specified in Clause 7.3.1.1 were executed to verify that the database was consistent.

The Business Recovery Time was 00:53:42.

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 Recovery Time Graph

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.

Table 8-1 Disk Space Requirements

Space calulcations for TPC-E		Customers:	360,000							
		TpsE:	695.24							
		TradeResult count:	7,261,909						Database File Groups	
Table	Rows	Data(KB)	Index(KB)	Total	Total + 5%	Rows After	Data After(KB)	Index After(KB)	Growth	BIG	SMALL
ACCOUNT_PERMISSION	2555672	255640	1880	257,520	270,396	2555672	255640	1880	0		257,520
ADDRESS	540004	31192	616	31,808	33,398	540004	31240	616	48		31,856
BROKER	3600	200	416	616	647	3600	392	432	208		824
CASH_TRANSACTION	5723149115	566790160	1195208	567,985,368	596,384,636	5729829090	578413200	2339712	12767544	580,752,912	
CHARGE	15	8	8	16	17	15	8	8	0		16
COMMISSION_RATE	240	16	16	32	34	240	16	16	0		32
COMPANY	180000	39176	11760	50,936	53,483	180000	39176	11760	0		50,936
COMPANY_COMPETITOR	540000	14536	12560	27,096	28,451	540000	14536	12560	0		27,096
CUSTOMER	360000	61016	16696	77,712	81,598	360000	61040	16672	0		77,712
CUSTOMER_ACCOUNT	1800000	167192	200056	367,248	385,610	1800000	167192	200056	0		367,248
CUSTOMER_TAXRATE	720000	15072	616	15,688	16,472	720000	15200	616	128		15,816
DAILY_MARKET	321813000	16507200	6979440	23,486,640	24,660,972	321813000	16508240	6979640	1240		23,487,880
EXCHANGE	4	8	8	16	17	4	8	8	0		16
FINANCIAL	3600000	423624	1752	425,376	446,645	3600000	423784	1856	264		425,640
HOLDING	318576550	16949768	12560328	29,510,096	30,985,601	318762902	26864824	12827160	10181888	39,691,984	
HOLDING_HISTORY	8336913474	303160592	157992064	461,152,656	484,210,289	8346703976	304006328	158589192	1442864	462,595,520	
HOLDING_SUMMARY	17910923	607432	2800	610,232	640,744	17910879	1214688	7568	612024	1,222,256	
INDUSTRY	102	8	40	48	50	102	8	40	0		48
LAST_TRADE	246600	11504	616	12,120	12,726	246600	22840	624	11344		23,464
NEWS_ITEM	360000	39030768	1000	39,031,768	40,983,356	360000	39030768	1000	0		39,031,768
NEWS_XREF	360000	9008	616	9,624	10,105	360000	9008	616	0		9,624
SECTOR	12	8	24	32	34	12	8	24	0		32
SECURITY	246600	38768	17736	56,504	59,329	246600	38768	17736	0		56,504
SETTLEMENT	6220800000	305281272	644144	305,925,416	321,221,687	6228061909	316361192	1287152	11722928	317,648,344	
STATUS_TYPE	5	8	8	16	17	5	8	8	0		16
TAXRATE	320	24	16	40	42	320	40	16	16		56
TRADE	6220800000	689176072	369146688	1,058,322,760	1,111,238,898	6228101113	698914664	373699768	14291672	1,072,614,432	
TRADE_HISTORY	14929960797	428099328	1116336	429,215,664	450,676,447	14947405518	429462376	1123984	1370696	430,586,360	
TRADE_REQUEST	0	0	0	-	-	39204	7584	8848	16432	16,432	
TRADE_TYPE	5	8	1032	1,040	1,092	5	8	1032	0		1,040
WATCH_ITEM	36004138	985856	4088	989,944	1,039,441	36004138	985976	4200	232		990,176
WATCH_LIST	360000	9000	8096	17,096	17,951	360000	9000	8096	0		17,096
ZIP_CODE	14741	488	176	664	697	14741	488	176	0		664
Totals in KB		2367664952	549916840	2917581792	3063460882		2412858248	557143072	52419528	2905128240	64873080

								file size	30208000	3200000
Database File Groups	Allocated size MB	Required size MB	Diff					# of files	28	28
big_fg	6,608,000	2,837,039	3,770,961					total in KB (*8)	6766592000	716800000
small_fg	700,000	63,353	636,647							

Growing Space	52,406,048	KB	
per Trade Results	7.22	KB	
Data Growth	144,496,673	KB	
60 Day Space	11,587,382,149	KB	
60 Day Space	11,051	GB	

Log space before in MB	17,240	4.9969654	345000
Log space after in MB	92,596	26.839415	345000
per Trade Results	0.010		
Log Growth	207,777	MB	
Total 8 hours log space	225,016	MB	
Total 8 hours log space	219.74	GB	

	Count	Formatted size GB	Total GB Configur	Total Needed
Data Disks configured	336	67.05	22,530	
			-	
			-	
RAID 5 overhead	8.33%		(1,878)	
Data Disks space total			20,653	11,051
Log Disks configured	12	135.97	1,632	
RAID 10 overhead 50%	50.00%		(816)	
Log Disk space total			816	220

Table 8-2. Ordering and Pricing Information

Description	Part Number	Order Date	Availability Date	Order Method	Price Verification
Inspur NF520D2 (4 x Intel X7460 Processor(2.67GHz), 128GB memory (32 x 4GB), Integrated RAID Controller, Onboard Dual-Port Gigabit Ethernet Controller, 2 x 73GB SAS driver） plus ServicePac for 3-year 24 x 7 suport	SNF5202DR 111	11-30-08	11-30-08	See Note 1	See Note 2

Note 1: INSPUR 800-860-6708 or 86 0531-85105430

Note 2: This component is not immediately orderable. For price verification before order date, call 86 0531-85105430.

Auditor's Attestation Letter

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

September 24, 2008

Mr. Dujidong

Inspur Group Co. Ltd.
1St Flor of Building C, No.2 xinxi Road
Shangdi,Haidian district, Beijing
P.C. 100085

I have verified on-site and by remote the TPC Benchmark™ E for the following configuration:

Platform:	Inspur NF520D2
Database Manager:	Microsoft SQL Server 2008 Enterprise x64 Edition
Operating System:	Microsoft Windows Sever 2008 Enterprise x64 Edition

Server (Tier B): NF520D2			
CPU's	Memory	Disks (total)	tpsE
4 Intel Xeon 6 core @ 2.66 Ghz	128 GB	336 @ 73 GB 12 @ 146 GB 2 @ 73GB (OS)	**695.24**
Clients (Tier A): 2			
2 Intel quad core @ 2.33 Ghz	4 GB	2 @ 73 GB	Na

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

- All EGen components were verified to be version 1.5.1.
- The database files were properly sized and populated for 360,000 customers.
- The transaction components were properly implemented.
- The required network between the driver and the transaction harness was configured.
- The ACID properties were successfully demonstrated.
- The database was verified to have no Trade-Request rows prior to the start of the test run.
- The test run met all the requirements for timing, mix, and response times.
- Input data was generated according to the specified percentages.
- One and only one Data-Maintenance process was running during the test run.
- There were no inactive load units during the test run.
- Eight hours of mirrored log space was present on the measured system.
- Eight hours of growth space was present on the measured system.
- The data for the 60 day space calculation was verified.
- There were 732 user contexts present on the system.
- The steady state portion of the test was 120 minutes.
- One checkpoint was taken after steady state and before the measured interval.

- Checkpoint interval was verified to be equal to or less than 7.5 minutes.
- The system pricing was checked for major components and maintenance.
- The FDR was reviewed and verified as required.

Auditor Notes: None

Sincerely,

Lorna Livingtree

Lorna Livingtree
Auditor

Supporting Files Index Table

The **Supporting Files Index** file can be found in the *SupportingFiles* directory (SupportingFiles.doc).

Clause	Description	PathName
Introduction	Disk Configuration	SupportingFiles/Introduction/Hardware/formats.cmd
		SupportingFiles/Introduction/Hardware/input.txt
		SupportingFiles/Introduction/Hardware/c-mp.cmd
		SupportingFiles/Introduction/Hardware/c-part-init.out
		SupportingFiles/Introduction/Hardware/StorageSetup.doc
	Tier B-NF520D2 Configuration	SupportingFiles/Introduction/Hardware/TierB_NF520D2_setup.doc
	TierA-NF280D setup	SupportingFiles/Introduction/Hardware/TierA_NF280D_setup.doc
	Database Tunable Parameters	SupportingFiles/Introduction/software/runconfig.sql
		SupportingFiles/Introduction/software/tempdb.sql
		SupportingFiles/Introduction/software/tempdb-ext.sql
		SupportingFiles/Introduction/software/StartSQL.cmd
		SupportingFiles/Introduction/software/StartSQL-noFlags.cmd
		SupportingFiles/Introduction/software/backup.cmd
		SupportingFiles/Introduction/software/restore.cmd
		SupportingFiles/Introduction/software/StopSQL.cmd
		SupportingFiles/Introduction/software/Trade-cleanup.cmd
		SupportingFiles/Introduction/software/sp.cmd
		SupportingFiles/Introduction/software/softnuma-ipall.reg
		SupportingFiles/Introduction/software/softnuma-node.reg
		SupportingFiles/Introduction/software/ts.reg
		SupportingFiles/Introduction/software/tcpip.reg
		SupportingFiles/Introduction/software/sp_configure.txt
		SupportingFiles/Introduction/software/services.csv
	Checkpoint Scripts	SupportingFiles/Introduction/software/checkpoint.cmd
		SupportingFiles/Introduction/software/checkpoint_TPCE_Database.sql
	Tier A Scripts	SupportingFiles/Introduction/software/StartClient-12.cmd
		SupportingFiles/Introduction/software/StartClient-34.cmd
	OS Tunable Parameters	SupportingFiles/Introduction/software/TierB_OSConf.doc
		SupportingFiles/Introduction/software/server-sysInfo.txt
		SupportingFiles/Introduction/software/client2-sysinfo.txt
		SupportingFiles/Introduction/software/client1-sysinfo.txt
Clause 2	Table creation scripts	SupportingFiles/Clause2/DDL/Convert_NI_ITEM_Data.sql
		SupportingFiles/Clause2/DDL/Create_Check_Constraints_Fixed.sql
		SupportingFiles/Clause2/DDL/Create_Check_Constraints_Growing.sql
		SupportingFiles/Clause2/DDL/Create_Check_Constraints_Scaling.sql
		SupportingFiles/Clause2/DDL/Create_FK_Constraints.sql
		SupportingFiles/Clause2/DDL/Create_Tables_Fixed.sql
		SupportingFiles/Clause2/DDL/Create_Tables _Growing.sql

		SupportingFiles/Clause2/DDL/Create_Tables _Scaling.sql
		SupportingFiles/Clause2/DDL/Create_Tables _Scaling_Flat.sql
		SupportingFiles/Clause2/DDL/Create_TPCE_Types.sql
		SupportingFiles/Clause2/DDL/Drop_FK_Constraints.sql
		SupportingFiles/Clause2/DDL/Drop_Tables_Fixed.sql
		SupportingFiles/Clause2/DDL/Drop_Tables_Growing.sql
		SupportingFiles/Clause2/DDL/Drop_Tables_Scaling.sql
	Index creation scripts	SupportingFiles/Clause2/DDL/Create_Clustered_Indexes_Fixed.sql
		SupportingFiles/Clause2/DDL/Create_Clustered_Indexes_Growing.sql
		SupportingFiles/Clause2/DDL/Create_Clustered_Indexes_Scaling.sql
		SupportingFiles/Clause2/DDL/Create_NC_Indexes_Fixed.sql
		SupportingFiles/Clause2/DDL/Create_NC_Indexes_Growing.sql
		SupportingFiles/Clause2/DDL/Create_NC_Indexes_Scaling.sql
	Load Transaction Frames	SupportingFiles/Clause2/DML/BrokerVolume.sql
		SupportingFiles/Clause2/DML/CustomerPosition.sql
		SupportingFiles/Clause2/DML/DataMaintenance.sql
		SupportingFiles/Clause2/DML/Get_Next_T_ID.sql
		SupportingFiles/Clause2/DML/MarketFeed.sql
		SupportingFiles/Clause2/DML/MarketWatch.sql
		SupportingFiles/Clause2/DML/SecurityDetail.sql
		SupportingFiles/Clause2/DML/Trade_Cleanup.sql
		SupportingFiles/Clause2/DML/TradeLookup.sql
		SupportingFiles/Clause2/DML/TradeOrder.sql
		SupportingFiles/Clause2/DML/TradeResult.sql
		SupportingFiles/Clause2/DML/TradeStatus.sql
		SupportingFiles/Clause2/DML/TradeUpdate.sql
	Create Database	SuportingFiles/Clause2/Backup_Database.sql
		SuportingFiles/Clause2/Checkpoint_TPCE_Database.SQL
		SuportingFiles/Clause2/Count_Customers.sql
		SuportingFiles/Clause2/Create_Database.sql
		SuportingFiles/Clause2/Create_DM_Audit_Table.sql
		SuportingFiles/Clause2/Create_TID_Ranges_Table.sql
		SuportingFiles/Clause2/Create_Timer_Table.sql
		SuportingFiles/Clause2/Create_TPCE_VERSIONS_Table.sql
		SuportingFiles/Clause2/Database_Options_1.sql
		SuportingFiles/Clause2/Database_Options_2.sql
		SuportingFiles/Clause2/Drop_and_Create_TPCE_INFO.sql
		SuportingFiles/Clause2/End_Load_Timer.sql
		SuportingFiles/Clause2/Get_Next_T_ID.sql
		SuportingFiles/Clause2/Install_Load_Timer_Proc.sql
		SuportingFiles/Clause2/Load_TPCE_Info.sql
		SuportingFiles/Clause2/MSTPCE Database Setup Reference.pdf
		SuportingFiles/Clause2/Remove_Database.sql

		SuportingFiles/Clause2/Restore_Database.sql
		SuportingFiles/Clause2/runconfig.sql
		SuportingFiles/Clause2/SQL_Server_Configuration.sql
		SuportingFiles/Clause2/startSQL.cmd
		SuportingFiles/Clause2/tempdb.sql
		SuportingFiles/Clause2/tempdb-ext.sql
		SuportingFiles/Clause2/TPCE_Setup.cmd
		SuportingFiles/Clause2/Trade_Cleanup.sql
		SuportingFiles/Clause2/Version.sql
	Database Space Scripts	SupportingFiles/Clause2/audit_scripts/Space/SPFiles.sql
		SupportingFiles/Clause2/audit_scripts/Space/SPLog.sql
		SupportingFiles/Clause2/audit_scripts/Space/SPUsed.sql
	Database Audit Scripts	SupportingFiles/Clause2/audit_scripts/database/Create_DB_Audit_Tables.sql
		SupportingFiles/Clause2/audit_scripts/database/DB_Check.sql
		SupportingFiles/Clause2/audit_scripts/database/DB_Primary_Key_Check.sql
		SupportingFiles/Clause2/audit_scripts/database/DB_Tables.sql
		SupportingFiles/Clause2/audit_scripts/database/Drop_DB_Audit_Tables.sql
		SupportingFiles/Clause2/audit_scripts/database/Insert_Duplicates_Tests.sql
		SupportingFiles/Clause2/Audit_Scripts/Database/Referential_Integrity_Tests.sql
Clause 3	Transaction Frames	SupportingFiles/Clause3/BrokerVolume.sql
		SupportingFiles/Clause3/CustomerPosition.sql
		SupportingFiles/Clause3/DataMaintenance.sql
		SupportingFiles/Clause3/Get_Next_T_ID.sql
		SupportingFiles/Clause3/MarketFeed.sql
		SupportingFiles/Clause3/MarketWatch.sql
		SupportingFiles/Clause3/SecurityDetail.sql
		SupportingFiles/Clause3/Trade_Cleanup.sql
		SupportingFiles/Clause3/TradeLookup.sql
		SupportingFiles/Clause3/TradeOrder.sql
		SupportingFiles/Clause3/TradeResult.sql
		SupportingFiles/Clause3/TradeStatus.sql
		SupportingFiles/Clause3/TradeUpdate.sql
	BaseServer	SupportingFiles/Clause3/BaseServer/BaseServer.cpp
		SupportingFiles/Clause3/BaseServer/BaseServer.h
		SupportingFiles/Clause3/BaseServer/BaseServer.vcproj
		SupportingFiles/Clause3/BaseServer/stdafx.cpp
		SupportingFiles/Clause3/BaseServer/stdafx.h
		SupportingFiles/Clause3/BaseServer/SUTServersLocals.h
	SUT_CE_Server	SupportingFiles/Clause3/SUT_CE_Server/CEServer.cpp
		SupportingFiles/Clause3/SUT_CE_Server/CEServer.h
		SupportingFiles/Clause3/SUT_CE_Server/CEServerMain.cpp
		SupportingFiles/Clause3/SUT_CE_Server/PortDefinitions.h
		SupportingFiles/Clause3/SUT_CE_Server/stdafx.cpp
		SupportingFiles/Clause3/SUT_CE_Server/stdafx.h

		SupportingFiles/Clause3/SUT_CE_Server/SUT_CE_Server.vcproj
		SupportingFiles/Clause3/SUT_CE_Server/SUTServer.sln
		SupportingFiles/Clause3/SUT_CE_Server/SUTServer.suo
		SupportingFiles/Clause3/SUT_CE_Server/SUTStructs.h
	SUT_MEE_Server	SupportingFiles/Clause3/SUT_MEE_Server/MEEServer.cpp
		SupportingFiles/Clause3/SUT_MEE_Server/MEEServer.h
		SupportingFiles/Clause3/SUT_MEE_Server/MEEServerMain.cpp
		SupportingFiles/Clause3/SUT_MEE_Server/stdafx.cpp
		SupportingFiles/Clause3/SUT_MEE_Server/stdafx.h
		SupportingFiles/Clause3/SUT_MEE_Server/SUT_MEE_Server.vcproj
	TransactionsSP	SupportingFiles/Clause3/TransactionsSP/BrokerVolumeDB_SP.cpp
		SupportingFiles/Clause3/TransactionsSP/BrokerVolumeDB_SP.h
		SupportingFiles/Clause3/TransactionsSP/CheckpointDB_SP.cpp
		SupportingFiles/Clause3/TransactionsSP/CheckpointDB_SP.h
		SupportingFiles/Clause3/TransactionsSP/CustomerPositionDB_SP.cpp
		SupportingFiles/Clause3/TransactionsSP/CustomerPositionDB_SP.h
		SupportingFiles/Clause3/TransactionsSP/DataMaintenanceDB_SP.cpp
		SupportingFiles/Clause3/TransactionsSP/DataMaintenanceDB_SP.h
		SupportingFiles/Clause3/TransactionsSP/MarketFeedDB_SP.cpp
		SupportingFiles/Clause3/TransactionsSP/MarketFeedDB_SP.h
		SupportingFiles/Clause3/TransactionsSP/MarketWatchDB_SP.cpp
		SupportingFiles/Clause3/TransactionsSP/MarketWatchDB_SP.h
		SupportingFiles/Clause3/TransactionsSP/SecurityDetailDB_SP.cpp
		SupportingFiles/Clause3/TransactionsSP/SecurityDetailDB_SP.h
		SupportingFiles/Clause3/TransactionsSP/stdafx.cpp
		SupportingFiles/Clause3/TransactionsSP/stdafx.h
		SupportingFiles/Clause3/TransactionsSP/TradeLookupDB_SP.cpp
		SupportingFiles/Clause3/TransactionsSP/TradeLookupDB_SP.h
		SupportingFiles/Clause3/TransactionsSP/TradeOrderDB_SP.cpp
		SupportingFiles/Clause3/TransactionsSP/TradeOrderDB_SP.h
		SupportingFiles/Clause3/TransactionsSP/TradeResultDB_SP.cpp
		SupportingFiles/Clause3/TransactionsSP/TradeResultDB_SP.h
		SupportingFiles/Clause3/TransactionsSP/TradeStatusDB_SP.cpp
		SupportingFiles/Clause3/TransactionsSP/TradeStatusDB_SP.h
		SupportingFiles/Clause3/TransactionsSP/TradeUpdateDB_SP.cpp
		SupportingFiles/Clause3/TransactionsSP/TradeUpdateDB_SP.h
		SupportingFiles/Clause3/TransactionsSP/TransactionsSP.vcproj
		SupportingFiles/Clause3/TransactionsSP/TxnHarnessDBBase.cpp
		SupportingFiles/Clause3/TransactionsSP/TxnHarnessDBBase.h
		SupportingFiles/Clause3/TransactionsSP/TxnHarnessDBConn.cpp
		SupportingFiles/Clause3/TransactionsSP/TxnHarnessDBConn.h
	TxnHarness	SupportingFiles/Clause3/TxnHarness/TxnHarness.vcproj
		SupportingFiles/Clause3/TxnHarness/TxnHarness_stdafx.cpp
		SupportingFiles/Clause3/TxnHarness/TxnHarness_stdafx.h

		SupportingFiles/Clause3/TxnHarness/TxnHarnessSendToMarket.cpp
		SupportingFiles/Clause3/TxnHarness/TxnHarnessSendToMarket.h
Clause 4	No Requirements	
Clause 5	No EGen modifications	
	No EGenLoader extensions	
	EGenDriver Configuration	SupportingFiles/Clause5/benchcraft.xml
		SupportingFiles/Clause5/txnreport-120.xls
	EGenLoader Parameters	SupportingFiles/Clause5/EGenLoaderFlags.txt
		SupportingFiles/Clause5/EGenLoaderFrom1To15000.log
		SupportingFiles/Clause5/EGenLoaderFrom15001To30000.log
		SupportingFiles/Clause5/EGenLoaderFrom30001To45000.log
		SupportingFiles/Clause5/EGenLoaderFrom45001To60000.log
		SupportingFiles/Clause5/EGenLoaderFrom60001To75000.log
		SupportingFiles/Clause5/EGenLoaderFrom75001To90000.log
		SupportingFiles/Clause5/EGenLoaderFrom90001To105000.log
		SupportingFiles/Clause5/EGenLoaderFrom105001To120000.log
		SupportingFiles/Clause5/EGenLoaderFrom120001To135000.log
		SupportingFiles/Clause5/EGenLoaderFrom135001To150000.log
		SupportingFiles/Clause5/EGenLoaderFrom150001To165000.log
		SupportingFiles/Clause5/EGenLoaderFrom165001To180000.log
		SupportingFiles/Clause5/EGenLoaderFrom180001To195000.log
		SupportingFiles/Clause5/EGenLoaderFrom195001To210000.log
		SupportingFiles/Clause5/EGenLoaderFrom210001To225000.log
		SupportingFiles/Clause5/EGenLoaderFrom225001To240000.log
		SupportingFiles/Clause5/EGenLoaderFrom240001To255000.log
		SupportingFiles/Clause5/EGenLoaderFrom255001To270000.log
		SupportingFiles/Clause5/EGenLoaderFrom270001To285000.log
		SupportingFiles/Clause5/EGenLoaderFrom285001To300000.log
		SupportingFiles/Clause5/EGenLoaderFrom300001To315000.log
		SupportingFiles/Clause5/EGenLoaderFrom315001To330000.log
		SupportingFiles/Clause5/EGenLoaderFrom330001To345000.log
		SupportingFiles/Clause5/EGenLoaderFrom345001To360000.log
Clause 6	EGenValidate Output	SupportingFiles/Clause6/Validate.ver

Clause 7	Scripts of ACID procedures	SupportingFiles/Clause7/AcidProcs/AcidProc.cmd
		SupportingFiles/Clause7/AcidProcs/Scripts/AcidProc.vbs
		SupportingFiles/Clause7/AcidProcs/Scripts/CustomerPosition_Iso3.sql
		SupportingFiles/Clause7/AcidProcs/Scripts/CustomerPosition_Iso4.sql
		SupportingFiles/Clause7/AcidProcs/Scripts/Drop_SPROC.sql
		SupportingFiles/Clause7/AcidProcs/Scripts/Remove_AcidProcs.vbs
		SupportingFiles/Clause7/AcidProcs/Scripts/TradeOrder_C.sql
		SupportingFiles/Clause7/AcidProcs/Scripts/TradeOrder_Iso1_1.sql
		SupportingFiles/Clause7/AcidProcs/Scripts/TradeOrder_Iso1_2.sql
		SupportingFiles/Clause7/AcidProcs/Scripts/TradeOrder_Iso2.sql
		SupportingFiles/Clause7/AcidProcs/Scripts/TradeOrder_Iso3.sql
		SupportingFiles/Clause7/AcidProcs/Scripts/TradeOrder_Iso4.sql
		SupportingFiles/Clause7/AcidProcs/Scripts/TradeOrder_RB.sql
		SupportingFiles/Clause7/AcidProcs/Scripts/TradeResult_Iso1_1.sql
		SupportingFiles/Clause7/AcidProcs/Scripts/TradeResult_Iso1_2.sql
		SupportingFiles/Clause7/AcidProcs/Scripts/TradeResult_Iso2_1.sql
		SupportingFiles/Clause7/AcidProcs/Scripts/TradeResult_Iso2_2.sql
		SupportingFiles/Clause7/AcidProcs/Scripts/TradeResult_Iso3.sql
		SupportingFiles/Clause7/AcidProcs/Scripts/TradeResult_Iso4.sql
		SupportingFiles/Clause7/AcidProcs/Remove_AcidProcs.cmd
	ACID procedures output	SupportingFiles/Clause7/AcidProcs/AcidProc.out
	Atomicity Scripts	SupportingFiles/Clause7/Atomicity/Atomicity.cmd
		SupportingFiles/Clause7/Atomicity/Scripts/Atomicity_C.sql
		SupportingFiles/Clause7/Atomicity/Scripts/Atomicity_RB.sql
		SupportingFiles/Clause7/Atomicity/Scripts/atom.vbs
	Atomicity Output	SupportingFiles/Clause7/Atomicity/Atomicity_C.out
		SupportingFiles/Clause7/Atomicity/Atomicity_RB.out
	Consistency Scripts	SupportingFiles/Clause7/Consistency/Consistency.cmd
		SupportingFiles/Clause7/Consistency/Scripts/Consistency.sql
		SupportingFiles/Clause7/Consistency/Scripts/Consistency.vbs
	Consistency Output	SupportingFiles/Clause7/Consistency/Consistency.out
		SupportingFiles/Clause7/Consistency/Consistency_after.out
	Isolation Scripts	SupportingFiles/Clause7/Isolation/Scripts/Isolation1_S1.sql
		SupportingFiles/Clause7/Isolation/Scripts/Isolation1_S2.sql
		SupportingFiles/Clause7/Isolation/Scripts/Isolation1_S3.sql
		SupportingFiles/Clause7/Isolation/Scripts/Isolation1_S4.sql
		SupportingFiles/Clause7/Isolation/Scripts/Isolation2_S1.sql
		SupportingFiles/Clause7/Isolation/Scripts/Isolation2_S2.sql
		SupportingFiles/Clause7/Isolation/Scripts/Isolation2_S3.sql
		SupportingFiles/Clause7/Isolation/Scripts/Isolation2_S4.sql
		SupportingFiles/Clause7/Isolation/Scripts/Isolation3_S1.sql
		SupportingFiles/Clause7/Isolation/Scripts/Isolation3_S2.sql
		SupportingFiles/Clause7/Isolation/Scripts/Isolation3_S3.sql

		SupportingFiles/Clause7/Isolation/Scripts/Isolation4_S1.sql
		SupportingFiles/Clause7/Isolation/Scripts/Isolation4_S2.sql
		SupportingFiles/Clause7/Isolation/Scripts/Isolation4_S3.sql
	Isolation Output	SupportingFiles/Clause7/Isolation/Isolation1_S1.rpt
		SupportingFiles/Clause7/Isolation/Isolation1_S2.rpt
		SupportingFiles/Clause7/Isolation/Isolation1_S3.rpt
		SupportingFiles/Clause7/Isolation/Isolation1_S4.rpt
		SupportingFiles/Clause7/Isolation/Isolation2_S1.rpt
		SupportingFiles/Clause7/Isolation/Isolation2_S2.rpt
		SupportingFiles/Clause7/Isolation/Isolation2_S3.rpt
		SupportingFiles/Clause7/Isolation/Isolation2_S4.rpt
		SupportingFiles/Clause7/Isolation/Isolation3_S1.rpt
		SupportingFiles/Clause7/Isolation/Isolation3_S2.rpt
		SupportingFiles/Clause7/Isolation/Isolation3_S3.rpt
		SupportingFiles/Clause7/Isolation/Isolation4_S1.rpt
		SupportingFiles/Clause7/Isolation/Isolation4_S2.rpt
		SupportingFiles/Clause7/Isolation/Isolation4_S3.rpt
	Durability Business Recovery	SupportingFiles/Clause7/Durability/BusinessRecovery/BusinessRecoveryTime.txt
		SupportingFiles/Clause7/Durability/BusinessRecovery/run2/Consistency_After.out
		SupportingFiles/Clause7/Durability/BusinessRecovery/CountSettlement.BeforeBusinessRecovery.txt
		SupportingFiles/Clause7/Durability/BusinessRecovery/CountSettlement.AfterBusinessRecovery.txt
		SupportingFiles/Clause7/Durability/BusinessRecovery/run1/run1_step_all.xls
		SupportingFiles/Clause7/Durability/BusinessRecovery/run2/run2_step_all.xls
		SupportingFiles/Clause7/Durability/BusinessRecovery/run1/run1_txnreport_20.xls
		SupportingFiles/Clause7/Durability/BusinessRecovery/run2/run2_txnreport_20.xls
		SupportingFiles/Clause7/Durability/BusinessRecovery/run1/run1_txnreport_all.xls
		SupportingFiles/Clause7/Durability/BusinessRecovery/run2/run2_txnreport_all.xls
		SupportingFiles/Clause7/Durability/BusinessRecovery/CountSettlement.sql
		SupportingFiles/Clause7/Durability/BusinessRecovery/run2/run2_dblog_businessrecovery.txt
		SupportingFiles/Clause7/Durability/BusinessRecovery/run1/run1_dblog_businessrecovery.txt
		SupportingFiles/Clause7/Durability/BusinessRecovery/BusinessRecovery_TimeGraph.xls
		SupportingFiles/Clause7/Durability/BusinessRecovery/ businessrecovery-client1-sysinfo.txt
		SupportingFiles/Clause7/Durability/BusinessRecovery/ businessrecovery-client2-sysinfo.txt
		SupportingFiles/Clause7/Durability/BusinessRecovery/ businessrecovery-server-sysinfo.txt
	Durability Data Accessibility	SupportingFiles/Clause7/Durability/DataAccessbility/CountSettlement-AfterDataAccessibility.txt
		SupportingFiles/Clause7/Durability/DataAccessbility/CountSettlement-BeforeDataAccessibility.txt
		SupportingFiles/Clause7/Durability/DataAccessbility/CountSettlement.sql
		SupportingFiles/Clause7/Durability/DataAccessbility/txnreport-all.xls
		SupportingFiles/Clause7/Durability/DataAccessbility/DataAccessibilityGraph.xls
		SupportingFiles/Clause7/Durability/DataAccessbility/dblog.txt
		SupportingFiles/Clause7/Durability/DataAccessbility/data-progress.jpg
		SupportingFiles/Clause7/Durability/DataAccessbility/log-progress.jpg
	ACID Procedures Document	SupportingFiles/Clause7/MSTPCE ACID Procedures.doc

Clause 8	60-Day Space Calculations	SupportingFiles/Clause8/Space-TPCE-Inspur.xls
		SupportingFiles/Clause8/Seagate_ ds_cheetah_15k_5.pdf.pdf
		SupportingFiles/Clause8/Seagate_ po_cheetah_15k_5.pdf.pdf