

**TPC Benchmark™ C  
Full Disclosure Report  
for  
Dell PowerEdge 2900  
using  
Microsoft SQL Server 2005 Standard x64  
Edition and  
Microsoft Windows Server 2003 Standard  
x64 Edition SP1**

First Edition  
Submitted for Review  
June 30, 2006

## **First Edition, June 30, 2006**

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The pricing information given in this FDR is accurate as of the first publication date, June 30, 2006 and is generally available.

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

All performance data contained in this report were obtained in a rigorously controlled environment. Actual performance experienced by a particular customer may vary due to differences in system layout and configuration, hardware and/or software revision levels, and background system activity. The content of this document is for informational purposes only.

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## Abstract

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### Overview

This report documents the methodology and results of the TPC Benchmark™ C test conducted on Dell PowerEdge 2900. The tests were run in a client/server configuration using one PowerEdge SC 1420 as client. The operating system used for the benchmark was Microsoft Windows Server 2003 SP1, Microsoft SQL Server 2005 Standard x64 Edition on the database server and Microsoft Windows Server 2003 Standard Edition on the client. The database was Microsoft SQL Server 2005 Standard x64 Edition. Microsoft COM+ provided the database connection queues. All tests were done in compliance with Revision 5.7 of the Transaction Processing Council's TPC Benchmark™ C Standard Specification. Two standard TPC Benchmark™ C metrics, transactions per second (tpmC) and price per tpmC (\$/tpmC) are reported and referred to in this document. The results from the tests are summarized below.

Hardware	Software	Total System Cost	tpmC	\$/tpmC	Availability Date
Dell PowerEdge 2900	Microsoft SQL Server 2005 Standard x64 Edition With Windows Server 2003 Standard x64 Edition SP1	\$64,512	65,833	\$.98	June 26, 2006

### Auditor

The results of the benchmark and test methodology used to produce the results were audited by Lorna Livingtree of Performance Metrics and have fully met the TPC-C rev 5.7 specifications.

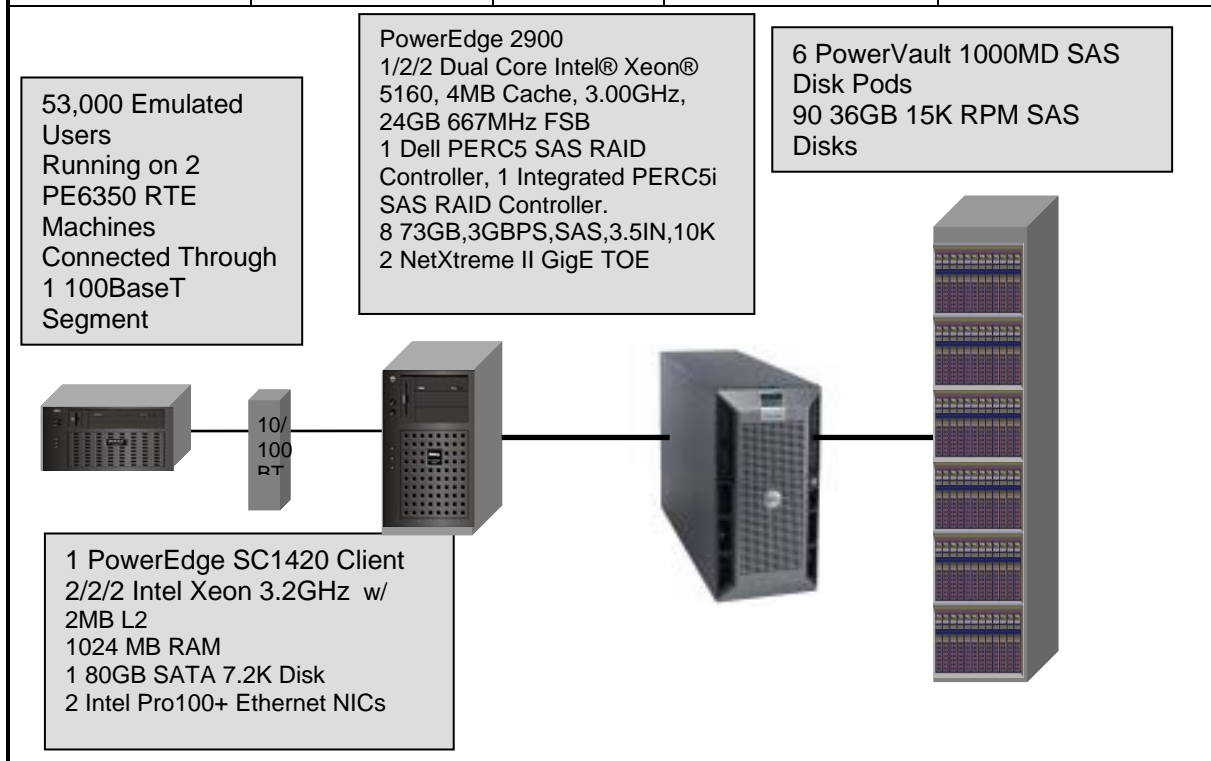
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or

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Round Rock, TX 78682  
Attention: Mike Molloy, Ph.D.

<b>DELL</b>		<b>PowerEdge 2900 Server with 1 PowerEdge SC1420 Client</b>		TPC-C Rev 5.7 Original Report Date <b>June 30 ,2006</b>
Total System Cost		TPC-C Throughput	Price/Performance	Availability Date
<b>\$64,512</b>		<b>65,833 tpmC</b>	<b>\$.98 / tpmC</b>	June 26, 2006
Processors	Database Manager	OS	Other Software	Number of Users
1/2/2 Dual Core Intel® Xeon® 5160, 4MB Cache, 3.00GHZ 1333, 667MHZ FSB	Microsoft SQL Server 2005 Standard x64 Edition	Microsoft Windows Server 2003 Standard x64 Edition SP1	Windows Server 2003 Standard Edition w/ COM+ Internet Information Server 6.0 Microsoft Visual C++	53,000



System Component	Server		Each Client	
Processor/Core/Cache	1	1/2/2 Dual Core Intel® Xeon® 5160, 4MB Cache, 3.00GHZ, 1333	2	2/2/2 Intel® Xeon® w/ 2MB L2, 3.2 GHz
Memory		24GB 667 FB-DIMM		1024 MB
Disk Controllers	1 1	Dell PERC5 RAID Controller. Integrated PERC5i Raid Controller.	1	Onboard SATA
Disk Drives	90 8	36GB SAS 15K 73GB SAS 10K	1	80GB 7.2K SATA
Total Storage	98	3345 GB SAS	1	80GB SATA
Other	2 1	Broadcom NetXtreme II GigE CD-ROM	2 1	10/100MB BT NIC CD-ROM

Dell		PowerEdge 2900		TPC-C REV 5.7 EXECUTIVE SUMMARY PAGE 2 OF 3			
		Client/Server	Report Date: 30-June-06				
Description	Part Number	Third Party	Unit Price	Qty	Extended Price	3 yr. Maint. Price	
<b>Server Hardware</b>							
		<b>Brand</b>	<b>Pricing</b>				
3.0G/4MB,1333,XEON,2 onboard Gigabit NICs	222-0210				\$1,451.00	1	\$1,451.00
24GB (12X2GB) DDR2 667MHz FBD	311-3605				\$420.67	12	\$5,048.04
PERC5/E,SAS,EXT,PCI-E,MD1000	341-3023				\$799.00	1	\$799.00
73GB SAS 10K (OS+LOG)	341-2565				\$299.00	8	\$2,392.00
E773s 17-inch Color CRT Monitor	E7733YR				\$149.00	1	\$149.00
						<b>Subtotal</b>	\$9,839.04
							\$320.00
<b>PowerVault Disk Subsystem</b>							
PV MD1000,RACK,3U,15 BAY,LBZL	220-4476				\$3,180.00	6	\$19,080.00
TWO ENCL MGT MODULES, SAS ONLY	340-9324				\$500.00	6	\$3,000.00
36GB,3GBPS,SAS,3.5IN,15K Hard Drive	340-9472				\$249.00	90	\$22,410.00
Dell Depth 4 Post Rack 30U	RACK-111-30-D	Racksolutions.com	3		\$429	1	\$429.00
						<b>Subtotal</b>	\$44,919.00
							\$9,888.00
<b>Server Software</b>							
SQL Server 2005 Std x64 Edition, Per processor licensing *	228-03128	Microsoft.com	1		\$5,999.00	1	\$5,999.00
Windows Server 2003 Standard x64 Edition **	P73-00295	Microsoft.com	1		\$719.00	1	\$719.00
Professional Support (1 Incident)		Microsoft.com	1		\$245.00	1	\$245.00
						<b>Subtotal</b>	\$6,718.00
							\$245.00
<b>Client Hardware</b>							
Dell PowerEdge SC 1420, 3.2GHZ/2MB,400 FSB	221-7738				\$1,129.00	1	\$1,129.00
Additional processor , 2nd Proc,3.2GHz/2MB/400,SC1420	311-4792				\$599.00	1	\$599.00
1.0GB DDR2, 400, 2X512 Dimms	311-3811				\$198.00	1	\$198.00
80GB,SATA,1IN,7.2K RPM,HD ,7.2K	341-1024				\$99.00	1	\$99.00
INTEL PRO-100S WMPSEC,NIC	430-0369				\$59.00	1	\$59.00
E773s 17-inch Color CRT Monitor	E7733YR				\$149.00	1	\$149.00
						<b>Subtotal</b>	\$2,233.00
							\$320.00
<b>Client Software</b>							
Windows Server 2003 Standard Edition **	P73-00295	Microsoft.com	1		\$719.00	1	\$719.00
Visual C++ Standard Edition	254-00170	Microsoft.com	1		\$109.00	1	\$109.00
						<b>Subtotal</b>	\$828.00
<b>User Connectivity</b>							
7ft Crossover cable	CBLC5C7	LanAdapter.com	2		\$1.38	3	\$4.14
						<b>Subtotal</b>	\$4.14
All Hardware and maintenance components from Dell are discounted 16% based on total dollar value of this configuration.					<b>Other Discounts</b>		\$10,803.05
					<b>Total USD:</b>		<b>\$53,738</b>
							<b>\$10,773</b>
Notes: For pricing verification call 1-800-BUY-Dell and reference Quote# 302710744 as a complex quote.					<b>Three-Year Cost of Ownership USD:</b>		
** All Microsoft maintenance is covered by the maintenance costs of Microsoft SQL Server							
Pricing: 1 - Microsoft 2 - LanAdapter.com 3 -RackSolutions.com					<b>tpmC Rating:</b>		
					<b>65833</b>		
<b>Audited by Lorna Livingtree, Performance Metrics Inc.</b>					<b>USD\$ / tpmC:</b>		
					<b>0.98</b>		
Prices used in the TPC benchmarks reflect the actual prices a customer would pay for a one time purchase of the stated components. Individually negotiated discounts are not permitted. All discounts reflect standard pricing policies for the listed components. For complete details, see the pricing sections of the TPC benchmark pricing specifications. If you find that the stated prices are not available according to these terms, please inform the TPC at <a href="mailto:pricing@tpc.org">pricing@tpc.org</a> .							

**MQTh**, computed Maximum Qualified Throughput

65,833 tpmC

**Response Times** (in seconds)

	Average	90 <sup>th</sup>	Max
- Neworder	0.45	0.86	7.14
- Payment	0.36	0.75	6.92
- Delivery (interactive portion)	0.21	0.44	2.83
- Stock-Level	0.47	0.94	7.03
- Order Status	0.42	0.83	9.74
- Delivery (deferred portion)	0.35	0.55	6.99
- Menu	0.21	0.44	2.87

Response time delay added for emulated components

Menu 0.1  
Resp 0.1

**Transaction Mix**, in percent of total transactions

- New-Order	44.83%
- Payment	43.03%
- Delivery	4.05%
- Stock-Level	4.05%
- Order-Status	4.04%

**Keying/Think Times** (in seconds),

	Min		Average		Max	
- New-Order	18.02	0.0	18.03	12.06	19.53	120.65
- Payment	3.02	0.0	3.03	12.05	4.54	120.88
- Delivery	2.02	0.0	2.03	5.06	3.52	50.42
- Stock-Level	2.02	0.0	2.03	5.06	3.53	50.42
- Order-Status	2.02	0.0	2.03	10.06	3.52	100.42

**Test Duration**

- Ramp-up time	10 minutes
- Measurement interval	120 minutes
- Number of checkpoints	4
- Checkpoint interval	30 minutes
- Number of transactions (all types)	18,257,161

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## Introduction

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### **Document Structure**

The TPC Benchmark C Standard Specification Revision 5.7, written and approved by the Transaction Processing Performance Council (TPC), determines the contents of this report. The format of this report is based on this specification. Most sections of this report begin with the specification requirements printed in italic type, immediately followed by the detail in plain type of how Dell complied with the specification. Where extensive listings are required (such as listing of code), a note is included which references an appendix containing the listing.

### **Benchmark Overview**

TPC Benchmark™ C (TPC-C) is an OLTP workload. It is a mixture of read-only and update intensive transactions that simulate the activities found in complex OLTP application environments. It does so by exercising 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
- On-line and deferred transaction execution modes
- Multiple on-line terminal sessions
- Moderate system and application execution time
- Significant disk input/output
- Transaction integrity (ACID properties)
- Non-uniform distribution of data access through primary and secondary keys
- Databases consisting of many tables with a wide variety of sizes, attributes, and relationships
- Contention on data access and update

The performance metric reported by TPC-C is a "business throughput" measuring the number of orders processed per minute. Multiple transactions are used to simulate the business activity of processing an order, and each transaction is subject to a response time constraint.

The performance metric for this benchmark is expressed in transactions-per-minute-C (tpmC). To be compliant with the TPC-C standard, all references to tpmC results must include the tpmC rate, the associated price-per-tpmC, and the availability date of the priced configuration.

Although these specifications express implementation in terms of a relational data model with conventional locking scheme, 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-C uses terminology and metrics that are similar to other benchmarks, originated by the TPC or others. Such similarity in terminology does not in any way imply that TPC-C results are comparable to other benchmarks. The only benchmark results comparable to TPC-C are other TPC-C results conformant with the same revision.

Despite the fact that this benchmark offers a rich environment that emulates 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-C approximates the customer application. The relative performance of

systems derived from this benchmark does not necessarily hold for other workloads or environments. Extrapolations to any other environment are not recommended.

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

### ***System Overview***

The hardware configuration used in this TPC-C test is a Dell PowerEdge 2900 server driven by one Dell PowerEdge SC1420 client. The client and server are networked together via switch and cables. Two remote terminal emulators (RTE) systems PowerEdge 6350 emulate users executing the standard TPC-C workload. The RTE are connected to the client through a 10/100 BaseT switch. The switch connects to the client machine at 100 BaseT and to the RTE machine at 100Mbit/sec, full duplex. Microsoft Windows Server 2003, Standard x64 Edition SP1 was the operating system used on the server. Microsoft Windows Server 2003, Standard x64 Edition was used on the client. Microsoft SQL Server 2005 Standard x64 Edition was the database on the server machine.

The PowerEdge 2900 motherboard uses an Intel chipset and can hold up to 2/4/4 two Pentium® Xeon® Dual Core processors 3.73 GHz 1333 with 4 MB L2 cache and 64-bit Extensions. The system has 1 PCIe x8 slot, 3 PCIe x4 slots, and 2 PCI-x 64 Bit/133 MHz slots. The measured configuration used 24 GB of Fully Buffered 667 DDR2 RAM, which was achieved using 12 2 GB DIMMs. The network adapters are embedded with Broadcom NetXtreme II GigE network adapters.

The PowerEdge 2900 has an integrated 6 slot riser board to which was attached 8 72GB SAS LFF DISKS in RAID 10 configuration containing the database log and OS via an internal channel on a Dell embedded PERC5i RAID controller. In addition, one Dell PERC5 Dual Channel PCI-e RAID controller was installed in a PCI Express slot for the data volumes. The Dell PERC5 PCI Express RAID controller was connected to 6 MD1000 disk pods enclosing a total of 90 36GB 15K RPM SAS disks.

The client has dual 2/2/2 3.2GHz Intel Xeon® processors with 2MB of L2 cache. The client has 1024 Mbytes of RAM, one 80 GB hard disk, one integrated Intel Ether Express Pro100+ PCI Ethernet adapter and one Intel Pro 100 Network Interface Card. The client's Intel Ethernet adapter was connected to the RTE machine through a 10/100 BaseT switch and the Intel Pro NIC was connected to the Database Server through a cross-over cable. The client was driven through two network segments to run a total of 53,000 emulated users.

## General Items

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### **Test Sponsor**

*A statement identifying the sponsor of the Benchmark and any other companies who have participated.*

Dell was the test sponsor of this TPC Benchmark™ C.

### **Application Code and Definition Statements**

*The application program must be disclosed. This includes, but is not limited to, the code implementing the five transactions and the terminal input/output functions.*

The application consists of the Microsoft Benchcraft Remote Terminal Emulator (RTE) program emulating a set of users entering TPC-C transactions through web browsers, and communicating with Client machines running the Microsoft Internet Information Server (IIS) web server. The Client machines use the COM+ transaction monitor to communicate with the database server machine.

On each Client machine IIS loads a custom Microsoft Internet Information Server Application Programming Interface dynamic link library (ISAPI DLL) application program that communicates with the emulated web browsers through the HTTP protocol and with the database server through the COM+ transaction monitor and the Microsoft DBLIB interface. The application supplies fill-in screens to the user for each transaction, then parses the data in each request, and makes a call on SQL Server through the COM+ layer, which manages a set of DBLIB connections to the database server. The resulting data is passed back to the application where it is formatted into HTML and sent back to the user's browser. The Delivery transaction is handled directly from the application to the database without the use of COM+.

The web Client code is listed in Appendix A.

### **Parameter Settings**

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

- *Database options*
- *Recover/commit options*
- *Consistency/locking options*
- *System parameter, application parameters, and configuration parameters.*

*This requirement can be satisfied by providing a full listing of all parameters and options.*

Appendix C contains all the database, Windows 2003 Server, and Internet Information Service parameters used in this benchmark.

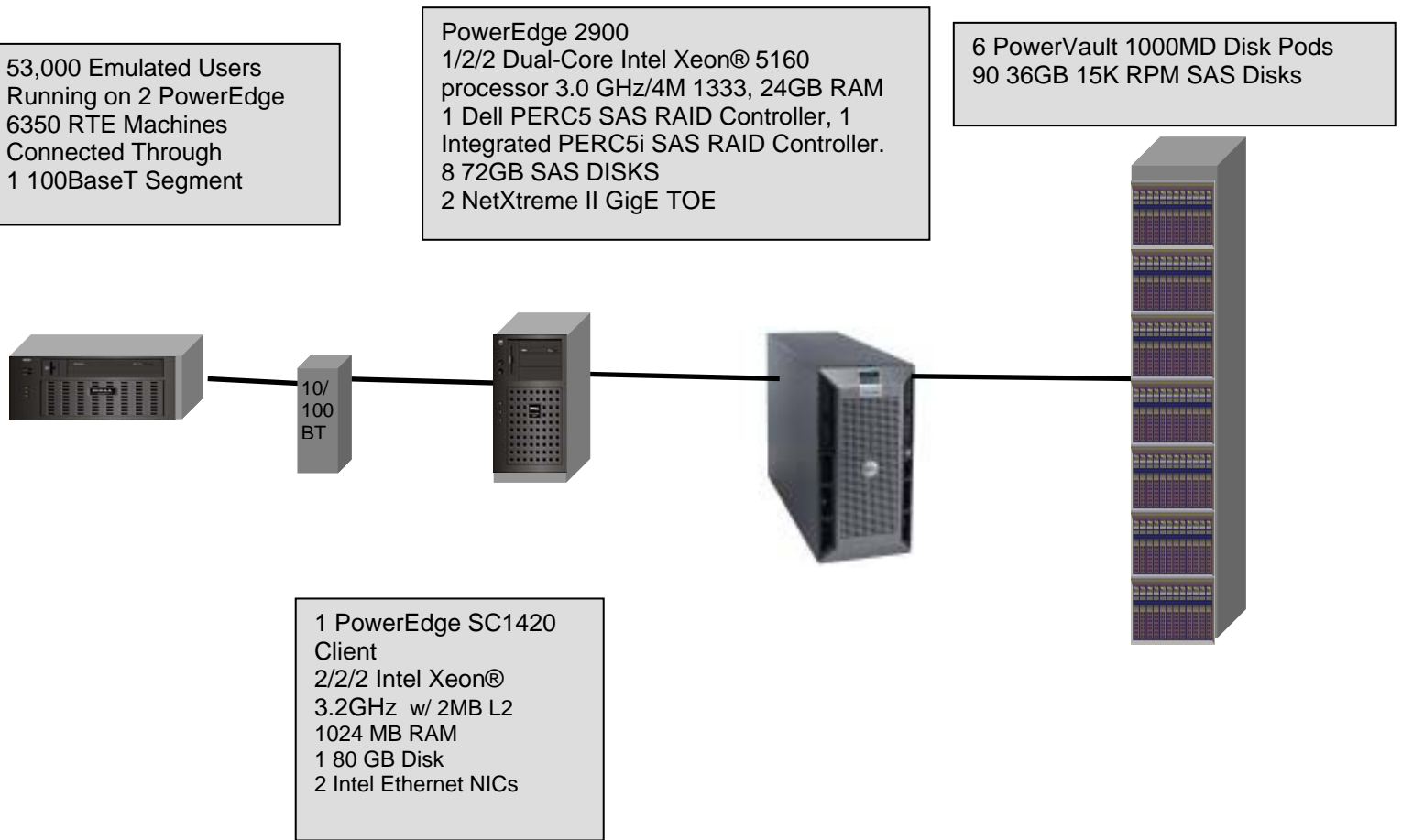
Appendix D contains the 60 day space calculations.

### Configuration Diagrams

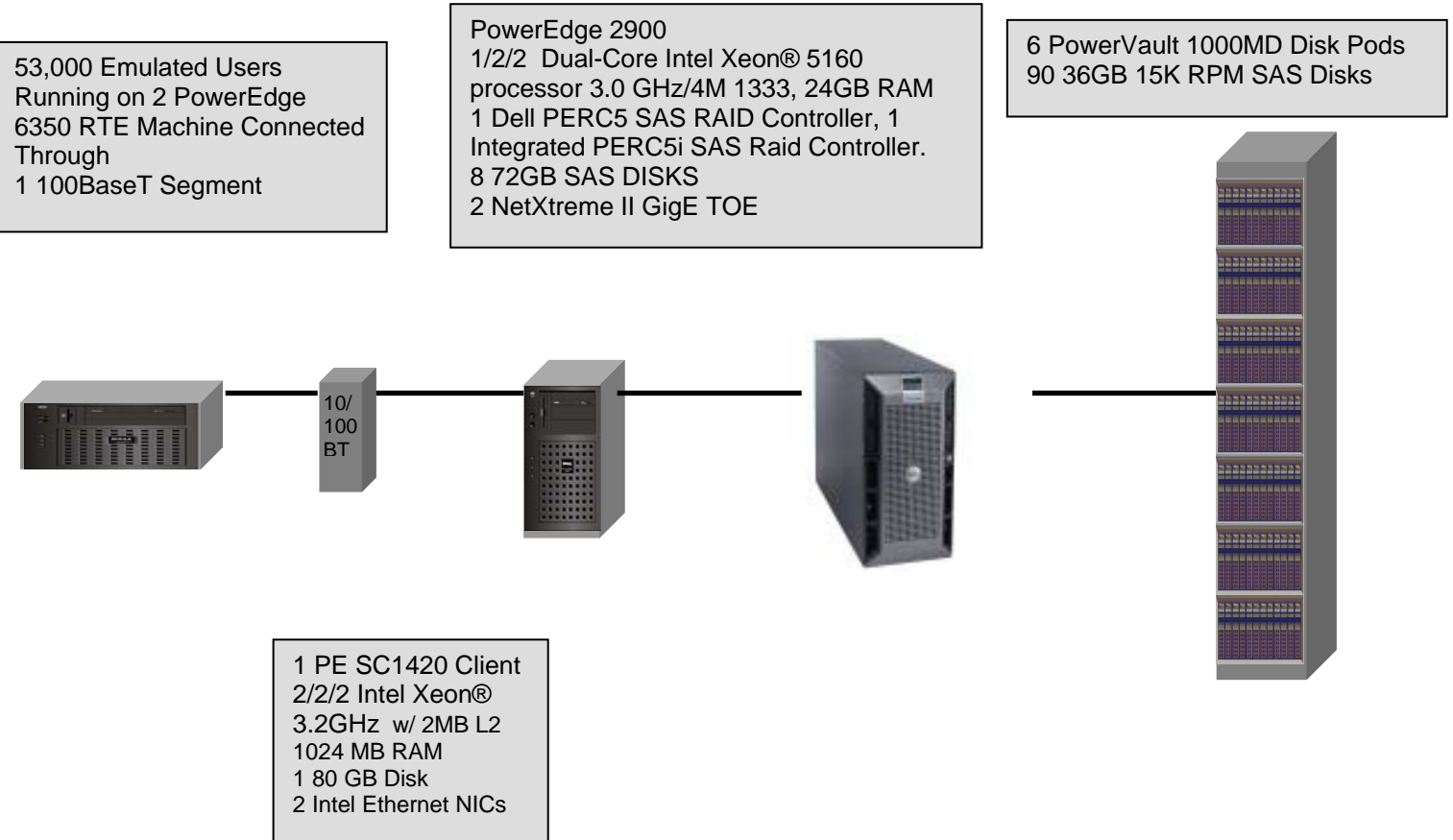
Diagrams of both the measured and priced system must be provided, accompanied by a description of the differences.

Figures 1 and 2 respectively show the measured and priced full client/server configurations. The system under test (SUT) in the measured system was identical to what was priced.

**Figure 1: Measured Configuration**



**Figure 2: Priced Configuration**



## Clause 1 -- Logical Database Design Related Items

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### **Table Definitions**

Listings must be provided for all table definition statements and all other statements used to set-up the database. (8.1.2.1)

Appendix B contains the code used to define and load the database tables.

### **Physical Organization of the Database**

The physical organization of tables and indices, within the database, must be disclosed. (8.1.2.2)

The measured configuration used 99 disk drives. The organization is shown in Table 5: Data Distribution.

### **Insert and Delete Operations**

It must be ascertained that insert and/or delete operations to any of the tables can occur

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*concurrently with the TPC-C transaction mix. Furthermore, any restriction in the SUT database implementation that precludes inserts beyond the limits defined in Clause 1.4.11 must be disclosed. This includes the maximum number of rows that can be inserted and the maximum key value for these new rows. (8.1.2.3)*

Insert and delete functionality was fully operational during the benchmark.

***Horizontal and Vertical Partitioning***

*While there are a few restrictions placed upon horizontal or vertical partitioning of tables and rows in the TPC-C benchmark (see Clause 1.6), any such partitioning must be disclosed. (8.1.2.4)*

Partitioning was not used in this benchmark.

***Replication***

*Replication of tables, if used, must be disclosed (see Clause 1.4.6). (8.1.2.5)*

Replication was not used in this benchmark.

***Table Attributes***

*Additional and/or duplicated attributes in any table must be disclosed along with a statement on the impact on performance (see Clause 1.4.7). (8.1.2.6)*

No additional attributes were used in this benchmark.



## Clause 2 -- Transaction and Terminal Profiles Related Items

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### **Random Number Generation**

*The method of verification for the random number generation must be described. (8.1.3.1)*

The random number generation was done internal to the Microsoft BenchCraft RTE program, which was audited independently.

### **Screen Layout**

*The actual layouts of the terminal input/output screens must be disclosed. (8.1.3.2)*

The screen layouts are based on those in Clauses 2.4.3, 2.5.3, 2.6.3, 2.7.3, and 2.8.3 of the TPC-C Standard Specification. There are some very minor differences based on the fact that this is a web client implementation.

### **Terminal Verification**

*The method used to verify that the emulated terminals provide all the features described in Clause 2.2.2.4 must be explained. Although not specifically priced, the type and model of the terminals used for the demonstration in 8.1.3.3 must be disclosed and commercially available (including supporting software and maintenance). (8.1.3.3)*

The terminal features were verified by allowing the auditor to manually execute each of the five transaction types, using Microsoft Internet Explorer version 3.0.

### **Intelligent Terminals**

*Any usage of presentation managers or intelligent terminals must be explained. (8.1.3.4)*

**Comment 1:** *The intent of this clause is to describe any special manipulations performed by a local terminal or workstation to off-load work from the SUT. This includes, but is not limited to: screen presentations, message bundling, and local storage of TPC-C rows.*

**Comment 2:** *This disclosure also requires that all data manipulation functions performed by the local terminal to provide navigational aids for transaction(s) must also be described. Within this disclosure, the purpose of such additional function(s) must be explained.*

Application code involved in the manipulation of data was run on the client. Screen manipulation commands in the form of HTML were downloaded to the web browser, which handled input and output presentation graphics. A listing of this code is included in Appendix A. Microsoft Internet Information Service assisted in the processing and presentation of this data.

### **Transaction Profiles**

*The percentage of home and remote order-lines in the New-Order transactions must be disclosed. (8.1.3.5)*

*The percentage of New-Order transactions that were rolled back as a result of an unused item number must be disclosed. (8.1.3.6)*

*The number of items per orders entered by New-Order transactions must be disclosed. (8.1.3.7)*

*The percentage of home and remote Payment transactions must be disclosed. (8.1.3.8)*

*The percentage of Payment and Order-Status transactions that used non-primary key (C\_LAST) access to the database must be disclosed. (8.1.3.9)*

*The percentage of Delivery transactions that were skipped as a result of an insufficient number of rows in the NEW-ORDER table must be disclosed. (8.1.3.10)*

**Table 1: Transaction Statistics**

Transaction	Function	Value
New Order	Home Warehouse Items	99.00%
	Remote Warehouse Items	1.00%
	Rolled Back Transactions	1.00%
	Average Lines Per Order	10.00
Payment	Home Warehouse	85.00%
	Remote Warehouse	0.15%
	Non-Primary Key Access	60.04%
Order Status	Non-Primary Key Access	60.01%
Delivery	Skipped Transactions	0

**Transaction Mix**

The mix (i.e., percentages) of transaction types seen by the SUT must be disclosed. (8.1.3.11)

**Table 2: Transaction mix**

Transaction	Percentage
New Order	44.83%
Payment	43.03%
Order Status	4.05%
Delivery	4.05%
Stock Level	4.04%

**Deferred Delivery Mechanism**

The queuing mechanism used to defer the execution of the Delivery transaction must be disclosed. (8.1.3.12)

The application creates a semaphore-base thread pool consisting of a user-specified number of threads, which open DBLIB connections on the database. When a Delivery transaction is posted one of these threads makes the database call while the transaction's original thread returns control to the user. Upon completion the Delivery thread writes an entry in the Delivery log and returns to the thread pool.

The source code is listed in Appendix A.

# Appendix B – Database Design

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## Clause 3 -- Transaction and System Properties Related Items

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### **ACID Tests**

*The results of the ACID tests must be disclosed along with a description of how the ACID requirements were met. This includes disclosing which case was followed for the execution of Isolation Test 7. (8.1.4.1)*

All ACID property tests were successful. The executions are described below.

### **Atomicity**

*The system under test must guarantee that the 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.*

### **Completed Transactions**

A row was selected in a script from the warehouse, district and customer tables, and the balances noted. A payment transaction was started with the same warehouse, district and customer identifiers and a known amount. The payment transaction was committed and the rows were verified to contain correctly updated balances.

### **Aborted Transactions**

A row was selected in a script from the warehouse, district and customer tables, and the balances noted. A payment transaction was started with the same warehouse, district and customer identifiers and a known amount. The payment transaction was rolled back and the rows were verified to contain the original balances.

### **Consistency**

*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, assuming that the database is initially in a consistent state.*

Consistency conditions one through four were tested using a shell script to issue queries to the database. The results of the queries verified that the database was consistent for all four tests. A run was executed under full load lasting over ten (10) minutes and included a checkpoint. The shell script was executed again. The result of the same queries verified that the database remained consistent after the run.

### **Isolation**

*Sufficient conditions must be enabled at either the system or application level to ensure the required isolation defined above (clause 3.4.1) is obtained.*

Isolation tests one through seven were executed using shell scripts to issue queries to the database. Each script included timestamps to demonstrate the concurrency of operations. The results of the queries were captured to files. The captured files were verified by the auditor to demonstrate the required isolation had been met.

In addition, the phantom tests and the stock level tests were executed and verified.

For Isolation test seven, case A was followed.

## Appendix B – Database Design

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### Durability

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

### Durable Media Failure

Durability from media failure was demonstrated on the 530 warehouse database. The standard driving mechanism was used to generate the transaction load of 5300 users for the Loss of Data.

### Loss of Data/ Loss of Log

Loss of data was demonstrated on the 530 warehouse database. The standard driving mechanism was used to generate the transaction load of 5300 users for the test. To demonstrate recovery from a permanent failure of durable media containing TPC-C tables, the following steps were executed:

1. The 530 warehouse database was used for this test.
2. The database was backed up using SQL Server backup facilities.
3. A sum of D\_NEXT\_O\_ID was taken.
4. 5300 users were logged in to the database and ran transactions.
5. The system was run at steady state for 5 minutes.
6. One disk drive in the transaction log array was removed with no effect on Windows 2003 or SQL Server.
7. One disk drive in the data array was removed causing SQL Server errors.
8. The RTE was allowed to continue running. Completed transactions enroute from the clients were recorded. Error messages began appearing on the RTE screen.
9. The RTE was stopped.
10. SQL Server was stopped and restarted and a dump of the transaction log was taken.
11. SQL Server was stopped, Windows 2003 was shutdown and the machine powered off.
12. The failed disks were replaced.
13. The machine was powered up, Windows 2003 and SQL Server were started.
14. The TPC-C database was dropped and restored from backup.
15. The transaction log was restored and transactions rolled forward.
16. A new count of D\_NEXT\_O\_ID was taken.
15. This number was compared with the number of new orders reported by the RTE. The difference was valid per the spec.

### Instantaneous Interruption and Loss of Memory

Instantaneous Interruption and Loss of Memory were demonstrated on the database with 5300 warehouses in a single test. The standard driving mechanism was used to generate the transaction load of 53000 users for the test. To demonstrate recovery an instantaneous system interruption caused by powering off the Server, the following steps were executed:

1. The full database was used.
2. A sum of D\_NEXT\_O\_ID was taken.
3. 53000 users were logged in to the database and ran transactions.
4. The system was run in steady state for 5 minutes
5. A checkpoint was executed and allowed to finish.
6. The system ran for an additional 30 seconds.
7. The Server was powered off by normal means, causing instantaneous interruption. No battery or UPS was providing power for the server.

## Appendix B – Database Design

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8. The RTE was allowed to continue running. Completed transactions enroute from the clients were recorded. Error messages began appearing on the RTE screen.
9. The RTE was stopped.
10. The server was powered on again and rebooted.
11. SQL Server was restarted and automatically recovered.
12. A new count of D\_NEXT\_O\_ID was taken.
13. This number was compared with the number of new orders reported by the RTE. The difference was valid per the spec.

### Clause 4 -- Scaling and Database Population Related Items

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#### **Table Cardinality**

The cardinality (e.g., the number of rows) of each table, as it existed at the start of the benchmark run (see Clause 4.2), must be disclosed. If the database was over-scaled and inactive rows of the WAREHOUSE table were deleted (see Clause 4.2.2), the cardinality of the WAREHOUSE table as initially configured and the number of rows deleted must be disclosed. (8.1.5.1)

The database was originally built with 5300 warehouses.

**Table 3: Table Cardinality**

Table	Cardinality as Benchmarked
Warehouse	5300
District	53000
Customer	159000000
History	159000000
NewOrder	47700000
Orders	159000000
OrderLine	1589999090
Item	100000
Stock	530000000
Deleted Warehouses	0

#### **Constant Values**

The following values were used as constant value inputs to the NURand function for this benchmark.

**Table 4: Constant Values**

Function	Constant C Value
C_LAST (Build)	123
C_LAST (Run)	208

## Appendix B – Database Design

### Data Distribution

The distribution of tables and logs across all media must be explicitly depicted for the tested and priced systems. (8.1.5.2)

The Database was built using a total of 98 disks: 90 36GB for data, 8 72GB for log and OS and application software. The data drives were configured as hardware RAID 0. Logs and OS were configured as hardware RAID 10. 1 Dell Perc5 was configured with 3 logical drives each. Each logical drive spanned 30 disk drives. 1 Embedded PERC5i RAID Controller 0 was configured with 1 logical drive spanning 8 72GB drives. Each Windows 2003 data drive contained 3 partitions: partition 1 for customer/stock, partition 2 for miscellaneous, and partition 3 for backup. Partitions 1 and 2 were RAW file systems and partition 3 was formatted NTFS. The details are shown in Table 5.

**Table 5: Data Distribution**

W2K Disk Administration			Dell Perc5i				
Disk 0 270.99GB			Controller # 0				
Partition			Slot# 1	Channels			
1	2	3	SAS ID	A			
C: OS NTFS 10.0GB	E: LOG RAW 260GB		0	00-1			
			1	00-2			
			2	00-3			
			3	00-4			
			4	00-5			
			5	00-6			
			8	00-7			
			9	00-8			
			10				
			11				
			12				
			13				
			14				
			15				

## Appendix B – Database Design

W2K Disk Administration			Dell Perc5 SAS RAID Controller						
Disk 1 1025GB Disk 2 1025GB Disk 3 1025GB			Controller HA-1						
Partition			Slot# 1		Channels				
1	2	3	SAS ID	0			1		
F:	M:	X:	0	00-1	01-1	02-1	03-1	04-1	05-1
MS1	CS1	Backup1	1	00-2	01-2	02-2	03-2	04-2	05-2
RAW	RAW	NTFS	2	00-3	01-3	02-3	03-3	04-3	05-3
51,234GB	107.77 GB	807.78GB	3	00-4	01-4	02-4	03-4	04-4	05-4
H:	N:	Y:	4	00-5	01-5	02-5	03-5	04-5	05-5
MS2	CS1	Backup2	5	00-6	01-6	02-6	03-6	04-6	05-6
RAW	RAW	NTFS	8	00-7	01-7	02-7	03-7	04-7	05-7
51,234GB	107.77 GB	807.78GB	9	00-8	01-8	02-8	03-8	04-8	05-8
I:	O:		10	00-9	01-9	02-9	03-9	04-9	05-9
MS2	CS1		11	00-10	01-10	02-10	03-10	04-10	05-10
RAW	RAW		12	00-11	01-11	02-11	03-11	04-11	05-11
51,234GB	107.77 GB		13	00-12	01-12	02-12	03-12	04-12	05-12
			14	00-13	01-13	02-13	03-13	04-13	05-13
			15	00-14	01-14	02-14	03-14	04-14	05-14

**Comment:** Detailed diagrams for layout of database files on disks can widely vary, and it is difficult to provide exact guideline suitable for all implementations. The intent is to provide sufficient detail to allow independent reconstruction of the test database. The two figures below are examples of database layout descriptions and are not intended to depict or imply any optimal layout for the TPC-C database.

8.1.5.3 A statement must be provided that describes:

1. The data model implemented by the DBMS used (e.g., relational, network, hierarchical)
2. The database interface (e.g., embedded, call level) and access language (e.g., SQL, DL/1, COBOL read/write) used to implement the TPC-C transactions. If more than one interface/access language is used to implement TPC-C, each interface/access language must be described and a list of which interface/access language is used with which transaction type must be disclosed.

Microsoft SQL Server Enterprise Edition is a relational DBMS.

The interface used was Microsoft SQL Server stored procedures accessed with Remote Procedure Calls embedded in C code using the Microsoft DBLIB interface.

# Appendix B – Database Design

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## **Partition Mapping**

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

**Comment:** *The intent is to provide sufficient detail about partitioning and replication to allow independent reconstruction of the test database. (8.1.5.3)*

*An description of a database partitioning scheme is presented below as an example. The nomenclature of this example was outlined using the CUSTOMER table (in Clause 8.1.2.1), and has been extended to use the ORDER and ORDER\_LINE tables as well.*

The database was not replicated.

## **60 day Space Calculation**

*Details of the 60 day space computations along with proof that the database is configured to sustain 8 hours of growth for the dynamic tables (Order, Order-Line, and History) must be disclosed (see Clause 4.2.3). (8.1.5.5)*

To calculate the space required to sustain the database log for 8 hours of growth at steady state, the following steps were followed:

1. The current log space usage was determined by running *dbcc sqlperf(logspace)*
2. Transactions were run against the database with a full load of users.
3. The final log space usage was determined by running *dbcc sqlperf(logspace)*
4. The space used was calculated as the difference between the first and second query.
5. The number of NEW-ORDERS was verified from an RTE report covering the entire run.
6. The space used was divided by the number of NEW-ORDERS giving a spaceused per NEW-ORDER transaction.
7. The space used per transaction was multiplied by the measured tpmC rate times 480 minutes.

The results of the above steps yielded a requirement 141.4 GB (including mirror) to sustain the log for 8 hours. Space available on the transaction log volume was 262.96 GB (including mirror), indicating that enough storage was configured to sustain 8 hours of growth.

The same methodology was used to compute growth requirements for dynamic tables Order, Order-Line and History.

The details of the 60-day space requirement is shown in Appendix D.

## **Clause 5 -- Performance Metrics and Response Time Related Items**

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### **Measured TpmC**

*Measured tpmC must be reported. (8.1.6.1)*

Measured TpmC	65,833
Price per TpmC	\$.98

### **Response Times**

*Ninetieth percentile, maximum and average response times must be reported for all transaction types as well as for the Menu response time. (8.1.6.2)*



**Table 6: Transaction Response Times**

Transaction	Average	90%	Maximum
New Order	0.45	0.86	7.14
Payment	0.36	0.75	6.92
Interactive Delivery	0.21	0.44	2.83
Stock Level	0.47	0.94	7.03
Order Status	0.42	0.83	9.74
Deferred Delivery	0.35	0.55	6.99
Menu	0.21	0.44	2.87

### **Think Times & Key Times**

*The minimum, the average, and the maximum keying and think times must be reported for each transaction type. (8.1.6.3)*

**Table 7: Transaction Key Times**

Transaction	Minimum	Average	Maximum
New Order	18.02	18.03	19.53
Payment	3.02	3.03	4.54
Delivery	2.02	2.03	3.52
Stock Level	2.02	2.03	3.53
Order Status	2.02	2.03	3.52

**Table 8: Transaction Think Times**

Transaction	Minimum	Average	Maximum
New Order	0.00	12.06	120.65
Payment	0.00	12.05	120.88
Delivery	0.00	5.06	50.42
Stock Level	0.00	5.06	50.42
Order Status	0.00	10.06	100.42

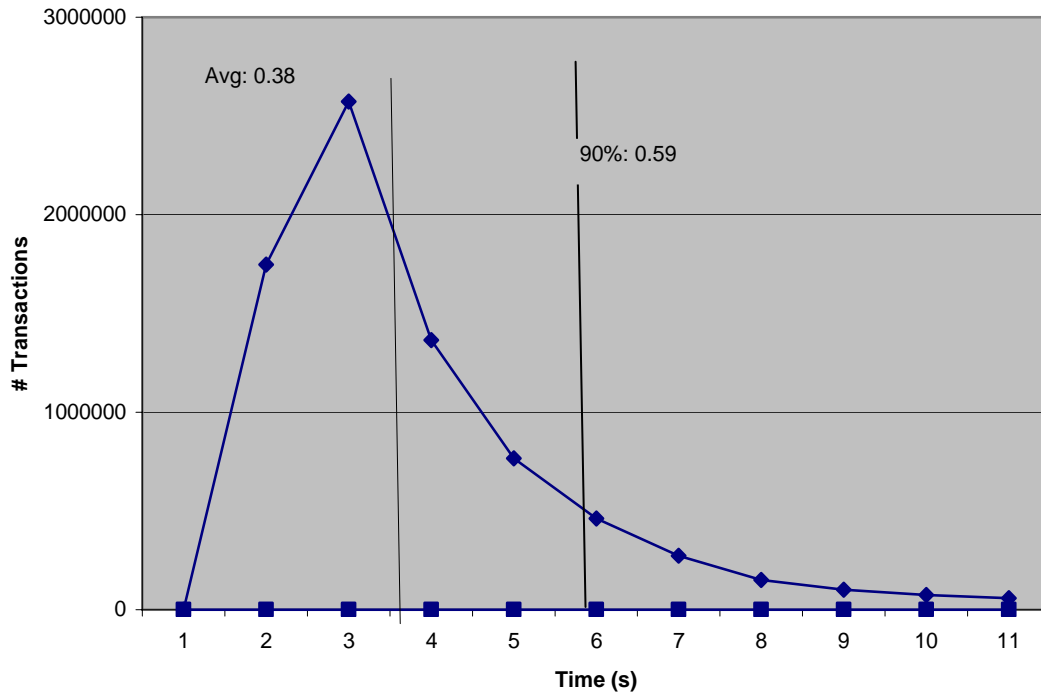
# Appendix B – Database Design

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## **Response Time Distribution Curves**

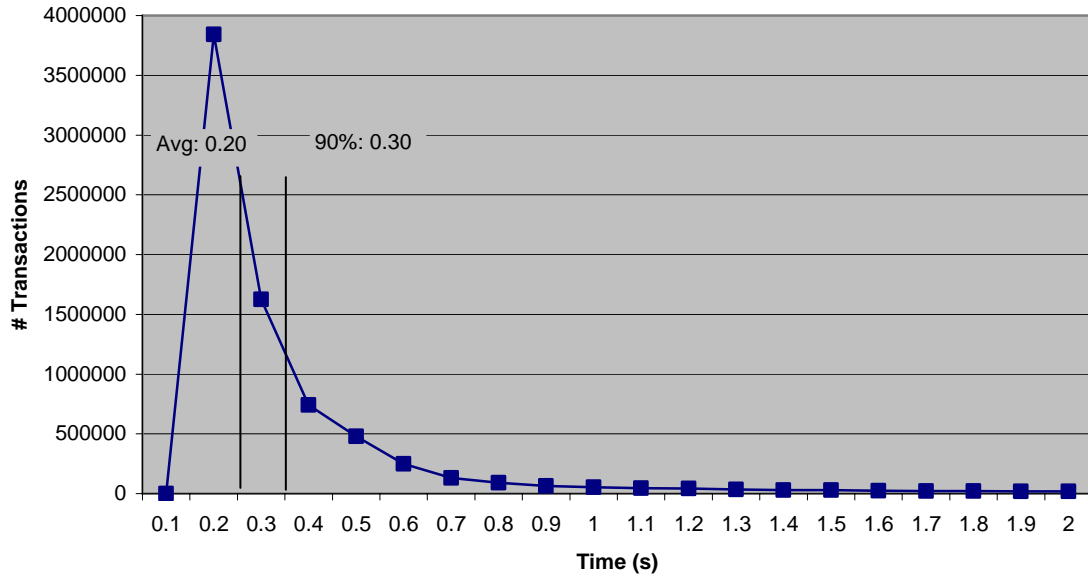
Response Time frequency distribution curves (see Clause 5.6.1) must be reported for each transaction type. (8.1.6.4)

**Figure 3: New Order Response Time Distribution**

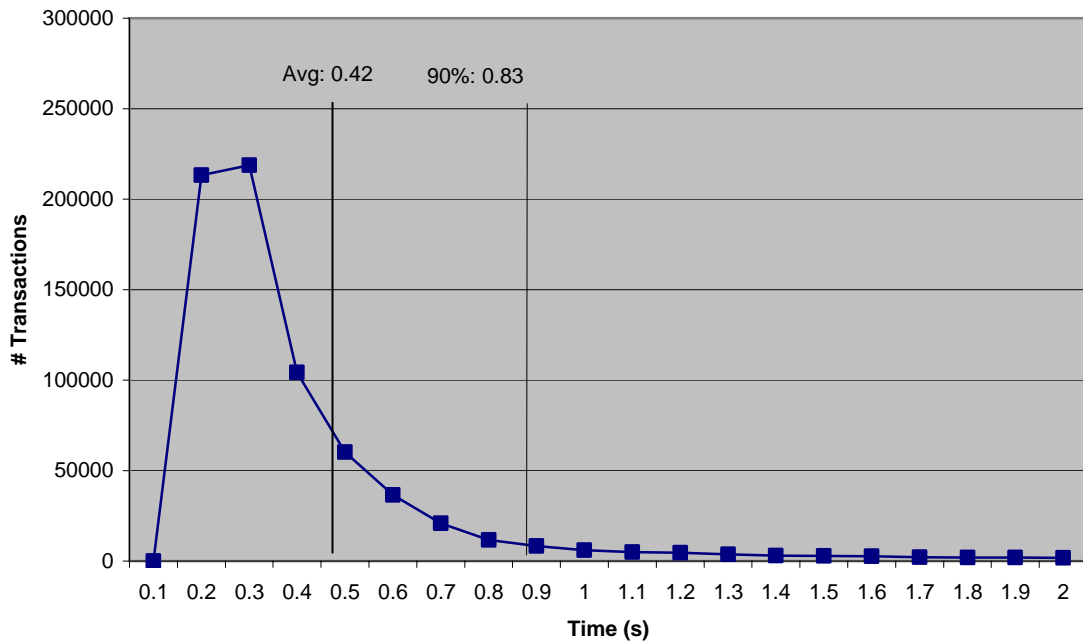


# Appendix B – Database Design

**Figure 4: Payment Response Time Distribution**



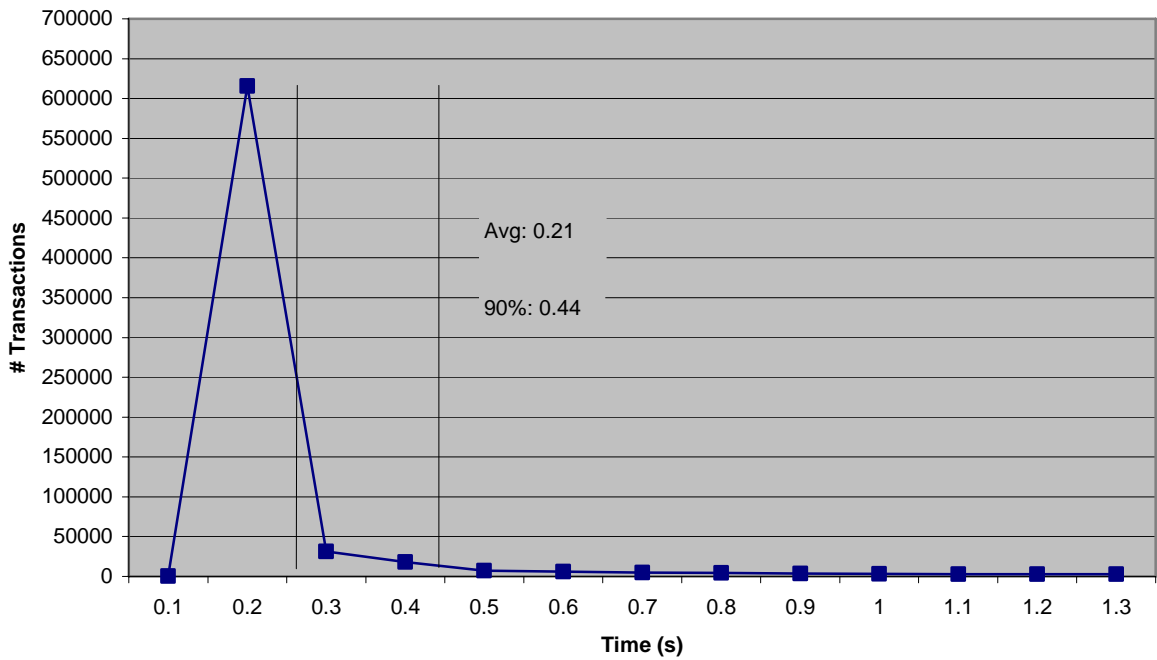
**Figure 5: Order Status Response Time Distribution**



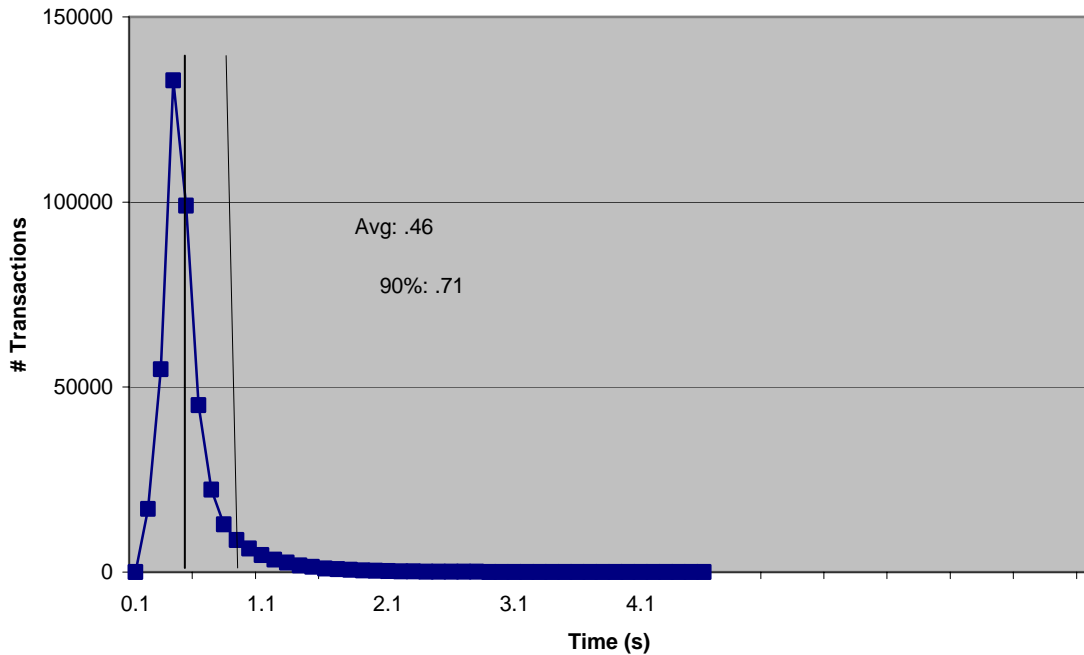
**Figure 6: Delivery Response Time Distribution**

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**Figure 7: Stock Level Response Time Distribution**



New-Order Response Time vs. Throughput Graph

*The performance curve for response times versus throughput (see Clause 5.6.2) must be*

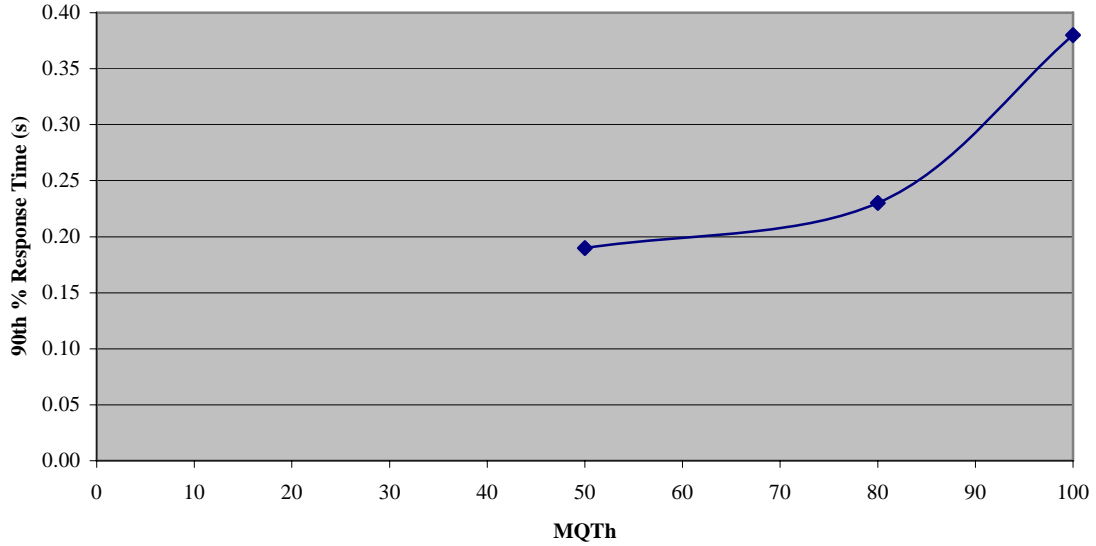
# Appendix B – Database Design

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reported for the New-Order transaction. (8.1.6.5)

**Figure 8: New Order Response Time vs. Throughput**

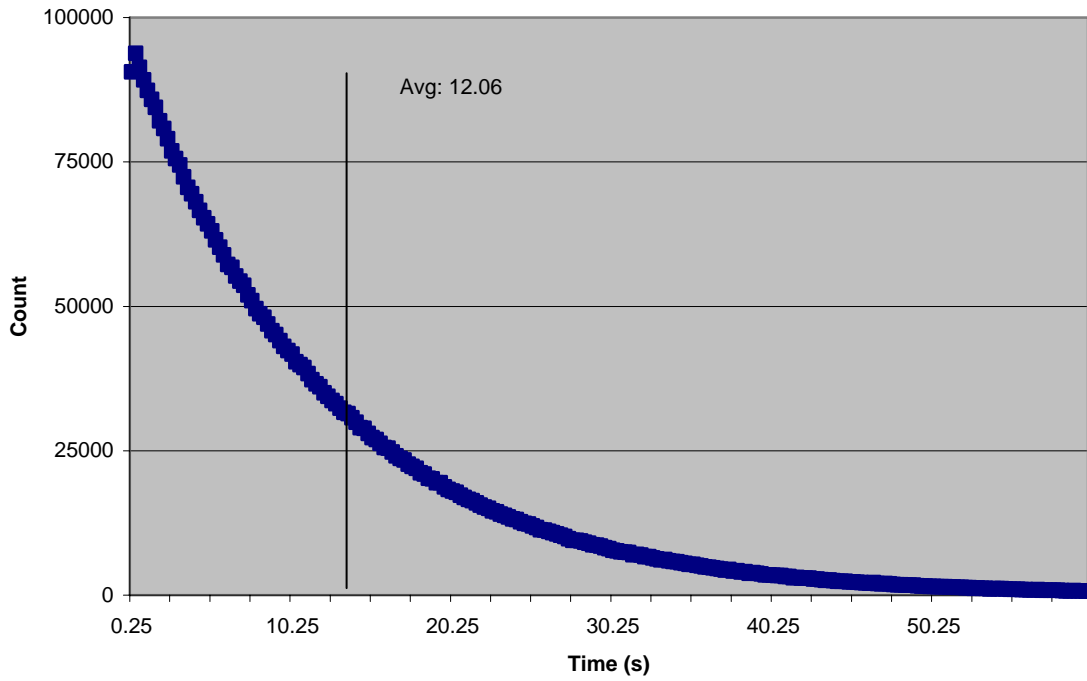
Report MQTh versus 90th % Response Time



## New-Order Think Time Distribution Graph

Think Time frequency distribution curves (see Clause 5.6.3) must be reported for the New-Order transaction (8.1.6.6)

**Figure 9: New Order Think Time Distribution**



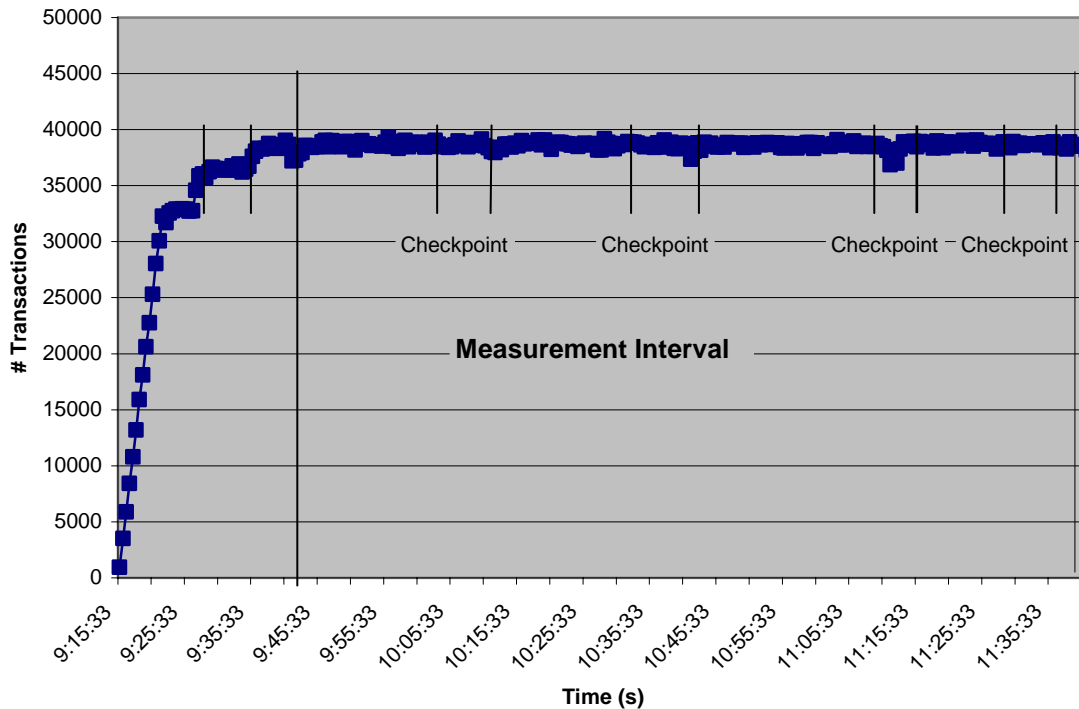
### Steady-State Graph

A graph of throughput versus elapsed time (see Clause 5.6.5) must be reported for the New-Order transaction. (8.1.6.8)

**Figure 10: New Order Throughput vs. Time**

## Appendix B – Database Design

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### Steady-State Methodology

*The method used to determine that the SUT had reached a steady state prior to commencing the measurement interval (see Clause 5.5) must be described. (8.1.6.9)*

Steady state was determined using real time monitor utilities from both the operating system and the RTE. Steady state was further confirmed by the throughput data collected during the run and graphed in Figure 10.

### Work Performed During Steady State

*A description of how the work normally performed during a sustained test (for example checkpointing, writing redo/undo log records, etc.), actually occurred during the measurement interval must be reported. (8.1.6.10)*

The RTE generated the required input data to choose a transaction from the menu. This data was timestamped. The menu response for the requested transaction was verified and timestamped in the RTE log files.

The RTE generated the required input data for the chosen transaction. It waited to complete the minimum required key time before transmitting the HTTP request to the client. The transmission was timestamped. The return of the screen with the required response data was timestamped. The difference between these two timestamps was the response time for that transaction and was logged in the RTE log.

The RTE then waited the required think time interval before repeating the process starting at selecting another transaction from the menu.

The RTE transmissions were sent to the web-based application program running on the client machines through Ethernet LANs. These web clients managed the emulated web browser interface as well as all requests to the database on the server. The applications communicated

## Appendix B – Database Design

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with the database server over another Ethernet LAN using the COM+ transaction monitor and Microsoft SQL Server DBLIB library and RPC calls.

To perform checkpoints at specific intervals, we set SQL Server *recovery interval* to the maximum allowable value and wrote a script to schedule multiple checkpoints at specific intervals. By setting the TRACE FLAG #3502, SQL Server logged the checkpoint beginning and ending time in the ERRORLOG file. The script included a wait time between each checkpoint equal to the measurement interval, which was 30 minutes. The checkpoint script was started manually after the RTE had all users logged in and sending transactions.

At each checkpoint, Microsoft SQL Server wrote to disk all memory pages that had been updated but not yet physically written to disk. Upon completion of the checkpoint, Microsoft SQL Server wrote a special record to the recovery log to indicate that all disk operations had been satisfied to this point.

### **Measurement Interval**

*A statement of the duration of the measurement interval for the reported Maximum Qualified Throughput (tpmC) must be included. (8.1.6.12)*

The measurement interval was 7200 minutes.

### **Measurement Period Duration and Checkpoint Duration**

*The start time and duration in seconds of at least the four (4) longest checkpoints during the measurement interval must be disclosed (see clause 5.5.2.2(2) ) (8.1.6.11)*

*A statement of the duration of the measurement interval for the reported Maximum Qualified Throughput (tpmC) must be included. (8.1.6.12)*

	<b>Start</b>	<b>End</b>	<b>Duration</b>
Measurement Interval	17:05:06	17:05:06	7,200
1 <sup>st</sup> Checkpoint	17:19:07.90	17:34:08.15	900
2 <sup>nd</sup> Checkpoint	17:45:40.45	18:00:40.76	900
3 <sup>rd</sup> Checkpoint	18:13:04.81	18:28:05.00	900
4 <sup>th</sup> Checkpoint	18:39:21.95	18:54:22.14	900

### **Transaction Mix**

*8.1.6.13 The method of regulation of the transaction mix (e.g., card decks or weighted random distribution) must be described. If weighted distribution is used and the RTE adjusts the weights associated with each transaction type, the maximum adjustments to the weight from the initial value must be disclosed. (8.1.6.13)*

The RTE was given a weighted random distribution that was not adjusted during the run.

*The percentage of the total mix for each transaction type must be disclosed. (8.1.6.14)*

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**Table 9: Transaction Mix**

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## Appendix B – Database Design

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Transaction	Percentage
New Order	44.83%
Payment	43.03%
Delivery	4.05%
Stock Level	4.05%
Order Status	4.04%

### Other Metrics

The percentage of New-Order transactions rolled back as a result of invalid item number must be disclosed. (8.1.6.15)

The average number of order-lines entered per New-Order transaction must be disclosed. (8.1.6.16)

The percentage of remote order-lines entered per New-Order transaction must be disclosed. (8.1.6.17)

The percentage of remote Payment transactions must be disclosed. (8.1.6.18)

The percentage of customer selections by customer last name in the Payment and Order-Status transactions must be disclosed. (8.1.6.19)

The percentage of Delivery transactions skipped due to there being fewer than necessary orders in the New-Order table must be disclosed. (8.1.6.20)

**Table 10: Transaction Statistics**

Transaction	Function	Value
New Order	Home Warehouse Items	99.85%
	Remote Warehouse Items	0.15%
	Rolled Back Transactions	1.00%
	Average Lines Per Order	10.00
Payment	Home Warehouse	85.00%
	Remote Warehouse	15.00%
	Non-Primary Key Access	60.00%
Order Status	Non-Primary Key Access	60.14%
Delivery	Skipped Transactions	0

### Clause 6 -- SUT, Driver, and Communication Definition Related Items

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#### RTE Parameters

The RTE input parameters, code fragments, functions, etc. used to generate each transaction input field must be disclosed. (8.1.7.1)

**Comment:** The intent is to demonstrate the RTE was configured to generate transaction input data as specified in Clause 2.

The RTE input parameters are listed in Appendix C - Tunable Parameters.

#### Emulated Components

It must be demonstrated that the functionality and performance of the components being

## Appendix B – Database Design

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*emulated in the Driver System are equivalent to that of the priced system. The results of the test described in Clause 6.6.3.4 must be disclosed. (8.1.7.2)*

No components were emulated.

### **Benchmarked and Targeted System Configuration Diagrams**

*A complete functional diagram of both the benchmark configuration and the configuration of the proposed (target) system must be disclosed. A detailed list of all software and hardware functionality being performed on the Driver System, and its interface to the SUT must be disclosed (see Clause 6.6.3.6). (8.1.7.3)*

The driver system performed transaction data generation and communication to the client through the standard web browser (HTTP) protocol. It also captured and timestamped the SUT output data for post-processing of the reported metrics. No other functionality was included on the driver system.

Figures 1 & 2 of this report contain detailed diagrams of both the benchmark configuration and the priced configuration.

### **Network Configuration**

*The network configurations of both the tested services and the proposed (target) services which are being represented and a thorough explanation of exactly which parts of the proposed configuration are being replaced with the Driver System must be disclosed (see Clause 6.6.4). (8.1.7.4)*

The network configurations of the benchmarked and priced configurations were identical.

### **Network Bandwidth**

*The bandwidth of the network(s) used in the tested/priced configuration must be disclosed. (8.1.7.5)*

The bandwidth of the tested and priced networks were as follows:

- 100 BaseT (100 Mbit/sec) network segments between the RTE/Emulated Users and the switch.
- 100 BaseT (100 Mbit/sec) between the Clients and Server.

### **Operator Intervention**

*If the configuration requires operator intervention (see Clause 6.6.6), the mechanism and the frequency of this intervention must be disclosed. (8.1.7.6)*

This configuration does not require any operator intervention to sustain eight hours of the reported throughput.

## **Clause 7 -- Pricing Related Items**

---

### **Hardware and Software List**

*A detailed list of hardware and software used in the priced system must be reported. Each separately orderable item must have vendor part number, description, and release/revision level, and either general availability status or committed delivery date. If package-pricing is used, vendor part number of the package and a description uniquely identifying each of the components of the package must be disclosed.*

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## Appendix B – Database Design

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*Pricing source(s) and effective date(s) of price(s) must also be reported. (8.1.8.1)*

*The total 5-year price of the entire configuration must be reported, including: hardware, software, and maintenance charges. Separate component pricing is recommended. The basis of all discounts used must be disclosed. (8.1.8.2)*

The details of the hardware and software are reported in the front of this report as part of the executive summary. All third party quotations are included at the end of this report as Appendix E.

### **Availability Date**

*The committed delivery date for general availability (availability date) of products used in the price calculations must be reported. When the priced system includes products with different availability dates, the reported availability date for the priced system must be the date at which all components are committed to be available. (8.1.8.3)*

Hardware Availability Date: June 26, 2006  
Software Availability Date: June 26, 2006

### **Measured TpmC**

*A statement of the measured tpmC, as well as the respective calculations for 5-year pricing, price/performance (price/tpmC), and the availability date must be included. (8.1.8.4)*

Maximum Qualified Throughput: 65,833 tpmC  
Price Performance Metric: \$.98

### **Country Specific Pricing**

*Additional Clause 7 related items may be included in the Full Disclosure Report for each country specific priced configuration. Country specific pricing is subject to Clause 7.1.7. (8.1.8.5)*

This system is being priced for the United States of America.

### **Usage Pricing**

*For any usage pricing, the sponsor must disclose (8.1.8.6):*

- *Usage level at which the component was priced.*
- *A statement of the company policy allowing such pricing.*

**Comment:** *Usage pricing may include, but is not limited to, the operating system and database management software.*

The component pricing based on usage is shown below:

- 1 Microsoft Windows Server 2003, Standard x64 Edition License.
- 1 Microsoft Windows Server 2003, Standard Edition License.
- 1 Microsoft SQL Server 2005 Standard x64 Edition License (1 processor).
- 1 Microsoft Visual C++ Standard Edition.
- 3 Year Support for Hardware Components.

### **System Pricing**

*System pricing should include subtotals for the following components: Server Hardware, Server Software, Client Hardware, Client Software, and Network Components used for terminal*

## Appendix B – Database Design

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*connection (see Clause 7.2.2.3). Clause 6.1 describes the Server and Client components. An example of the standard pricing sheet is shown in Appendix B. (8.1.8.7)*  
*System pricing must include line item indication where non-sponsoring companies' brands are used. System pricing must also include line item indication of third party pricing. See example in Appendix B. (8.1.8.8)*

The details of the hardware and software are reported in the front of this report as part of the executive summary. All third party quotations are included at the end of this report as Appendix E.

### **Clause 9 -- Audit Related Items**

---

#### **Auditor**

*The auditor's name, address, phone number, and a copy of the auditor's attestation letter indicating compliance must be included in the Full Disclosure Report. (8.1.9.1)*  
*A review of the pricing model is required to ensure that all components required are priced (see Clause 9.2.8). The auditor is not required to review the final Full Disclosure Report or the final pricing prior to issuing the attestations letter. (8.1.9.2)*

This TPC-C benchmark has been audited by Lorna Livingtree of Performance Metrics.

#### **Availability of the Full Disclosure Report**

*The Full Disclosure Report must be readily available to the public at a reasonable charge, similar to the charges for similar documents by the test sponsor. The report must be made available when results are made public. In order to use the phrase "TPC Benchmark™ C", the Full Disclosure Report must have been submitted to the TPC Administrator as well as written permission obtained to distribute same.*

Requests for this TPC Benchmark C Full Disclosure Report should be sent to:

Transaction Processing Performance Council  
c/o Administrator, TPC  
Presidio of San Francisco  
Bldg 572B Rucker St.  
San Francisco, CA 94129-0920  
Phone: (415) 561-6272, Fax (415)561-6120  
[www.tpc.org](http://www.tpc.org)

or:

One Dell Way  
Round Rock, TX 78682  
Attention: Mike Molloy, Ph.D.



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June 30, 2006

Mr. Dan Hambrick  
Dell Computer Corporation  
One Dell Way  
Round Rock, TX 78682

I have verified by remote the TPC Benchmark™ C for the following configuration:

Platform: Dell PowerEdge 2900  
Database Manager: Microsoft SQL Server 2005 x64 Standard Edition  
Operating System: Microsoft Windows Server 2003 Standard x64 Edition  
Transaction Monitor: COM+

System Under Test: Dell PowerEdge 2900 with:				
CPU's	Memory	Disks (total)	90% Response	TpmC
1 dual core Intel @ 3 Ghz	Main: 24 GB	90 @36GB 8 @ 73GB	0.86	65,833

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:

- The transactions were correctly implemented.
- The database files were properly sized.
- The database was properly scaled with 5,300 warehouses, all of which were active during the measured interval.
- The ACID properties were successfully demonstrated.
- Data loss durability was demonstrated on a subset of the SUT configured with a database properly populated for 530 warehouses.
- Input data was generated according to the specified percentages.
- Eight hours of mirrored log space was present on the tested system.
- Eight hours of growth space for the dynamic tables was present on the tested system.
- The data for the 60 days space calculation was verified.
- The controller cache for the log disks was disabled.
- The steady state portion of the test was 120 minutes.
- One checkpoint was taken in steady state before the measured interval opened.
- Four checkpoints were completed inside the measured interval.
- The system pricing was checked for major components and maintenance.
- Third party quotes were verified for compliance.

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Auditor Notes:  
None

Sincerely,

A handwritten signature in cursive script that reads "Lorna Livingtree".

Lorna Livingtree  
Auditor

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## Appendix A - Application Source Code

### *tpcc.dll ISAPI DLL Source Code*

#### isapi\_dll/src/tpcc.def

```
LIBRARY TPCC.DLL

EXPORTS

    GetExtensionVersion @1
    HttpExtensionProc   @2
    TerminateExtension  @3
```

#### Isapi\_dll/src/tpcc.h

```
/*      FILE:          TPCC.H
 *
 *      Microsoft TPC-C Kit Ver. 4.20.000
 *      Copyright Microsoft, 1999
 *
 *      All Rights Reserved
 *
 *      Version 4.10.000 audited by Richard Gimarc, Performance Metrics, 3/17/99
 *
 *      PURPOSE:  Header file for ISAPI TPCC.DLL, defines structures and functions used in the isapi tpcc.dll.
 */

//VERSION RESOURCE DEFINES
#define _APS_NEXT_RESOURCE_VALUE          101
#define _APS_NEXT_COMMAND_VALUE         40001
#define _APS_NEXT_CONTROL_VALUE         1000
#define _APS_NEXT_SYMED_VALUE           101

#define TP_MAX_RETRIES                    50

//note that the welcome form must be processed first as terminal ids assigned here, once the
//terminal id is assigned then the forms can be processed in any order.
#define WELCOME_FORM                      1                //beginning form no
//term id assigned, form id
#define MAIN_MENU_FORM                    2                //term id assigned
//main menu form id
#define NEW_ORDER_FORM                    3                //new order form id
#define PAYMENT_FORM                      4                //payment form id
#define DELIVERY_FORM                     5                //delivery form id
#define ORDER_STATUS_FORM                 6                //order status id
#define STOCK_LEVEL_FORM                  7                //stock level form id

//This macro is used to prevent the compiler error unused formal parameter
#define UNUSEDPARAM(x) (x = x)

//This structure defines the data necessary to keep distinct for each terminal or client connection.
typedef struct _CLIENTDATA
{
    int                iNextFree;                //index of next free element
    or -1 if this entry in use.
    int                w_id;                    //warehouse id assigned at
    welcome form      int                d_id;    //district id assigned at
    welcome form
    int                iSyncId;                //synchronization id
    int                iTickCount;            //time of last access;

    CTPCC_BASE        *pTxn;

} CLIENTDATA, *PCLIENTDATA;

//This structure is used to define the operational interface for terminal id support
typedef struct _TERM
{
    int                iNumEntries;            //total allocated
    terminal array entries
    int                iFreeList;                //next
    available terminal array element or -1 if none
    int                iMasterSyncId;            //synchronization id
    CLIENTDATA        *pClientData;            //pointer to allocated client
    data
} _TERM;
```

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---

```
typedef TERM *PTERM; //pointer to terminal
structure type

enum WEBERROR
{
    NO_ERR,
    ERR_COMMAND_UNDEFINED,
    ERR_D_ID_INVALID,
    ERR_DELIVERY_CARRIER_ID_RANGE,
    ERR_DELIVERY_CARRIER_INVALID,
    ERR_DELIVERY_MISSING_OCD_KEY,
    ERR_DELIVERY_THREAD_FAILED,
    ERR_GETPROCADDR_FAILED,
    ERR_HTML_ILL_FORMED,
    ERR_INVALID_SYNC_CONNECTION,
    ERR_INVALID_TERMID,
    ERR_LOADDLL_FAILED,
    ERR_MAX_CONNECTIONS_EXCEEDED,
    ERR_MEM_ALLOC_FAILED,
    ERR_MISSING_REGISTRY_ENTRIES,
    ERR_NEWORDER_CUSTOMER_INVALID,
    ERR_NEWORDER_CUSTOMER_KEY,
    ERR_NEWORDER_DISTRICT_INVALID,
    ERR_NEWORDER_FORM_MISSING_DID,
    ERR_NEWORDER_ITEMID_INVALID,
    ERR_NEWORDER_ITEMID_RANGE,
    ERR_NEWORDER_ITEMID_WITHOUT_SUPPW,
    ERR_NEWORDER_MISSING_IID_KEY,
    ERR_NEWORDER_MISSING_QTY_KEY,
    ERR_NEWORDER_MISSING_SUPPW_KEY,
    ERR_NEWORDER_NOITEMS_ENTERED,
    ERR_NEWORDER_QTY_INVALID,
    ERR_NEWORDER_QTY_RANGE,
    ERR_NEWORDER_QTY_WITHOUT_SUPPW,
    ERR_NEWORDER_SUPPW_INVALID,
    ERR_NO_SERVER_SPECIFIED,
    ERR_ORDERSTATUS_CID_AND_CLT,
    ERR_ORDERSTATUS_CID_INVALID,
    ERR_ORDERSTATUS_CLT_RANGE,
    ERR_ORDERSTATUS_DID_INVALID,
    ERR_ORDERSTATUS_MISSING_CID_CLT,
    ERR_ORDERSTATUS_MISSING_CID_KEY,
    ERR_ORDERSTATUS_MISSING_CLT_KEY,
    ERR_ORDERSTATUS_MISSING_DID_KEY,
    ERR_PAYMENT_CDI_INVALID,
    ERR_PAYMENT_CID_AND_CLT,
    ERR_PAYMENT_CUSTOMER_INVALID,
    ERR_PAYMENT_CWI_INVALID,
    ERR_PAYMENT_DISTRICT_INVALID,
    ERR_PAYMENT_HAM_INVALID,
    ERR_PAYMENT_HAM_RANGE,
    ERR_PAYMENT_LAST_NAME_TOO_LONG,
    ERR_PAYMENT_MISSING_CDI_KEY,
    ERR_PAYMENT_MISSING_CID_CLT,
    ERR_PAYMENT_MISSING_CID_KEY,
    ERR_PAYMENT_MISSING_CLT,
    ERR_PAYMENT_MISSING_CLT_KEY,
    ERR_PAYMENT_MISSING_CWI_KEY,
    ERR_PAYMENT_MISSING_DID_KEY,
    ERR_PAYMENT_MISSING_HAM_KEY,
    ERR_STOCKLEVEL_MISSING_THRESHOLD_KEY,
    ERR_STOCKLEVEL_THRESHOLD_INVALID,
    ERR_STOCKLEVEL_THRESHOLD_RANGE,
    ERR_VERSION_MISMATCH,
    ERR_W_ID_INVALID
};

class CWEBCLNT_ERR : public CBaseErr
{
public:
    CWEBCLNT_ERR(WEBERROR Err)
    {
        m_Error = Err;
        m_szTextDetail = NULL;
        m_SystemErr = 0;
        m_szErrorText = NULL;
    };

    CWEBCLNT_ERR(WEBERROR Err, char *szTextDetail, DWORD dwSystemErr)
    {
        m_Error = Err;
        m_szTextDetail = new char[strlen(szTextDetail)+1];
        strcpy( m_szTextDetail, szTextDetail );
        m_SystemErr = dwSystemErr;
        m_szErrorText = NULL;
    };

    ~CWEBCLNT_ERR()
    {
        if (m_szTextDetail != NULL)

```



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---

```
        delete [] m_szTextDetail;
        if (m_szErrorText != NULL)
            delete [] m_szErrorText;
    };

    WEBERROR m_Error;
    char      *m_szTextDetail;    //
    char      *m_szErrorText;
    DWORD     m_SystemErr;

    int ErrorType() {return ERR_TYPE_WEBDLL;};
    int ErrorNum() {return m_Error;};
    char *ErrorText();
};

//These constants have already been defined in engstut.h, but since we do
//not want to include it in the delisrv executable
#define TXN_EVENT_START      2
#define TXN_EVENT_STOP      4
#define TXN_EVENT_WARNING   6           //used to record a warning into the log

//function prototypes

BOOL WINAPI DllMain(HANDLE hModule, DWORD ul_reason_for_call, LPVOID lpReserved);
void WriteMessageToEventLog(LPTSTR lpszMsg);
void ProcessQueryString(EXTENSION_CONTROL_BLOCK *pECB, int *pCmd, int *pFormId, int *pTermId, int *pSyncId);
void WelcomeForm(EXTENSION_CONTROL_BLOCK *pECB, char *szBuffer);
void SubmitCmd(EXTENSION_CONTROL_BLOCK *pECB, char *szBuffer);
void BeginCmd(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId);
void ProcessCmd(EXTENSION_CONTROL_BLOCK *pECB, int iFormId, int iTermId);
void StatsCmd(EXTENSION_CONTROL_BLOCK *pECB, char *szBuffer);
void ErrorMessage(EXTENSION_CONTROL_BLOCK *pECB, int iError, int iErrorType, char *szMsg, int iTermId);
void GetKeyValue(char **pQueryString, char *pKey, char *pValue, int iMax, WEBERROR err);
int GetIntKeyValue(char **pQueryString, char *pKey, WEBERROR NoKeyErr, WEBERROR NotIntErr);
void TermInit(void);
void TermDeleteAll(void);
int TermAdd(void);
void TermDelete(int id);
void ErrorForm(EXTENSION_CONTROL_BLOCK *pECB, int iType, int iErrorNum, int iTermId, int iSyncId, char *szErrorText, char *szBuffer );
void MakeMainMenuForm(int iTermId, int iSyncId, char *szForm);
void MakeStockLevelForm(int iTermId, STOCK_LEVEL_DATA *pStockLevelData, BOOL bInput, char *szForm);
void MakeNewOrderForm(int iTermId, NEW_ORDER_DATA *pNewOrderData, BOOL bInput, char *szForm);
void MakePaymentForm(int iTermId, PAYMENT_DATA *pPaymentData, BOOL bInput, char *szForm);
void MakeOrderStatusForm(int iTermId, ORDER_STATUS_DATA *pOrderStatusData, BOOL bInput, char *szForm);
void MakeDeliveryForm(int iTermId, DELIVERY_DATA *pDeliveryData, BOOL bInput, char *szForm);
void ProcessNewOrderForm(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, char *szBuffer);
void ProcessPaymentForm(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, char *szBuffer);
void ProcessOrderStatusForm(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, char *szBuffer);
void ProcessDeliveryForm(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, char *szBuffer);
void ProcessStockLevelForm(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, char *szBuffer);
void GetNewOrderData(LPSTR lpszQueryString, NEW_ORDER_DATA *pNewOrderData);
void GetPaymentData(LPSTR lpszQueryString, PAYMENT_DATA *pPaymentData);
void GetOrderStatusData(LPSTR lpszQueryString, ORDER_STATUS_DATA *pOrderStatusData);
BOOL PostDeliveryInfo(long w_id, short o_carrier_id);
BOOL IsNumeric(char *ptr);
BOOL IsDecimal(char *ptr);
void DeliveryWorkerThread(void *ptr);
```

## isapi\_dll/src/tpcc.rc

```
//Microsoft Developer Studio generated resource script.
//
#include "resource.h"

#define APSTUDIO_READONLY_SYMBOLS
////////////////////////////////////
//
// Generated from the TEXTINCLUDE 2 resource.
//
#include "afxres.h"

////////////////////////////////////
#undef APSTUDIO_READONLY_SYMBOLS

////////////////////////////////////
// English (U.S.) resources

#if !defined(AFX_RESOURCE_DLL) || defined(AFX_TARG_ENU)
#ifdef _WIN32
LANGUAGE LANG_ENGLISH, SUBLANG_ENGLISH_US
#pragma code_page(1252)
#endif // _WIN32

#ifdef _MAC
////////////////////////////////////
//
// Version
```

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---

```
//
VS_VERSION_INFO VERSIONINFO
FILEVERSION 0,4,0,0
PRODUCTVERSION 0,4,0,0
FILEFLAGSMASK 0x3fL
#ifdef _DEBUG
FILEFLAGS 0x1L
#else
FILEFLAGS 0x0L
#endif
FILEOS 0x40004L
FILETYPE 0x2L
FILESUBTYPE 0x0L
BEGIN
    BLOCK "StringFileInfo"
    BEGIN
        BLOCK "040904b0"
        BEGIN
            VALUE "Comments", "TPC-C HTML DLL Server (DBLIB)\0"
            VALUE "CompanyName", "Microsoft\0"
            VALUE "FileDescription", "TPC-C HTML DLL Server (DBLIB)\0"
            VALUE "FileVersion", "0, 4, 0, 0\0"
            VALUE "InternalName", "tpcc\0"
            VALUE "LegalCopyright", "Copyright © 1997\0"
            VALUE "OriginalFilename", "tpcc.dll\0"
            VALUE "ProductName", "Microsoft tpcc\0"
            VALUE "ProductVersion", "0, 4, 0, 0\0"
        END
    END
END
BLOCK "VarFileInfo"
BEGIN
    VALUE "Translation", 0x409, 1200
END
END
#endif // !_MAC

#ifdef APSTUDIO_INVOKED
////////////////////////////////////
//
// TEXTINCLUDE
//
1 TEXTINCLUDE DISCARDABLE
BEGIN
    "resource.h\0"
END

2 TEXTINCLUDE DISCARDABLE
BEGIN
    "#include \"afxres.h\"\r\n"
    "\0"
END

3 TEXTINCLUDE DISCARDABLE
BEGIN
    "\r\n"
    "\0"
END
#endif // APSTUDIO_INVOKED

////////////////////////////////////
//
// Dialog
//
IDD_DIALOG1 DIALOG DISCARDABLE 0, 0, 186, 95
STYLE DS_MODALFRAME | WS_POPUP | WS_CAPTION | WS_SYSMENU
CAPTION "Dialog"
FONT 8, "MS Sans Serif"
BEGIN
    DEFPUSHBUTTON "OK", IDOK, 129, 7, 50, 14
    PUSHBUTTON "Cancel", IDCANCEL, 129, 24, 50, 14
END

////////////////////////////////////
//
// DESIGNINFO
//

#ifdef APSTUDIO_INVOKED
GUIDELINES DESIGNINFO DISCARDABLE
BEGIN
    IDD_DIALOG1, DIALOG
    BEGIN
        LEFTMARGIN, 7
        RIGHTMARGIN, 179
        TOPMARGIN, 7
    END

```

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---

```
        BOTTOMMARGIN, 88
    END
END
#endif // APSTUDIO_INVOKED

#endif // English (U.S.) resources
////////////////////////////////////

#ifndef APSTUDIO_INVOKED
////////////////////////////////////
//
// Generated from the TEXTINCLUDE 3 resource.
//

////////////////////////////////////
#endif // not APSTUDIO_INVOKED
```

## isapi\_dll/src/tpcc.cpp

```
/*      FILE:          TPCC.C
 *
 *      Microsoft TPC-C Kit Ver. 4.20.000
 *      Copyright Microsoft, 1999
 *
 *      All Rights Reserved
 *
 *      Version 4.10.000 audited by Richard Gimarc, Performance Metrics, 3/17/99
 *
 *      PURPOSE:  Main module for TPCC.DLL which is an ISAPI service dll.
 *      Contact:  Charles Levine (clevine@microsoft.com)
 *
 *      Change history:
 *      4.20.000 - reworked error handling; added options for COM and Encina txn monitors
 */

#include <windows.h>
#include <process.h>
#include <tchar.h>
#include <stdio.h>
#include <stdarg.h>
#include <malloc.h>
#include <stdlib.h>
#include <string.h>
#include <time.h>
#include <sys\timeb.h>
#include <io.h>
#include <assert.h>

#include <sqltypes.h>

#ifdef ICECAP
#include <icapexp.h>
#endif

#include "..\..\common\src\trans.h" //tpckit transaction header contains definitions of structures
specific to TPC-C
#include "..\..\common\src\error.h"
#include "..\..\common\src\txn_base.h"
#include "..\..\common\src\ReadRegistry.h"

#include "..\..\common\txnlog\include\rtetime.h"
#include "..\..\common\txnlog\include\spinlock.h"
#include "..\..\common\txnlog\include\txnlog.h"

// Database layer includes
#include "..\..\db_dblib_dll\src\tpcc_dblib.h" // DBLIB implementation of TPC-C txns
#include "..\..\db_odbc_dll\src\tpcc_odbc.h" // ODBC implementation of TPC-C txns

// Txn monitor layer includes
#include "..\..\tm_com_dll\src\tpcc_com.h" // COM Services implementation on TPC-C txns
#include "..\..\tm_tuxedo_dll\src\tpcc_tux.h" // interface to Tuxedo libraries
#include "..\..\tm_encina_dll\src\tpcc_enc.h" // interface to Encina libraries

#include "httpext.h" //ISAPI DLL information header
#include "tpcc.h" //this dlls specific structure, value e.t. header.

#define LEN_ERR_STRING 256

// defines for Make<Txn>Form calls to distinguish input and output flavors
#define OUTPUT_FORM 0
#define INPUT_FORM 1

char szMyComputerName[MAX_COMPUTERNAME_LENGTH+1];

//Terminal client id structure
TERM Term = { 0, 0, 0, NULL };
```

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---

```
// The WEBCLIENT_VERSION string specifies the version level of this web client interface.
// The RTE must be synchronized with the interface level on login, otherwise the login
// will fail. This is a sanity check to catch problems resulting from mismatched versions
// of the RTE and web client.
#define WEBCLIENT_VERSION "410"

static CRITICAL_SECTION TermCriticalSection;

static HINSTANCE hLibInstanceTm = NULL;
static HINSTANCE hLibInstanceDb = NULL;

TYPE_CTPCC_DBLIB *pCTPCC_DBLIB_new;
TYPE_CTPCC_ODBC *pCTPCC_ODBC_new;
TYPE_CTPCC_TUXEDO *pCTPCC_TUXEDO_new;
TYPE_CTPCC_ENCINA *pCTPCC_ENCINA_new;
TYPE_CTPCC_ENCINA *pCTPCC_ENCINA_post_init;
TYPE_CTPCC_COM *pCTPCC_COM_new;

// For deferred Delivery txns:

CTxnLog transaction information *txnDelilog = NULL; //used to log delivery

HANDLE hWorkerSemaphore = INVALID_HANDLE_VALUE;
HANDLE hDoneEvent = INVALID_HANDLE_VALUE;
HANDLE *pDeliHandles = NULL;

// configuration settings from registry
TPCCREGISTRYDATA Reg;

DWORD dwNumDeliveryThreads = 4;
CRITICAL_SECTION DelBuffCriticalSection; //critical section for delivery transactions
cache
DELIVERY_TRANSACTION *pDelBuff = NULL;
DWORD dwDelBuffSize = 100; // size of circular
buffer for delivery txns
DWORD dwDelBuffFreeCount; // number of
buffers free
DWORD dwDelBuffBusyIndex = 0; // index position of entry
waiting to be delivered
DWORD dwDelBuffFreeIndex = 0; // index position of unused
entry

#include "..\..\common\src\ReadRegistry.cpp"

/* FUNCTION: DllMain
 *
 * PURPOSE: This function is the entry point for the DLL. This implementation is based on the
 * fact that DLL_PROCESS_ATTACH is only called from the inet service once.
 *
 * ARGUMENTS: HANDLE hModule module handle
 * DWORD ul_reason_for_call reason for call
 * LPVOID lpReserved reserved for future use
 *
 * RETURNS: BOOL FALSE errors occurred in initialization
 * TRUE DLL successfully
 *
 * initialized
 */
BOOL WINAPI DllMain(HANDLE hModule, DWORD ul_reason_for_call, LPVOID lpReserved)
{
    DWORD i;
    char szEvent[LEN_ERR_STRING] = "\0";
    char szLogFile[128];
    char szDllName[128];

    // debugging...
    // DebugBreak();

    try
    {
        switch( ul_reason_for_call )
        {
            case DLL_PROCESS_ATTACH:
            {
                DWORD dwSize = MAX_COMPUTERNAME_LENGTH+1;
                GetComputerName(szMyComputerName, &dwSize);
                szMyComputerName[dwSize] = 0;
            }

            DisableThreadLibraryCalls((HMODULE)hModule);
            InitializeCriticalSection(&TermCriticalSection);

            if ( ReadTPCCRegistrySettings( &Reg ) )
                throw new CWBCLNT_ERR( ERR_MISSING_REGISTRY_ENTRIES );

            dwDelBuffSize = min( Reg.dwMaxPendingDeliveries, 10000 ); // min with 10000 as
            a sanity constraint
            dwNumDeliveryThreads = min( Reg.dwNumberOfDeliveryThreads, 100 ); // min with
            100 as a sanity constraint
        }
    }
}
```

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---

```
TermInit();

// load DLL for txn monitor
if (Reg.eTxnMon == TUXEDO)
{
    strcpy( szDllName, Reg.szPath );
    strcat( szDllName, "tpcc_tuxedo.dll");
    hLibInstanceTm = LoadLibrary( szDllName );
    if (hLibInstanceTm == NULL)
        throw new CWBCLNT_ERR( ERR_LOADDLL_FAILED, szDllName,

GetLastError() );

    // get function pointer to wrapper for class constructor
    pCTPCC_TUXEDO_new = (TYPE_CTPCC_TUXEDO*)

GetProcAddress(hLibInstanceTm,"CTPCC_TUXEDO_new");
    if (pCTPCC_TUXEDO_new == NULL)
        throw new CWBCLNT_ERR( ERR_GETPROCADDR_FAILED, szDllName,

GetLastError() );
}
else if (Reg.eTxnMon == ENCINA)
{
    strcpy( szDllName, Reg.szPath );
    strcat( szDllName, "tpcc_encina.dll");
    hLibInstanceTm = LoadLibrary( szDllName );
    if (hLibInstanceTm == NULL)
        throw new CWBCLNT_ERR( ERR_LOADDLL_FAILED, szDllName,

GetLastError() );

    // get function pointer to wrapper for class constructor
    pCTPCC_ENCINA_new = (TYPE_CTPCC_ENCINA*)

GetProcAddress(hLibInstanceTm,"CTPCC_ENCINA_new");
    pCTPCC_ENCINA_post_init = (TYPE_CTPCC_ENCINA*)

GetProcAddress(hLibInstanceTm,"CTPCC_ENCINA_post_init");
    if (pCTPCC_ENCINA_new == NULL)
        throw new CWBCLNT_ERR( ERR_GETPROCADDR_FAILED, szDllName,

GetLastError() );
}
else if (Reg.eTxnMon == COM)
{
    strcpy( szDllName, Reg.szPath );
    strcat( szDllName, "tpcc_com.dll");
    hLibInstanceTm = LoadLibrary( szDllName );
    if (hLibInstanceTm == NULL)
        throw new CWBCLNT_ERR( ERR_LOADDLL_FAILED, szDllName,

GetLastError() );

    // get function pointer to wrapper for class constructor
    pCTPCC_COM_new = (TYPE_CTPCC_COM*)

GetProcAddress(hLibInstanceTm,"CTPCC_COM_new");
    if (pCTPCC_COM_new == NULL)
        throw new CWBCLNT_ERR( ERR_GETPROCADDR_FAILED, szDllName,

GetLastError() );
}

// load DLL for database connection
if ((Reg.eTxnMon == None) || (dwNumDeliveryThreads > 0))
{
    if (Reg.eDB_Protocol == DBLIB)
    {
        strcpy( szDllName, Reg.szPath );
        strcat( szDllName, "tpcc_dblib.dll");
        hLibInstanceDb = LoadLibrary( szDllName );
        if (hLibInstanceDb == NULL)
            throw new CWBCLNT_ERR( ERR_LOADDLL_FAILED,

szDllName, GetLastError() );

        // get function pointer to wrapper for class constructor
        pCTPCC_DBLIB_new = (TYPE_CTPCC_DBLIB*)

GetProcAddress(hLibInstanceDb,"CTPCC_DBLIB_new");
        if (pCTPCC_DBLIB_new == NULL)
            throw new CWBCLNT_ERR( ERR_GETPROCADDR_FAILED,

szDllName, GetLastError() );
    }
    else if (Reg.eDB_Protocol == ODBC)
    {
        strcpy( szDllName, Reg.szPath );
        strcat( szDllName, "tpcc_odbc.dll");
        hLibInstanceDb = LoadLibrary( szDllName );
        if (hLibInstanceDb == NULL)
            throw new CWBCLNT_ERR( ERR_LOADDLL_FAILED,

szDllName, GetLastError() );

        // get function pointer to wrapper for class constructor
        pCTPCC_ODBC_new = (TYPE_CTPCC_ODBC*)

GetProcAddress(hLibInstanceDb,"CTPCC_ODBC_new");
        if (pCTPCC_ODBC_new == NULL)
            throw new CWBCLNT_ERR( ERR_GETPROCADDR_FAILED,

szDllName, GetLastError() );
    }
}

if (dwNumDeliveryThreads)
{
    // for deferred delivery txns:
```

## Appendix B – Database Design

---

```
initially not signalled */, NULL );

hDoneEvent = CreateEvent( NULL, TRUE /* manual reset */, FALSE /*
InitializeCriticalSection(&DelBuffCriticalSection);
hWorkerSemaphore = CreateSemaphore( NULL, 0, dwDelBuffSize, NULL );
dwDelBuffFreeCount = dwDelBuffSize;

InitJulianTime(NULL);

// create unique log file name based on delilog-yymmdd-hhmm.log
SYSTEMTIME Time;
GetLocalTime( &Time );
wsprintf( szLogFile, "%sdelivery-%2.2d%2.2d%2.2d-%2.2d%2.2d.log",
Reg.szPath, Time.wYear % 100, Time.wMonth,

Time.wDay, Time.wHour, Time.wMinute );

txxDelilog = new CTxnLog(szLogFile, TXN_LOG_WRITE);

//write event into txn log for START
txxDelilog->WriteCtrlRecToLog(TXN_EVENT_START, szMyComputerName,

sizeof(szMyComputerName));

// allocate structures for delivery buffers and thread mgmt
pDeliHandles = new HANDLE[dwNumDeliveryThreads];
pDelBuff = new DELIVERY_TRANSACTION[dwDelBuffSize];
// launch DeliveryWorkerThread to perform actual delivery txns
for(i=0; i<dwNumDeliveryThreads; i++)
{
    pDeliHandles[i] = (HANDLE) _beginthread(

        if (pDeliHandles[i] == INVALID_HANDLE_VALUE)
            throw new CWEBCLNT_ERR(

DeliveryWorkerThread, 0, NULL );

ERR_DELIVERY_THREAD_FAILED );

}

break;

case DLL_PROCESS_DETACH:
    if (dwNumDeliveryThreads)
    {
        if (txxDelilog != NULL)
        {
            //write event into txn log for STOP
            txxDelilog->WriteCtrlRecToLog(TXN_EVENT_STOP,

szMyComputerName, sizeof(szMyComputerName));

            // This will do a clean shutdown of the delivery log file
            CTxnLog *txxDelilogLocal = txxDelilog;
            txxDelilog= NULL;
            delete txxDelilogLocal;

        }

        delete [] pDeliHandles;
        delete [] pDelBuff;

        CloseHandle( hWorkerSemaphore );
        CloseHandle( hDoneEvent );
        DeleteCriticalSection(&DelBuffCriticalSection);

    }

DeleteCriticalSection(&TermCriticalSection);

if (hLibInstanceTm != NULL)
    FreeLibrary( hLibInstanceTm );
hLibInstanceTm = NULL;

if (hLibInstanceDb != NULL)
    FreeLibrary( hLibInstanceDb );
hLibInstanceDb = NULL;

Sleep(500);
break;

default:
    /* nothing */;
}
}
catch (CBaseErr *e)
{
    WriteMessageToEventLog( e->ErrorText() );
    delete e;
    TerminateExtension(0);
    return FALSE;
}
catch (...)
{
    WriteMessageToEventLog(TEXT("Unhandled exception. DLL could not load.));
    TerminateExtension(0);
    return FALSE;
}

return TRUE;
}
```

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---

```
/* FUNCTION: GetExtensionVersion
 *
 * PURPOSE:      This function is called by the inet service when the DLL is first loaded.
 *
 * ARGUMENTS:    HSE_VERSION_INFO *pVer      passed in structure in which to place expected version number.
 *
 * RETURNS:      TRUE      inet service expected return value.
 */

BOOL WINAPI GetExtensionVersion(HSE_VERSION_INFO *pVer)
{
    pVer->dwExtensionVersion = MAKELONG(HSE_VERSION_MINOR, HSE_VERSION_MAJOR);
    lstrcpy(pVer->lpszExtensionDesc, "TPC-C Server.", HSE_MAX_EXT_DLL_NAME_LEN);

    // TODO: why do we need this here instead of in the DLL attach?
    if (Reg.eTxnMon == ENCINA)
        pCTPCC_ENCINA_post_init();

    return TRUE;
}

/* FUNCTION: TerminateExtension
 *
 * PURPOSE:      This function is called by the inet service when the DLL is about to be unloaded.
 *                Release all resources in anticipation of being unloaded.
 *
 * RETURNS:      TRUE      inet service expected return value.
 */

BOOL WINAPI TerminateExtension( DWORD dwFlags )
{
    if (pDeliHandles)
    {
        SetEvent( hDoneEvent );
        for(DWORD i=0; i<dwNumDeliveryThreads; i++)
            WaitForSingleObject( pDeliHandles[i], INFINITE );
    }

    TermDeleteAll();
    return TRUE;
}

/* FUNCTION: HttpExtensionProc
 *
 * PURPOSE:      This function is the main entry point for the TPCC DLL. The internet service
 *                calls this function passing in the http string.
 *
 * ARGUMENTS:    EXTENSION_CONTROL_BLOCK *pECB      structure pointer to passed in internet
 *                service information.
 *
 * RETURNS:      DWORD      HSE_STATUS_SUCCESS      connection can be
 *                dropped if error                  HSE_STATUS_SUCCESS_AND_KEEP_CONN      keep connect valid
 *                comment sent
 *
 * COMMENTS:     None
 */

DWORD WINAPI HttpExtensionProc(EXTENSION_CONTROL_BLOCK *pECB)
{
    int          iCmd, FormId, TermId, iSyncId;
    char         szBuffer[4096];

    int          lpbSize;
    static char  szHeader[] = "200 Ok";
    DWORD        dwSize = 6;          // initial value is strlen(szHeader)
    char         szHeader1[4096];

#ifdef ICECAP
    StartCAP();
#endif

    try
    {
        //process http query
        ProcessQueryString(pECB, &iCmd, &FormId, &TermId, &iSyncId);

        if (TermId != 0)
        {
            if ( TermId < 0 || TermId >= Term.iNumEntries || Term.pClientData[TermId].iNextFree != -1
            )
            {
                // debugging...
                char szTmp[128];
                wsprintf( szTmp, "Invalid term ID; TermId = %d", TermId );
                WriteMessageToEventLog( szTmp );

                throw new CWEBCLNT_ERR( ERR_INVALID_TERMID );
            }
        }
    }
}
```

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---

```
    }

    //must have a valid syncid here since termid is valid
    if (iSyncId != Term.pClientData[TermId].iSyncId)
        throw new CWEBCLNT_ERR( ERR_INVALID_SYNC_CONNECTION );

    //set use time
    Term.pClientData[TermId].iTickCount = GetTickCount();
}

switch(iCmd)
{
case 0:
    WelcomeForm(pECB, szBuffer);
    break;
case 1:
    switch( FormId )
    {
        case WELCOME_FORM:
        case MAIN_MENU_FORM:
            break;
        case NEW_ORDER_FORM:
            ProcessNewOrderForm(pECB, TermId, szBuffer);
            break;
        case PAYMENT_FORM:
            ProcessPaymentForm(pECB, TermId, szBuffer);
            break;
        case DELIVERY_FORM:
            ProcessDeliveryForm(pECB, TermId, szBuffer);
            break;
        case ORDER_STATUS_FORM:
            ProcessOrderStatusForm(pECB, TermId, szBuffer);
            break;
        case STOCK_LEVEL_FORM:
            ProcessStockLevelForm(pECB, TermId, szBuffer);
            break;
    }
    break;
case 2:
    // new-order selected from menu; display new-order input form
    MakeNewOrderForm(TermId, NULL, INPUT_FORM, szBuffer);
    break;
case 3:
    // payment selected from menu; display payment input form
    MakePaymentForm(TermId, NULL, INPUT_FORM, szBuffer);
    break;
case 4:
    // delivery selected from menu; display delivery input form
    MakeDeliveryForm(TermId, NULL, INPUT_FORM, szBuffer);
    break;
case 5:
    // order-status selected from menu; display order-status input form
    MakeOrderStatusForm(TermId, NULL, INPUT_FORM, szBuffer);
    break;
case 6:
    // stock-level selected from menu; display stock-level input form
    MakeStockLevelForm(TermId, NULL, INPUT_FORM, szBuffer);
    break;
case 7:
    // ExitCmd
    TermDelete(TermId);
    WelcomeForm(pECB, szBuffer);
    break;
case 8:
    SubmitCmd(pECB, szBuffer);
    break;
case 9:
    // menu
    MakeMainMenuForm(TermId, Term.pClientData[TermId].iSyncId, szBuffer);
    break;
case 10:
    // CMD=Clear
    // resets all connections; should only be used when no other connections are active
    TermDeleteAll();
    TermInit();
    WelcomeForm(pECB, szBuffer);
    break;
case 11:
    // CMD=Stats
    StatsCmd(pECB, szBuffer);
    break;
}
}
catch (CBaseErr *e)
{
    ErrorForm( pECB, e->ErrorType(), e->ErrorNum(), TermId, iSyncId, e->ErrorText(), szBuffer );
    delete e;
}
catch (...)
{
    ErrorForm( pECB, ERR_TYPE_WEBDLL, 0, TermId, iSyncId, "Error: Unhandled exception in Web Client.",
szBuffer );
}
}
```



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---

```
#ifdef ICECAP
    StopCAP();
#endif

    lpbSize = strlen(szBuffer);
    wsprintf(szHeader1,
             "Content-Type: text/html\r\n"
             "Content-Length: %d\r\n"
             "Connection: Keep-Alive\r\n\r\n", lpbSize);
    strcat( szHeader1, szBuffer );

    (*pECB->ServerSupportFunction)(pECB->ConnID, HSE_REQ_SEND_RESPONSE_HEADER, szHeader, (LPDWORD) &dwSize,
    (LPDWORD)szHeader1);

    //finish up and keep connection
    pECB->dwHttpStatusCode = 200;
    return HSE_STATUS_SUCCESS_AND_KEEP_CONN;
}

void WriteMessageToEventLog(LPTSTR lpszMsg)
{
    TCHAR    szMsg[256];
    HANDLE   hEventSource;
    LPTSTR   lpszStrings[2];

    // Use event logging to log the error.
    //
    hEventSource = RegisterEventSource(NULL, TEXT("TPCC.DLL"));

    _stprintf(szMsg, TEXT("Error in TPCC.DLL: "));
    lpszStrings[0] = szMsg;
    lpszStrings[1] = lpszMsg;

    if (hEventSource != NULL)
    {
        ReportEvent(hEventSource, // handle of event source
                   EVENTLOG_ERROR_TYPE, // event type
                   0, // event category
                   0, // event ID
                   NULL, // current user's SID
                   2, // strings in lpszStrings
                   0, // no bytes of raw data
                   (LPCTSTR *)lpszStrings, // array of error strings
                   NULL); // no raw data

        (VOID) DeregisterEventSource(hEventSource);
    }
}

/* FUNCTION: DeliveryWorkerThread
 *
 * PURPOSE:      This function processes deferred delivery txns. There are typically several
 *               threads running this routine. The number of threads is determined by an entry
 *               read from the registry. The thread waits for work by waiting on semaphore.
 *               When a delivery txn is posted, the semaphore is released. After processing
 *               the delivery txn, information is logged to record the txn status and execution
 *               time.
 */

/*static*/ void DeliveryWorkerThread(void *ptr)
{
    CTPCC_BASE          *pTxn = NULL;

    DELIVERY_TRANSACTION    delivery;
    PDELIVERY_DATA          pDeliveryData;
    TXN_RECORD_TPCC_DELIV_DEF    txnDeliRec;

    DWORD                index;
    HANDLE                handles[2];

    SYSTEMTIME            trans_end; //delivery transaction finished time
    SYSTEMTIME            trans_start; //delivery transaction start time

    assert(txnDeliRec != NULL);

    try
    {
        if (Reg.eDB_Protocol == ODBC)
            pTxn = pCTPCC_ODBC_new( Reg.szDbServer, Reg.szDbUser, Reg.szDbPassword, szMyComputerName,
            Reg.szDbName, Reg.szSPPrefix );
        else if (Reg.eDB_Protocol == DBLIB)
            pTxn = pCTPCC_DBLIB_new( Reg.szDbServer, Reg.szDbUser, Reg.szDbPassword,
            szMyComputerName, Reg.szDbName );
        pDeliveryData = pTxn->BuffAddr_Delivery();
    }
    catch (CBaseErr *e)
    {
        char szTmp[1024];
        wsprintf( szTmp, "Error in Delivery Txn thread. Could not connect to database. "

```

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---

```
        "%s. Server=%s, User=%s, Password=%s, Database=%s",
        e->ErrorText(), Reg.szDbServer, Reg.szDbUser, Reg.szDbPassword, Reg.szDbName );
    WriteMessageToEventLog( szTmp );
    delete e;
    goto ErrorExit;
}
catch (...)
{
    WriteMessageToEventLog(TEXT("Unhandled exception caught in DeliveryWorkerThread.));
    goto ErrorExit;
}
while (TRUE)
{
    try
    {
        //while delivery thread running, i.e. user has not requested termination
        while (TRUE)
        {
            // need to wait for multiple objects: program exit or worker semaphore;
            handles[0] = hDoneEvent;
            handles[1] = hWorkerSemaphore;
            index = WaitForMultipleObjects( 2, &handles[0], FALSE, INFINITE );
            if (index == WAIT_OBJECT_0)
                goto ErrorExit;

            ZeroMemory(&txnDeliRec, sizeof(txnDeliRec));
            txnDeliRec.TxnType = TXN_REC_TYPE_TPCC_DELIIV_DEF;

            // make a local copy of current entry from delivery buffer and increment buffer
            EnterCriticalSection(&DelBuffCriticalSection);
            delivery = *(pDelBuff+dwDelBuffBusyIndex);
            dwDelBuffFreeCount++;
            dwDelBuffBusyIndex++;
            if (dwDelBuffBusyIndex == dwDelBuffSize) // wrap-around if at end of
                dwDelBuffBusyIndex = 0;

            LeaveCriticalSection(&DelBuffCriticalSection);

            pDeliveryData->w_id = delivery.w_id;
            pDeliveryData->o_carrier_id = delivery.o_carrier_id;

            txnDeliRec.w_id = pDeliveryData->w_id;
            txnDeliRec.o_carrier_id = pDeliveryData->o_carrier_id;
            txnDeliRec.TxnStartT0 = Get(x64)Time(&delivery.queue);

            GetLocalTime( &trans_start );
            pTxn->Delivery();
            GetLocalTime( &trans_end );

            //log txn
            txnDeliRec.TxnStatus = ERR_SUCCESS;
            for (int i=0; i<10; i++)
                txnDeliRec.o_id[i] = pDeliveryData->o_id[i];
            txnDeliRec.DeltaT4 = (int)(Get(x64)Time(&trans_end) - txnDeliRec.TxnStartT0);
            txnDeliRec.DeltaTxnExec = (int)(Get(x64)Time(&trans_end) -
            Get(x64)Time(&trans_start));

            if (txnDelilog != NULL)
                txnDelilog->WriteToLog(&txnDeliRec);
        }
    }
    catch (CBaseErr *e)
    {
        char szTmp[1024];
        wsprintf( szTmp, "Error in Delivery Txn thread. %s", e->ErrorText() );
        WriteMessageToEventLog( szTmp );

        // log the error txn
        txnDeliRec.TxnStatus = e->ErrorType();
        if (txnDelilog != NULL)
            txnDelilog->WriteToLog(&txnDeliRec);

        delete e;
    }
    catch (...)
    {
        // unhandled exception; shouldn't happen; not much we can do...
        WriteMessageToEventLog(TEXT("Unhandled exception caught in DeliveryWorkerThread.));
    }
}

ErrorExit:
    delete pTxn;
    _endthread();
}

/* FUNCTION: PostDeliveryInfo
 *
 * PURPOSE:      This function enters the delivery txn into the deferred delivery buffer.
 *
 */
```

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---

```
* RETURNS:          BOOL      FALSE    delivery information posted successfully
*                  *          TRUE     error cannot post delivery info
*/

BOOL PostDeliveryInfo(long w_id, short o_carrier_id)
{
    BOOL bError;

    EnterCriticalSection(&DelBuffCriticalSection);
    if (dwDelBuffFreeCount > 0)
    {
        bError = FALSE;
        (pDelBuff+dwDelBuffFreeIndex)->w_id          = w_id;
        (pDelBuff+dwDelBuffFreeIndex)->o_carrier_id  = o_carrier_id;
        GetLocalTime(&(pDelBuff+dwDelBuffFreeIndex)->queue);

        dwDelBuffFreeCount--;
        dwDelBuffFreeIndex++;
        if (dwDelBuffFreeIndex == dwDelBuffSize)
            dwDelBuffFreeIndex = 0;                // wrap-around if at end of buffer
    }
    else
        // No free buffers. Return an error, which indicates that the delivery buffer is full.
        // Most likely, the number of delivery worker threads needs to be increased to keep up
        // with the txn rate.
        bError = TRUE;
    LeaveCriticalSection(&DelBuffCriticalSection);

    if (!bError)
        // increment worker semaphore to wake up a worker thread
        ReleaseSemaphore( hWorkerSemaphore, 1, NULL );

    return bError;
}

/* FUNCTION: ProcessQueryString
*
* PURPOSE:      This function extracts the relevent information out of the http command passed in from
*               the browser.
*
* COMMENTS:     If this is the initial connection i.e. client is at welcome screen then
*               there will not be a terminal id or current form id. If this is the case
*               then the pTermid and pFormid return values are undefined.
*/

void ProcessQueryString(EXTENSION_CONTROL_BLOCK *pECB, int *pCmd, int *pFormId, int *pTermId, int *pSyncId)
{
    char *ptr = pECB->lpszQueryString;
    char szBuffer[25];
    int i;

    //allowable client command strings i.e. CMD=command
    static char *szCmds[] =
    {
        "Process", "..NewOrder..", "..Payment..", "..Delivery..", "..Order-Status..", "..Stock-Level..",
        "..Exit..", "Submit", "Menu", "Clear", "Stats", ""
    };

    *pCmd = 0;                // default is the login screen
    *pTermId = 0;

    // if no params (i.e., empty query string), then return login screen
    if (strlen(pECB->lpszQueryString) == 0)
        return;

    // parse FORMID, TERMID, and SYNCID
    *pFormId = GetIntKeyValue(&ptr, "FORMID", NO_ERR, NO_ERR);
    *pTermId = GetIntKeyValue(&ptr, "TERMID", NO_ERR, NO_ERR);
    *pSyncId = GetIntKeyValue(&ptr, "SYNCID", NO_ERR, NO_ERR);

    // parse CMD
    GetKeyValue(&ptr, "CMD", szBuffer, sizeof(szBuffer), ERR_COMMAND_UNDEFINED);

    // see which command it matches
    for(i=0; i++)
    {
        if (szCmds[i][0] == 0)
            // no more; no match; return error
            throw new CWEBCLNT_ERR( ERR_COMMAND_UNDEFINED );
        if ( !strcmp(szCmds[i], szBuffer) )
        {
            *pCmd = i+1;
            break;
        }
    }
}

/* FUNCTION: void WelcomeForm
*
*/

void WelcomeForm(EXTENSION_CONTROL_BLOCK *pECB, char *szBuffer)
```

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```
char szTmp[1024];

//welcome to tpc-c html form buffer, this is first form client sees.
strcpy( szBuffer, "<HTML><HEAD><TITLE>TPC-C Web Client</TITLE></HEAD><BODY>"
" <B><BIG>Microsoft TPC-C Web Client (ver 4.20)</BIG></B>"
<BR> <BR>"

" <font face=\"Courier New\"><PRE>"
"Compiled: \"__DATE__\", \"__TIME__\" <BR>"
"Source: \"__FILE__\" ( \"__TIMESTAMP__\" ) <BR>"
"</PRE></font>"
"<FORM ACTION=\"tpcc.dll\" METHOD=\"GET\">"
"<INPUT TYPE=\"hidden\" NAME=\"STATUSID\" VALUE=\"0\">"
"<INPUT TYPE=\"hidden\" NAME=\"ERROR\" VALUE=\"0\">"
"<INPUT TYPE=\"hidden\" NAME=\"FORMID\" VALUE=\"1\">"
"<INPUT TYPE=\"hidden\" NAME=\"TERMIN\" VALUE=\"0\">"
"<INPUT TYPE=\"hidden\" NAME=\"SYNCID\" VALUE=\"0\">"
"<INPUT TYPE=\"hidden\" NAME=\"VERSION\" VALUE=\"\""

WEBCLIENT_VERSION "\">"
);

sprintf( szTmp, "Configuration Settings: <BR><font face=\"Courier New\" color=\"blue\"><PRE>"
"Txn Monitor = <B>%s</B><BR>"
"Database protocol = <B>%s</B><BR>"
"Max Connections = <B>%d</B><BR>"
"# of Delivery Threads = <B>%d</B><BR>"
"Max Pending Deliveries = <B>%d</B><BR>"
, szTxnMonNames[Reg.eTxnMon], szDBNames[Reg.eDB_Protocol],
Reg.dwMaxConnections, dwNumDeliveryThreads, dwDelBuffSize );
strcat( szBuffer, szTmp);

if (Reg.eTxnMon == COM)
{
    sprintf( szTmp, "COM Single Pool = <B>%s</B><BR>",
    Reg.bCOM_SinglePool ? "YES" : "NO" );
    strcat( szBuffer, szTmp);
}
strcat( szBuffer, "</PRE></font>");

if (Reg.eTxnMon == None)
// connection options may be specified when not using a txn monitor
sprintf( szTmp, "Please enter your database options for this connection:<BR>"
" <font face=\"Courier New\" color=\"blue\"><PRE>"
"DB Server = <INPUT NAME=\"db_server\" SIZE=20"
"DB User ID = <INPUT NAME=\"db_user\" SIZE=20"
"DB Password = <INPUT NAME=\"db_passwd\" SIZE=20"
"DB Name = <INPUT NAME=\"db_name\" SIZE=20"
"</PRE></font>"
, Reg.szDbServer, Reg.szDbUser, Reg.szDbPassword, Reg.szDbName );
else
// if using a txn monitor, connection options are determined from registry; can't
// set per user. show options fyi
sprintf( szTmp, "Database options which will be used by the transaction monitor:<BR>"
" <font face=\"Courier New\" color=\"blue\"><PRE>"
"DB Server = <B>%s</B><BR>"
"DB User ID = <B>%s</B><BR>"
"DB Password = <B>%s</B><BR>"
"DB Name = <B>%s</B><BR>"
"</PRE></font>"
, Reg.szDbServer, Reg.szDbUser, Reg.szDbPassword, Reg.szDbName );
strcat( szBuffer, szTmp);

sprintf( szTmp, "Please enter your Warehouse and District for this session:<BR>"
" <font face=\"Courier New\" color=\"blue\"><PRE>" );
strcat( szBuffer, szTmp);
strcat( szBuffer, "Warehouse ID = <INPUT NAME=\"w_id\" SIZE=6><BR>"
"District ID = <INPUT NAME=\"d_id\" SIZE=2><BR>"
"</PRE></font><HR>"
"<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Submit\">"
"</FORM></BODY></HTML>");
}

/* FUNCTION: SubmitCmd
*
* PURPOSE: This function allocated a new terminal id in the Term structure array.
*
*/

void SubmitCmd(EXTENSION_CONTROL_BLOCK *pECB, char *szBuffer)
{
    int iNewTerm;
    char *ptr = pECB->lpszQueryString;

    char szVersion[32] = { 0 };
    char szServer[32] = { 0 };
    char szUser[32] = "sa";
    char szPassword[32] = { 0 };
    char szDatabase[32] = "tpcc";

    // validate version field; the version field ensures that the RTE is synchronized with the web client
```

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---

```
GetKeyValue(&ptr, "VERSION", szVersion, sizeof(szVersion), ERR_VERSION_MISMATCH);
if ( strcmp( szVersion, WEBCLIENT_VERSION ) )
    throw new CWEBCLNT_ERR( ERR_VERSION_MISMATCH );

if (Reg.eTxnMon == None)
{
    // parse Server name
    GetKeyValue(&ptr, "db_server", szServer, sizeof(szServer), ERR_NO_SERVER_SPECIFIED);
    // parse User name
    GetKeyValue(&ptr, "db_user", szUser, sizeof(szUser), NO_ERR);
    // parse Password
    GetKeyValue(&ptr, "db_passwd", szPassword, sizeof(szPassword), NO_ERR);
    // parse Database name
    GetKeyValue(&ptr, "db_name", szDatabase, sizeof(szDatabase), NO_ERR);
}

// parse warehouse ID
int w_id = GetIntKeyValue(&ptr, "w_id", ERR_HTML_ILL_FORMED, ERR_W_ID_INVALID);
if ( w_id < 1 )
    throw new CWEBCLNT_ERR( ERR_W_ID_INVALID );

// parse district ID
int d_id = GetIntKeyValue(&ptr, "d_id", ERR_HTML_ILL_FORMED, ERR_D_ID_INVALID);
if ( d_id < 1 || d_id > 10 )
    throw new CWEBCLNT_ERR( ERR_D_ID_INVALID );

iNewTerm = TermAdd();

Term.pClientData[iNewTerm].w_id = w_id;
Term.pClientData[iNewTerm].d_id = d_id;

try
{
    if (Reg.eTxnMon == TUXEDO)
        Term.pClientData[iNewTerm].pTxn = pCTPCC_TUXEDO_new();
    else if (Reg.eTxnMon == ENCINA)
        Term.pClientData[iNewTerm].pTxn = pCTPCC_ENCINA_new();
    else if (Reg.eTxnMon == COM)
        Term.pClientData[iNewTerm].pTxn = pCTPCC_COM_new( Reg.bCOM_SinglePool );
    else if (Reg.eDB_Protocol == ODBC)
        Term.pClientData[iNewTerm].pTxn = pCTPCC_ODBC_new( szServer, szUser, szPassword,
szMyComputerName, szDatabase, Reg.szSPPrefix );
    else if (Reg.eDB_Protocol == DBLIB)
        Term.pClientData[iNewTerm].pTxn = pCTPCC_DBLIB_new( szServer, szUser, szPassword,
szMyComputerName, szDatabase );
}
catch (...)
{
    TermDelete(iNewTerm);
    throw; // pass exception upward
}

MakeMainMenuForm(iNewTerm, Term.pClientData[iNewTerm].iSyncId, szBuffer);
}

/* FUNCTION: StatsCmd
 *
 * PURPOSE:      This function returns to the browser the total number of active terminal ids.
 *              This routine is for development/debugging purposes.
 *
 */

void StatsCmd(EXTENSION_CONTROL_BLOCK *pECB, char *szBuffer)
{
    int i;
    int    iTotals;

    EnterCriticalSection(&TermCriticalSection);

    iTotals = 0;
    for(i=0; i<Term.iNumEntries; i++)
    {
        if (Term.pClientData[i].iNextFree == -1)
            iTotals++;
    }

    LeaveCriticalSection(&TermCriticalSection);

    wsprintf( szBuffer,
        "<HTML><HEAD><TITLE>TPC-C Web Client Stats</TITLE></HEAD>"
        "<BODY><B><BIG> Total Active Connections: %d </BIG></B><BR></BODY></HTML>"
        , iTotals );
}

char *CWEBCLNT_ERR::ErrorText()
{
    static SERRORMSG errorMsgs[] =
    {
        { ERR_COMMAND_UNDEFINED, "Command
undefined."
},

```

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ID Must be 1 to 10."	{	ERR_D_ID_INVALID,	},	"Invalid District
range must be 1 - 10."	{	ERR_DELIVERY_CARRIER_ID_RANGE,	},	"Delivery Carrier ID out of
numeric 1 - 10."	{	ERR_DELIVERY_CARRIER_INVALID,	},	"Delivery Carrier ID invalid must be
"OCD*\"."	{	ERR_DELIVERY_MISSING_OCD_KEY,	},	"Delivery missing Carrier ID key
worker thread."	{	ERR_DELIVERY_THREAD_FAILED,	},	"Could not start delivery
in DLL. GetProcAddress error. DLL="	{	ERR_GETPROCADDR_FAILED,	},	"Could not map proc
is missing from HTML string."	{	ERR_HTML_ILL_FORMED,	},	"Required key field
ID."	{	ERR_INVALID_SYNC_CONNECTION,	},	"Invalid Terminal Sync ID."
failed. DLL="	{	ERR_INVALID_TERMID,	},	"Invalid Terminal
Connections is probably too low."	{	ERR_LOADDLL_FAILED,	},	"Load of DLL
Rerun INSTALL to correct."	{	ERR_MAX_CONNECTIONS_EXCEEDED,	},	"No connections available. Max
invalid data type, range = 1 to 3000."	{	ERR_MISSING_REGISTRY_ENTRIES,	},	"Required registry entries are missing.
key \"CID*\"."	{	ERR_NEWORDER_CUSTOMER_INVALID,	},	"New Order customer id
Invalid range 1 - 10."	{	ERR_NEWORDER_CUSTOMER_KEY,	},	"New Order missing Customer
key \"DID*\"."	{	ERR_NEWORDER_DISTRICT_INVALID,	},	"New Order District ID
must be numeric."	{	ERR_NEWORDER_FORM_MISSING_DID,	},	"New Order missing District
range. Range = 1 to 999999."	{	ERR_NEWORDER_ITEMID_INVALID,	},	"New Order Item Id is wrong data type,
without a corresponding Supp.W."	{	ERR_NEWORDER_ITEMID_RANGE,	},	"New Order Item Id is out of
"IID*\"."	{	ERR_NEWORDER_ITEMID_WITHOUT_SUPPW,	},	"New Order Item_Id field entered
"SP##*\"."	{	ERR_NEWORDER_MISSING_IID_KEY,	},	"New Order missing Item Id key
be numeric range 1 - 99."	{	ERR_NEWORDER_MISSING_QTY_KEY,	},	"New Order Missing Qty key \"Qty##*\"."
out of range. Range = 1 to 99."	{	ERR_NEWORDER_MISSING_SUPPW_KEY,	},	"New Order missing Supp_W key
without a corresponding Supp.W."	{	ERR_NEWORDER_NOITEMS_ENTERED,	},	"New Order No order lines entered."
data type must be numeric."	{	ERR_NEWORDER_QTY_INVALID,	},	"New Order Qty invalid must
Name may be entered, not both."	{	ERR_NEWORDER_QTY_RANGE,	},	"New Order Qty is
range must be numeric 1 - 3000."	{	ERR_NEWORDER_QTY_WITHOUT_SUPPW,	},	"New Order Qty field entered
name longer than 16 characters."	{	ERR_NEWORDER_SUPPW_INVALID,	},	"New Order Supp_W invalid
must be numeric 1 - 10."	{	ERR_NO_SERVER_SPECIFIED,	},	"No Server name specified."
Last Name must be entered."	{	ERR_ORDERSTATUS_CID_AND_CLT,	},	"Order Status Only Customer ID or Last
"CID*\"."	{	ERR_ORDERSTATUS_CID_INVALID,	},	"Order Status Customer ID invalid,
Name key \"CLT*\"."	{	ERR_ORDERSTATUS_CLT_RANGE,	},	"Order Status Customer last
"DID*\"."	{	ERR_ORDERSTATUS_DID_INVALID,	},	"Order Status District invalid, value
invalid must be numeric."	{	ERR_ORDERSTATUS_MISSING_CID_CLT,	},	"Order Status Either Customer ID or
Last Name may be entered, not both."	{	ERR_ORDERSTATUS_MISSING_CID_KEY,	},	"Order Status missing Customer key
must be numeric."	{	ERR_ORDERSTATUS_MISSING_CLT_KEY,	},	"Order Status missing Customer Last
invalid, must be numeric."	{	ERR_ORDERSTATUS_MISSING_DID_KEY,	},	"Order Status missing District key
be 1 - 10."	{	ERR_PAYMENT_CDI_INVALID,	},	"Payment Customer district
type must be numeric."	{	ERR_PAYMENT_CID_AND_CLT,	},	"Payment Only Customer ID or
of range, 0 - 9999.98."	{	ERR_PAYMENT_CUSTOMER_INVALID,	},	"Payment Customer data type invalid,
longer than 16 characters."	{	ERR_PAYMENT_CWI_INVALID,	},	"Payment Customer Warehouse
"CDI*\"."	{	ERR_PAYMENT_DISTRICT_INVALID,	},	"Payment District ID is invalid, must
	{	ERR_PAYMENT_HAM_INVALID,	},	"Payment Amount invalid data
	{	ERR_PAYMENT_HAM_RANGE,	},	"Payment Amount out
	{	ERR_PAYMENT_LAST_NAME_TO_LONG,	},	"Payment Customer last name
	{	ERR_PAYMENT_MISSING_CDI_KEY,	},	"Payment missing Customer district key

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```

Name must be entered, { ERR_PAYMENT_MISSING_CID_CLT, "Payment Either Customer ID or Last
\"CID*\".\" { ERR_PAYMENT_MISSING_CID_KEY, "Payment missing Customer Key
\"CLT*\".\" { ERR_PAYMENT_MISSING_CLT_KEY, "Payment missing Customer Last Name key
\"CWI*\".\" { ERR_PAYMENT_MISSING_CWI_KEY, "Payment missing Customer Warehouse key
\"DID*\".\" { ERR_PAYMENT_MISSING_DID_KEY, "Payment missing District Key
{ ERR_PAYMENT_MISSING_HAM_KEY, "Payment missing Amount key \"HAM*\".\"
{ ERR_STOCKLEVEL_MISSING_THRESHOLD_KEY, "Stock Level; missing Threshold key \"TT*\".\"
in the range = 1 - 99.\" { ERR_STOCKLEVEL_THRESHOLD_INVALID, "Stock Level; Threshold value must be
range, range must be 1 - 99.\" { ERR_STOCKLEVEL_THRESHOLD_RANGE, "Stock Level Threshold out of
field. RTE and Web Client are probably out of sync.\" }, "Invalid version
ID.\" { ERR_VERSION_MISMATCH, "Invalid Warehouse
{ ERR_W_ID_INVALID, "Invalid Warehouse
},
\" \" { 0,
};

char szTmp[256];
int i = 0;
while (TRUE)
{
    if (errorMsgs[i].szMsg[0] == 0)
    {
        strcpy( szTmp, "Unknown error number." );
        break;
    }
    if (m_Error == errorMsgs[i].iError)
    {
        strcpy( szTmp, errorMsgs[i].szMsg );
        break;
    }
    i++;
}

if (m_szTextDetail)
    strcat( szTmp, m_szTextDetail );
if (m_SystemErr)
    vsprintf( szTmp+strlen(szTmp), " Error=%d", m_SystemErr );

m_szErrorText = new char[strlen(szTmp)+1];
strcpy( m_szErrorText, szTmp );
return m_szErrorText;
}

/* FUNCTION: GetKeyValue
*
* PURPOSE: This function parses a http formatted string for specific key values.
*
* ARGUMENTS: char *pQueryString http string from client browser
* char *pKey key value to look
* char *pValue character array
* int iMax maximum
length of key value array.
* WEBERROR err error value to
throw
*
* RETURNS: nothing.
*
* ERROR: if (the pKey value is not found) then
* if (err == 0)
* return (empty string)
* else
* throw CWEBCLNT_ERR(err)
*
* COMMENTS: http keys are formatted either KEY=value& or KEY=value\0. This DLL formats
* TPC-C input fields in such a manner that the keys can be extracted in the
* above manner.
*/

void GetKeyValue(char **pQueryString, char *pKey, char *pValue, int iMax, WEBERROR err)
{
    char *ptr;

    if ( !(ptr=strstr(*pQueryString, pKey)) )
        goto ErrorExit;
    ptr += strlen(pKey);
    if ( *ptr != '=' )
        goto ErrorExit;
    ptr++;
}

```

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---

```
    iMax--; // one position is for terminating null
    while( *ptr && *ptr != '&'amp; && iMax)
    {
        *pValue++ = *ptr++;
        iMax--;
    }
    *pValue = 0; // terminating null

    *pQueryString = ptr;
    return;

ErrorExit:
    if (err != NO_ERR)
        throw new CWEBCLNT_ERR( err );
    *pValue = 0; // return empty result string
}

/* FUNCTION: GetIntKeyValue
 *
 * PURPOSE:          This function parses a http formatted string for a specific key value.
 *
 * ARGUMENTS:       char          char          *pQueryString      http string from client browser
 *                  char          char          *pKey              key value to look
 *                  WEBERROR      NoKeyErr      error value to throw if key not found
 *                  WEBERROR      NotIntErr     error value to throw if value not
 *                  numeric
 *
 * RETURNS:         integer
 *
 * ERROR:           if (the pKey value is not found) then
 *                  if (NoKeyErr != NO_ERR)
 *                      throw CWEBCLNT_ERR(err)
 *                  else
 *                      return 0
 *                  else if (non-numeric char found) then
 *                      if (NotIntErr != NO_ERR) then
 *                          throw CWEBCLNT_ERR(err)
 *                      else
 *                          return 0
 *
 * COMMENTS:        http keys are formatted either KEY=value& or KEY=value\0. This DLL formats
 *                  TPC-C input fields in such a manner that the keys can be extracted in the
 *                  above manner.
 */

int GetIntKeyValue(char **pQueryString, char *pKey, WEBERROR NoKeyErr, WEBERROR NotIntErr)
{
    char *ptr0;
    char *ptr;

    if ( !(ptr=strstr(*pQueryString, pKey)) )
        goto ErrorNoKey;
    ptr += strlen(pKey);
    if ( *ptr != '=' )
        goto ErrorNoKey;
    ptr++;

    ptr0 = ptr; // remember starting point
    // scan string until a terminator (null or &) or a non-digit
    while( *ptr && *ptr != '&'amp; && isdigit(*ptr) )
        ptr++;

    // make sure we stopped scanning for the right reason
    if ((ptr0 == ptr) || (*ptr && *ptr != '&'))
    {
        if (NotIntErr != NO_ERR)
            throw new CWEBCLNT_ERR( NoKeyErr );
        return 0;
    }

    *pQueryString = ptr;
    return atoi(ptr0);

ErrorNoKey:
    if (NoKeyErr != NO_ERR)
        throw new CWEBCLNT_ERR( NoKeyErr );
    return 0;
}

/* FUNCTION: TermInit
 *
 * PURPOSE:          This function initializes the client terminal structure; it is called when the TPCC.DLL
 *                  is first loaded by the inet service.
 *
 */

void TermInit(void)
{
    EnterCriticalSection(&TermCriticalSection);

    Term.iMasterSyncId = 1;
}
```



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---

```
Term.iNumEntries = Reg.dwMaxConnections+1;

Term.pClientData = NULL;
Term.pClientData = (PCLIENTDATA)malloc(Term.iNumEntries * sizeof(CLIENTDATA));
if (Term.pClientData == NULL)
{
    LeaveCriticalSection(&TermCriticalSection);
    throw new CWEBCLNT_ERR( ERR_MEM_ALLOC_FAILED );
}

ZeroMemory( Term.pClientData, Term.iNumEntries * sizeof(CLIENTDATA) );

Term.iFreeList = Term.iNumEntries-1;
// build free list
// note: Term.pClientData[0].iNextFree gets set to -1, which marks it as "in use".
// This is intentional, as the zero entry is used as an anchor and never
// allocated as an actual terminal.
for(int i=0; i<Term.iNumEntries; i++)
    Term.pClientData[i].iNextFree = i-1;

LeaveCriticalSection(&TermCriticalSection);
}

/* FUNCTION: TermDeleteAll
 *
 * PURPOSE:      This function frees allocated resources associated with the terminal structure.
 *
 * ARGUMENTS:    none
 *
 * RETURNS:      None
 *
 * COMMENTS:    This function is called only when the inet service unloads the TPCC.DLL
 *
 */

void TermDeleteAll(void)
{
    EnterCriticalSection(&TermCriticalSection);

    for(int i=1; i<Term.iNumEntries; i++)
    {
        if (Term.pClientData[i].iNextFree == -1)
            delete Term.pClientData[i].pTxm;
    }

    Term.iFreeList = 0;
    Term.iNumEntries = 0;
    if ( Term.pClientData )
        free(Term.pClientData);
    Term.pClientData = NULL;

    LeaveCriticalSection(&TermCriticalSection);
}

/* FUNCTION: TermAdd
 *
 * PURPOSE:      This function assigns a terminal id which is used to identify a client browser.
 *
 * RETURNS:      int          assigned terminal id
 *
 */

int TermAdd(void)
{
    DWORD    i;
    int      iNewTerm, iTickCount;

    if (Term.iNumEntries == 0)
        return -1;

    EnterCriticalSection(&TermCriticalSection);
    if (Term.iFreeList != 0)
    {
        // position is available
        iNewTerm = Term.iFreeList;
        Term.iFreeList = Term.pClientData[iNewTerm].iNextFree;
        Term.pClientData[iNewTerm].iNextFree = -1; // indicates this position is in use
    }
    else
    {
        // no open slots, so find the slot that hasn't been used in the longest time and reuse it
        for(iNewTerm=1, i=1, iTickCount=0x7FFFFFFF; i<Reg.dwMaxConnections; i++)
        {
            if (iTickCount > Term.pClientData[i].iTickCount)
            {
                iTickCount = Term.pClientData[i].iTickCount;
                iNewTerm = i;
            }
        }
        // if oldest term is less than one minute old, it probably means that more connections
        // are being attempted than were specified as "Max Connections" at install. In this case,
        // do not bump existing connection; instead, return error to requestor.
        if ((GetTickCount() - iTickCount) < 60000)
        {
            LeaveCriticalSection(&TermCriticalSection);

```

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```
        throw new CWBCLNT_ERR( ERR_MAX_CONNECTIONS_EXCEEDED );
    }
}

Term.pClientData[iNewTerm].iTickCount = GetTickCount();
Term.pClientData[iNewTerm].iSyncId = Term.iMasterSyncId++;
Term.pClientData[iNewTerm].pTxn = NULL;

LeaveCriticalSection(&TermCriticalSection);
return iNewTerm;
}

/* FUNCTION: TermDelete
 *
 * PURPOSE:      This function makes a terminal entry in the Term array available for reuse.
 *
 * ARGUMENTS:   int                               id                               Terminal id of
client exiting
 *
 */

void TermDelete(int id)
{
    if ( id > 0 && id < Term.iNumEntries )
    {
        delete Term.pClientData[id].pTxn;

        // put onto free list
        EnterCriticalSection(&TermCriticalSection);

        Term.pClientData[id].iNextFree = Term.iFreeList;
        Term.iFreeList = id;

        LeaveCriticalSection(&TermCriticalSection);
    }
}

/* FUNCTION: MakeErrorForm
 */

void ErrorForm(EXTENSION_CONTROL_BLOCK *pECB, int iType, int iErrorNum, int iTermId, int iSyncId, char *szErrorText,
char *szBuffer )
{
    wsprintf(szBuffer,
        "<HTML><HEAD><TITLE>TPC-C Error</TITLE></HEAD><BODY>"
        "<FORM ACTION=\"tpcc.dll\" METHOD=\"GET\">"
        "<INPUT TYPE=\"hidden\" NAME=\"STATUSID\" VALUE=\"%d\">"
        "<INPUT TYPE=\"hidden\" NAME=\"ERROR\" VALUE=\"%d\">"
        "<INPUT TYPE=\"hidden\" NAME=\"FORMID\" VALUE=\"%d\">"
        "<INPUT TYPE=\"hidden\" NAME=\"TERMINID\" VALUE=\"%d\">"
        "<INPUT TYPE=\"hidden\" NAME=\"SYNCID\" VALUE=\"%d\">"
        "<BOLD>An Error Occurred</BOLD><BR><BR>"
        "%s"
        "<BR><BR><HR>"
        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..NewOrder..\">"
        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Payment..\">"
        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Delivery..\">"
        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Order-Status..\">"
        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Stock-Level..\">"
        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Exit..\">"
        "</FORM></BODY></HTML>"
        , iType, iErrorNum, MAIN_MENU_FORM, iTermId, iSyncId, szErrorText );
}

/* FUNCTION: MakeMainMenuForm
 */

void MakeMainMenuForm(int iTermId, int iSyncId, char *szForm)
{
    wsprintf(szForm,
        "<HTML><HEAD><TITLE>TPC-C Main Menu</TITLE></HEAD><BODY>"
        "Select Desired Transaction.<BR><HR>"
        "<FORM ACTION=\"tpcc.dll\" METHOD=\"GET\">"
        "<INPUT TYPE=\"hidden\" NAME=\"STATUSID\" VALUE=\"0\">"
        "<INPUT TYPE=\"hidden\" NAME=\"ERROR\" VALUE=\"0\">"
        "<INPUT TYPE=\"hidden\" NAME=\"FORMID\" VALUE=\"%d\">"
        "<INPUT TYPE=\"hidden\" NAME=\"TERMINID\" VALUE=\"%d\">"
        "<INPUT TYPE=\"hidden\" NAME=\"SYNCID\" VALUE=\"%d\">"
        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..NewOrder..\">"
        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Payment..\">"
        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Delivery..\">"
        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Order-Status..\">"
        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Stock-Level..\">"
        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Exit..\">"
        "</FORM></BODY></HTML>"
        , MAIN_MENU_FORM, iTermId, iSyncId);
}

/* FUNCTION: MakeStockLevelForm
 *
 * PURPOSE:      This function constructs the Stock Level HTML page.
 *
 */
```

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```
* COMMENTS:      The internal client buffer is created when the terminal id is assigned and should not
*                  be freed except when the client terminal id is no longer needed.
*/

void MakeStockLevelForm(int iTermId, STOCK_LEVEL_DATA *pStockLevelData, BOOL bInput, char *szForm)
{
    int      c;

    c = sprintf(szForm,
        "<HTML><HEAD><TITLE>TPC-C Stock Level</TITLE></HEAD><FORM ACTION=\"tpcc.dll\" METHOD=\"GET\">"
        "<INPUT TYPE=\"hidden\" NAME=\"STATUSID\" VALUE=\"0\">"
        "<INPUT TYPE=\"hidden\" NAME=\"ERROR\" VALUE=\"0\">"
        "<INPUT TYPE=\"hidden\" NAME=\"FORMID\" VALUE=\"%d\">"
        "<INPUT TYPE=\"hidden\" NAME=\"TERMINID\" VALUE=\"%d\">"
        "<INPUT TYPE=\"hidden\" NAME=\"SYNCID\" VALUE=\"%d\">"
        "<PRE><font face=\"Courier\">                               Stock-Level<BR>"
        "Warehouse: %6.6d  District: %2.2d<BR> <BR>",
        STOCK_LEVEL_FORM, iTermId, Term.pClientData[iTermId].iSyncId,
        Term.pClientData[iTermId].w_id, Term.pClientData[iTermId].d_id);

    if ( bInput )
    {
        strcpy(szForm+c,
            "Stock Level Threshold: <INPUT NAME=\"TT*\" SIZE=2><BR> <BR>"
            "low stock:  </font><BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR>"
            " <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR></PRE><HR>"
            "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Process\">"
            "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Menu\">"
            "</FORM></HTML>" );
    }
    else
    {
        sprintf(szForm+c,
            "Stock Level Threshold: %2.2d<BR> <BR>"
            "low stock: %3.3d</font> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR>"
            " <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR></PRE><HR>"
            "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..NewOrder..\">"
            "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Payment..\">"
            "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Delivery..\">"
            "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Order-Status..\">"
            "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Stock-Level..\">"
            "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Exit..\">"
            "</FORM></HTML>"
            , pStockLevelData->threshold, pStockLevelData->low_stock);
    }
}

/* FUNCTION: MakeNewOrderForm
* COMMENTS:      The internal client buffer is created when the terminal id is assigned and should not
*                  be freed except when the client terminal id is no longer needed.
*/

void MakeNewOrderForm(int iTermId, NEW_ORDER_DATA *pNewOrderData, BOOL bInput, char *szForm)
{
    int      i, c;
    BOOL     bValid;
    static   char szBR[] = " <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR>";

    if (!bInput)
        assert( pNewOrderData->exec_status_code == eOK || pNewOrderData->exec_status_code == eInvalidItem );

    bValid = (bInput || (pNewOrderData->exec_status_code == eOK));

    c = sprintf(szForm,
        "<HTML><HEAD><TITLE>TPC-C New Order</TITLE></HEAD><BODY>"
        "<FORM ACTION=\"tpcc.dll\" METHOD=\"GET\">"
        "<INPUT TYPE=\"hidden\" NAME=\"STATUSID\" VALUE=\"%d\">"
        "<INPUT TYPE=\"hidden\" NAME=\"ERROR\" VALUE=\"0\">"
        "<INPUT TYPE=\"hidden\" NAME=\"FORMID\" VALUE=\"%d\">"
        "<INPUT TYPE=\"hidden\" NAME=\"TERMINID\" VALUE=\"%d\">"
        "<INPUT TYPE=\"hidden\" NAME=\"SYNCID\" VALUE=\"%d\">"
        "<PRE><font face=\"Courier\">                               New Order<BR>"
        , bValid ? 0 : ERR_BAD_ITEM_ID, NEW_ORDER_FORM, iTermId, Term.pClientData[iTermId].iSyncId);

    if ( bInput )
    {
        c += sprintf(szForm+c, "Warehouse: %6.6d  ", Term.pClientData[iTermId].w_id );

        strcpy( szForm+c,
            "District: <INPUT NAME=\"DID*\" SIZE=1>                               Date:<BR> <BR>"
            "Customer:  <INPUT NAME=\"CID*\" SIZE=4>                               Name:                               Credit:"
            "%Disc:<BR>"
            "Order Number:                               Number of Lines:                               W_tax:                               D_tax:<BR> <BR>"
            " Supp_W Item_Id Item Name                               Qty Stock B/G Price                               Amount<BR> <BR>"
            " <INPUT NAME=\"SP00*\" SIZE=4> <INPUT NAME=\"IID00*\" SIZE=6>"
            "<INPUT NAME=\"Qty00*\" SIZE=1><BR>"
            " <INPUT NAME=\"SP01*\" SIZE=4> <INPUT NAME=\"IID01*\" SIZE=6>"
            "<INPUT NAME=\"Qty01*\" SIZE=1><BR>"
            " <INPUT NAME=\"SP02*\" SIZE=4> <INPUT NAME=\"IID02*\" SIZE=6>"
            "<INPUT NAME=\"Qty02*\" SIZE=1><BR>"
        );
    }
}
```

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```
" <INPUT NAME=\"SP03*\" SIZE=4> <INPUT NAME=\"IID03*\" SIZE=6>
<INPUT NAME=\"Qty03*\" SIZE=1><BR>
" <INPUT NAME=\"SP04*\" SIZE=4> <INPUT NAME=\"IID04*\" SIZE=6>
<INPUT NAME=\"Qty04*\" SIZE=1><BR>
" <INPUT NAME=\"SP05*\" SIZE=4> <INPUT NAME=\"IID05*\" SIZE=6>
<INPUT NAME=\"Qty05*\" SIZE=1><BR>
" <INPUT NAME=\"SP06*\" SIZE=4> <INPUT NAME=\"IID06*\" SIZE=6>
<INPUT NAME=\"Qty06*\" SIZE=1><BR>
" <INPUT NAME=\"SP07*\" SIZE=4> <INPUT NAME=\"IID07*\" SIZE=6>
<INPUT NAME=\"Qty07*\" SIZE=1><BR>
" <INPUT NAME=\"SP08*\" SIZE=4> <INPUT NAME=\"IID08*\" SIZE=6>
<INPUT NAME=\"Qty08*\" SIZE=1><BR>
" <INPUT NAME=\"SP09*\" SIZE=4> <INPUT NAME=\"IID09*\" SIZE=6>
<INPUT NAME=\"Qty09*\" SIZE=1><BR>
" <INPUT NAME=\"SP10*\" SIZE=4> <INPUT NAME=\"IID10*\" SIZE=6>
<INPUT NAME=\"Qty10*\" SIZE=1><BR>
" <INPUT NAME=\"SP11*\" SIZE=4> <INPUT NAME=\"IID11*\" SIZE=6>
<INPUT NAME=\"Qty11*\" SIZE=1><BR>
" <INPUT NAME=\"SP12*\" SIZE=4> <INPUT NAME=\"IID12*\" SIZE=6>
<INPUT NAME=\"Qty12*\" SIZE=1><BR>
" <INPUT NAME=\"SP13*\" SIZE=4> <INPUT NAME=\"IID13*\" SIZE=6>
<INPUT NAME=\"Qty13*\" SIZE=1><BR>
" <INPUT NAME=\"SP14*\" SIZE=4> <INPUT NAME=\"IID14*\" SIZE=6>
<INPUT NAME=\"Qty14*\" SIZE=1><BR>
"Execution Status: Total:<BR>
"</font></PRE><HR>
"<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Process\">
"<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Menu\">
"</FORM></HTML>
);
}
else
{
    c += sprintf(szForm+c, "Warehouse: %6.6d District: %2.2d Date: ",
                pNewOrderData->w_id,
                pNewOrderData->d_id);

    if ( bValid )
    {
        c += sprintf(szForm+c, "%2.2d-%2.2d-%4.4d %2.2d:%2.2d:%2.2d",
                    pNewOrderData->o_entry_d.day,
                    pNewOrderData->o_entry_d.month,
                    pNewOrderData->o_entry_d.year,
                    pNewOrderData->o_entry_d.hour,
                    pNewOrderData->o_entry_d.minute,
                    pNewOrderData->o_entry_d.second);
    }

    c += sprintf(szForm+c, "<BR>Customer: %4.4d Name: %-16s Credit: %-2s ",
                pNewOrderData->c_id, pNewOrderData->c_last, pNewOrderData->c_credit);

    if ( bValid )
    {
        c += sprintf(szForm+c,
                    "%5.2f D_tax: %5.2f <BR> <BR>"
                    "%5.2f %Disc: %5.2f <BR>"
                    "Order Number: %8.8d Number of Lines: %2.2d W_tax:
                    " Supp_W Item_Id Item Name Qty Stock
                    B/G Price Amount<BR>",
                    100.0*pNewOrderData->c_discount,
                    pNewOrderData->o_id,
                    pNewOrderData->o_ol_cnt,
                    100.0 * pNewOrderData->w_tax,
                    100.0 * pNewOrderData->d_tax);

        for(i=0; i<pNewOrderData->o_ol_cnt; i++)
        {
            c += sprintf(szForm+c, "%6.6d %6.6d %-24s %2.2d %3.3d %1.1s %6.2f
            %7.2f <BR>",
                pNewOrderData->OL[i].ol_supply_w_id,
                pNewOrderData->OL[i].ol_i_id,
                pNewOrderData->OL[i].ol_i_name,
                pNewOrderData->OL[i].ol_quantity,
                pNewOrderData->OL[i].ol_stock,
                pNewOrderData->OL[i].ol_brand_generic,
                pNewOrderData->OL[i].ol_i_price,
                pNewOrderData->OL[i].ol_amount );
        }
    }
    else
    {
        c += sprintf(szForm+c,
                    "%Disc:<BR>"
                    "Order Number: %8.8d Number of Lines: W_tax: D_tax:<BR>
                    " Supp_W Item_Id Item Name Qty Stock B/G Price
                    Amount<BR>"
                    , pNewOrderData->o_id);

        i = 0;
    }

    strncpy( szForm+c, szBR, (15-i)*5 );
}
```

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```
c += (15-i)*5;

if ( bValid )
    c += sprintf(szForm+c, "Execution Status: Transaction committed.
Total:  $$%.2f ",
                pNewOrderData->total_amount);
else
    c += sprintf(szForm+c, "Execution Status: Item number is not valid.
Total:");

strcpy(szForm+c,
" <BR></font></PRE><HR>"
"<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..NewOrder..\">"
"<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Payment..\">"
"<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Delivery..\">"
"<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Order-Status..\">"
"<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Stock-Level..\">"
"<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Exit..\">"
"</FORM></HTML>"
);
}
}

/* FUNCTION: MakePaymentForm
 *
 * COMMENTS:      The internal client buffer is created when the terminal id is assigned and should not
 *                be freed except when the client terminal id is no longer needed.
 */

void MakePaymentForm(int iTermId, PAYMENT_DATA *pPaymentData, BOOL bInput, char *szForm)
{
    int c;

    c = sprintf(szForm,
"<HTML><HEAD><TITLE>TPC-C Payment</TITLE></HEAD><BODY>"
"<FORM ACTION=\"tpcc.dll\" METHOD=\"GET\">"
"<INPUT TYPE=\"hidden\" NAME=\"STATUSID\" VALUE=\"0\">"
"<INPUT TYPE=\"hidden\" NAME=\"ERROR\" VALUE=\"0\">"
"<INPUT TYPE=\"hidden\" NAME=\"FORMID\" VALUE=\"%d\">"
"<INPUT TYPE=\"hidden\" NAME=\"TERMINID\" VALUE=\"%d\">"
"<INPUT TYPE=\"hidden\" NAME=\"SYNCID\" VALUE=\"%d\">"
"<PRE><font face=\"Courier\">
"Date: "
", PAYMENT_FORM, iTermId, Term.pClientData[iTermId].iSyncId);

if ( !bInput )
{
    c += sprintf(szForm+c, "%2.2d-%2.2d-%4.4d %2.2d:%2.2d:%2.2d",
pPaymentData->h_date.day,
pPaymentData->h_date.month,
pPaymentData->h_date.year,
pPaymentData->h_date.hour,
pPaymentData->h_date.minute,
pPaymentData->h_date.second);
}

if ( bInput )
{
    c += sprintf(szForm+c,
"<BR> <BR>Warehouse: %6.6d"
"District: <INPUT NAME=\"DID\" SIZE=1><BR> <BR> <BR> <BR>
<BR>"
"Customer: <INPUT NAME=\"CID\" SIZE=4>"
"Cust-Warehouse: <INPUT NAME=\"CWI\" SIZE=4> "
"Cust-District: <INPUT NAME=\"CDI\" SIZE=1><BR>"
"Name: <INPUT NAME=\"CLT\" SIZE=16>
Since:<BR>"
"Credit:<BR>"
"Disc:<BR>"
"Phone:<BR> <BR>"
"Amount Paid: $<INPUT NAME=\"HAM\" SIZE=7> New Cust-Balance:<BR>"
"Credit Limit:<BR> <BR>Cust-Data: <BR> <BR> <BR> <BR> <BR></font></PRE><HR>"
"<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Process\"><INPUT TYPE=\"submit\"
NAME=\"CMD\" VALUE=\"Menu\">"
"</BODY></FORM></HTML>"
, Term.pClientData[iTermId].w_id);
}
else
{
    c += sprintf(szForm+c,
"<BR> <BR>Warehouse: %6.6d District: %2.2d<BR>"
"%-20s %-20s<BR>"
"%-20s %-20s<BR>"
"%-20s %-2s %5.5s-%4.4s %-20s %-2s %5.5s-%4.4s<BR> <BR>"
"Customer: %4.4d Cust-Warehouse: %6.6d Cust-District: %2.2d<BR>"
"Name: %-16s %-2s %-16s Since: %2.2d-%2.2d-%4.4d<BR>"
"%-20s %-20s Credit: %-2s<BR>"
, Term.pClientData[iTermId].w_id, pPaymentData->d_id
pPaymentData->w_street_1, pPaymentData->d_street_1
pPaymentData->w_street_2, pPaymentData->d_street_2
pPaymentData->w_city, pPaymentData->w_state, pPaymentData->w_zip, pPaymentData->w_zip+5
pPaymentData->d_city, pPaymentData->d_state, pPaymentData->d_zip, pPaymentData->d_zip+5
```

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```
, pPaymentData->c_id, pPaymentData->c_w_id, pPaymentData->c_d_id
, pPaymentData->c_first, pPaymentData->c_middle, pPaymentData->c_last
, pPaymentData->c_since.day, pPaymentData->c_since.month, pPaymentData->c_since.year
, pPaymentData->c_street_1, pPaymentData->c_credit
);

c += sprintf(szForm+c,
"          %-20s          %%Disc:  %5.2f<BR>",
pPaymentData->c_street_2, 100.0*pPaymentData->c_discount);

c += wsprintf(szForm+c,
"          %-20s %-2s %5.5s-%4.4s Phone: %6.6s-%3.3s-%3.3s-%4.4s<BR> <BR>",
pPaymentData->c_city, pPaymentData->c_state, pPaymentData->c_zip, pPaymentData->c_zip+5,
pPaymentData->c_phone, pPaymentData->c_phone+6, pPaymentData->c_phone+9, pPaymentData->
>c_phone+12 );

c += sprintf(szForm+c,
"Amount Paid:          $%7.2f          New Cust-Balance:  $%14.2f<BR>"
"Credit Limit:    $%13.2f<BR> <BR>"
, pPaymentData->h_amount, pPaymentData->c_balance
, pPaymentData->c_credit_lim
);

if ( pPaymentData->c_credit[0] == 'B' && pPaymentData->c_credit[1] == 'C' )
c += wsprintf(szForm+c,
"          Cust-Data:  %-50.50s<BR>          %-50.50s<BR>          %-
50.50s<BR>          %-50.50s<BR>",
pPaymentData->c_data, pPaymentData->c_data+50, pPaymentData->
>c_data+100, pPaymentData->c_data+150 );
else
strcpy(szForm+c, "Cust-Data:  <BR> <BR> <BR> <BR>");

strcat(szForm,
" <BR></font></PRE><HR>"
" <INPUT TYPE=\"submit\" NAME=\"CMD\"\"
VALUE=\"..NewOrder..\">"
" <INPUT TYPE=\"submit\" NAME=\"CMD\"\"
VALUE=\"..Payment..\">"
" <INPUT TYPE=\"submit\" NAME=\"CMD\"\"
VALUE=\"..Delivery..\">"
" <INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Order-
Status..\">"
" <INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Stock-
Level..\">"
" <INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Exit..\">"
" </BODY></FORM></HTML>");
}
}

/* FUNCTION: MakeOrderStatusForm
*
* COMMENTS: The internal client buffer is created when the terminal id is assigned and should not
* be freed except when the client terminal id is no longer needed.
*/

void MakeOrderStatusForm(int iTermId, ORDER_STATUS_DATA *pOrderStatusData, BOOL bInput, char *szForm)
{
int i, c;
static char szBR[] = " <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> ";

c = wsprintf(szForm,
"<HTML><HEAD><TITLE>TPC-C Order-Status</TITLE></HEAD><BODY>"
"<FORM ACTION=\"tpcc.dll\" METHOD=\"GET\">"
"<INPUT TYPE=\"hidden\" NAME=\"STATUSID\" VALUE=\"0\">"
"<INPUT TYPE=\"hidden\" NAME=\"ERROR\" VALUE=\"0\">"
"<INPUT TYPE=\"hidden\" NAME=\"FORMID\" VALUE=\"&d\">"
"<INPUT TYPE=\"hidden\" NAME=\"TERMINID\" VALUE=\"&d\">"
"<INPUT TYPE=\"hidden\" NAME=\"SYNCD\" VALUE=\"&d\">"
"<PRE><font face=\"Courier\">" Order-Status<BR>"
"Warehouse: %6.6d ",
ORDER_STATUS_FORM, iTermId, Term.pClientData[iTermId].iSyncId, Term.pClientData[iTermId].w_id);

if ( bInput )
{
strcpy(szForm+c,
"District: <INPUT NAME=\"DID\" SIZE=1><BR>"
"Customer: <INPUT NAME=\"CID\" SIZE=4> Name: <INPUT NAME=\"CLT\"\"
SIZE=23><BR>"
"Cust-Balance:<BR> <BR>"
"Order-Number: Entry-Date: Carrier-Number:<BR>"
"Supply-W Item-Id Qty Amount Delivery-Date<BR> <BR> <BR> <BR>"
" <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR></font></PRE>"
"<HR><INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Process\"><INPUT TYPE=\"submit\"
NAME=\"CMD\" VALUE=\"Menu\">"
" </BODY></FORM></HTML> " );
}
else
{
c += wsprintf(szForm+c,
"District: %2.2d<BR>"
"Customer: %4.4d Name: %-16s %-2s %-16s<BR>",
pOrderStatusData->d_id, pOrderStatusData->c_id,
pOrderStatusData->c_first, pOrderStatusData->c middle, pOrderStatusData->c last);
}
```

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```

c += sprintf(szForm+c, "Cust-Balance: $%9.2f<BR> <BR>",
             pOrderStatusData->c_balance);

c += wsprintf(szForm+c,
             "Order-Number: %8.8d   Entry-Date: %2.2d-%2.2d-%4.4d %2.2d:%2.2d:%2.2d   Carrier-Number:
%2.2d<BR>"
             "Supply-W   Item-Id   Qty   Amount   Delivery-Date<BR>",
             pOrderStatusData->o_id,
             pOrderStatusData->o_entry_d.day,
             pOrderStatusData->o_entry_d.month,
             pOrderStatusData->o_entry_d.year,
             pOrderStatusData->o_entry_d.hour,
             pOrderStatusData->o_entry_d.minute,
             pOrderStatusData->o_entry_d.second,
             pOrderStatusData->o_carrier_id);

for(i=0; i< pOrderStatusData->o_ol_cnt; i++)
{
c += sprintf(szForm+c, "   %6.6d   %6.6d   %2.2d   $$$8.2f   %2.2d-%2.2d-
%4.4d<BR>",
             pOrderStatusData->OL[i].ol_supply_w_id,
             pOrderStatusData->OL[i].ol_i_id,
             pOrderStatusData->OL[i].ol_quantity,
             pOrderStatusData->OL[i].ol_amount,
             pOrderStatusData->OL[i].ol_delivery_d.day,
             pOrderStatusData->OL[i].ol_delivery_d.month,
             pOrderStatusData->OL[i].ol_delivery_d.year);
}

strncpy( szForm+c, szBR, (15-i)*5 );
c += (15-i)*5;

strcpy(szForm+c,
       "</font></PRE><HR><INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..NewOrder..\">"
       "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Payment..\">"
       "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Delivery..\">"
       "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Order-Status..\">"
       "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Stock-Level..\">"
       "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Exit..\">"
       "</BODY></FORM></HTML>" );
}

/* FUNCTION: MakeDeliveryForm
 *
 * COMMENTS:      The internal client buffer is created when the terminal id is assigned and should not
 *                  be freed except when the client terminal id is no longer needed.
 */

void MakeDeliveryForm(int iTermId, DELIVERY_DATA *pDeliveryData, BOOL bInput, char *szForm)
{
int     c;

c = wsprintf(szForm,
             "<HTML><HEAD><TITLE>TPC-C Delivery</TITLE></HEAD><BODY>"
             "<FORM ACTION=\"tpcc.dll\" METHOD=\"GET\""
             "<INPUT TYPE=\"hidden\" NAME=\"STATUSID\" VALUE=\"%d\""
             "<INPUT TYPE=\"hidden\" NAME=\"ERROR\" VALUE=\"0\""
             "<INPUT TYPE=\"hidden\" NAME=\"FORMID\" VALUE=\"%d\""
             "<INPUT TYPE=\"hidden\" NAME=\"TERMID\" VALUE=\"%d\""
             "<INPUT TYPE=\"hidden\" NAME=\"SYNCID\" VALUE=\"%d\""
             "<PRE><font face=\"Courier\"
                                     Delivery<BR>"
             "Warehouse: %6.6d<BR> <BR>",
             (!bInput && (pDeliveryData->exec_status_code != eOK)) ? ERR_TYPE_DELIVERY_POST : 0,
             DELIVERY_FORM, iTermId, Term.pClientData[iTermId].iSyncId, Term.pClientData[iTermId].w_id);

if ( bInput )
{
strcpy( szForm+c,
       "Carrier Number: <INPUT NAME=\"OCD*\" SIZE=1<BR> <BR>"
       "Execution Status: <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR>"
       "<BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> </font></PRE><HR>"
       "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Process\""
       "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Menu\""
       "</BODY></FORM></HTML>" );
}
else
{
wsprintf( szForm+c,
         "Carrier Number: %2.2d<BR> <BR>"
         "Execution Status: %s <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR>"
         "<BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> </font></PRE>"
         "<HR><INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..NewOrder..\">"
         "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Payment..\">"
         "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Delivery..\">"
         "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Order-Status..\">"
         "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Stock-Level..\">"
         "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"..Exit..\">"
         "</BODY></FORM></HTML>"

         , pDeliveryData->o_carrier_id,

```

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```
Failed      "                (pDeliveryData->exec_status_code == eOK) ? "Delivery has been queued." : "Delivery Post
                );
    }
}

/* FUNCTION: ProcessNewOrderForm
 *
 * PURPOSE:      This function gets and validates the input data from the new order form
 *               filling in the required input variables. it then calls the SQLNewOrder
 *               transaction, constructs the output form and writes it back to client
 *               browser.
 */

void ProcessNewOrderForm(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, char *szBuffer)
{
    PNEW_ORDER_DATA      pNewOrder;

    pNewOrder = Term.pClientData[iTermId].pTxn->BuffAddr_NewOrder();

    ZeroMemory(pNewOrder, sizeof(NEW_ORDER_DATA));
    pNewOrder->w_id = Term.pClientData[iTermId].w_id;
    GetNewOrderData(pECB->lpszQueryString, pNewOrder);

    Term.pClientData[iTermId].pTxn->NewOrder();

    pNewOrder = Term.pClientData[iTermId].pTxn->BuffAddr_NewOrder();
    MakeNewOrderForm(iTermId, pNewOrder, OUTPUT_FORM, szBuffer );
}

/* FUNCTION: void ProcessPaymentForm
 *
 * PURPOSE:      This function gets and validates the input data from the payment form
 *               filling in the required input variables. It then calls the SQLPayment
 *               transaction, constructs the output form and writes it back to client
 *               browser.
 *
 * ARGUMENTS:    EXTENSION_CONTROL_BLOCK      *pECB      passed in structure pointer from inetsrv.
 *               int                          iTermId    client
 *               browser terminal id
 */

void ProcessPaymentForm(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, char *szBuffer)
{
    PPAYMENT_DATA      pPayment;

    pPayment = Term.pClientData[iTermId].pTxn->BuffAddr_Payment();
    ZeroMemory(pPayment, sizeof(PAYMENT_DATA));
    pPayment->w_id = Term.pClientData[iTermId].w_id;
    GetPaymentData(pECB->lpszQueryString, pPayment);

    Term.pClientData[iTermId].pTxn->Payment();

    pPayment = Term.pClientData[iTermId].pTxn->BuffAddr_Payment();
    MakePaymentForm(iTermId, pPayment, OUTPUT_FORM, szBuffer);
}

/* FUNCTION: ProcessOrderStatusForm
 *
 * PURPOSE:      This function gets and validates the input data from the Order Status
 *               form filling in the required input variables. It then calls the
 *               SQLOrderStatus transaction, constructs the output form and writes it
 *               back to client browser.
 *
 * ARGUMENTS:    EXTENSION_CONTROL_BLOCK      *pECB      passed in structure pointer from inetsrv.
 *               int                          iTermId    client
 *               browser terminal id
 */

void ProcessOrderStatusForm(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, char *szBuffer)
{
    PORDER_STATUS_DATA pOrderStatus;

    pOrderStatus = Term.pClientData[iTermId].pTxn->BuffAddr_OrderStatus();
    ZeroMemory(pOrderStatus, sizeof(ORDER_STATUS_DATA));
    pOrderStatus->w_id = Term.pClientData[iTermId].w_id;
    GetOrderStatusData(pECB->lpszQueryString, pOrderStatus);

    Term.pClientData[iTermId].pTxn->OrderStatus();

    pOrderStatus = Term.pClientData[iTermId].pTxn->BuffAddr_OrderStatus();
    MakeOrderStatusForm(iTermId, pOrderStatus, OUTPUT_FORM, szBuffer);
}

/* FUNCTION: ProcessDeliveryForm
 *
 * PURPOSE:      This function gets and validates the input data from the delivery form
 *               filling in the required input variables. It then calls the PostDeliveryInfo
 *               Api, The client is then informed that the transaction has been posted.
 *
 * ARGUMENTS:    EXTENSION CONTROL BLOCK      *pECB      passed in structure pointer from inetsrv.

```



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```
*
*                               int                               iTermId  client
browser terminal id
*/

void ProcessDeliveryForm(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, char *szBuffer)
{
    char      *ptr = pECB->lpszQueryString;

    PDELIVERY_DATA    pDelivery;

    pDelivery = Term.pClientData[iTermId].pTxn->BuffAddr_Delivery();
    ZeroMemory(pDelivery, sizeof(DELIVERY_DATA));
    pDelivery->w_id = Term.pClientData[iTermId].w_id;

    pDelivery->o_carrier_id      = GetIntKeyValue(&ptr, "OCD*", ERR_DELIVERY_MISSING_OCD_KEY,
ERR_DELIVERY_CARRIER_INVALID);
    if ( pDelivery->o_carrier_id > 10 || pDelivery->o_carrier_id < 1 )
        throw new CWBCLNT_ERR( ERR_DELIVERY_CARRIER_ID_RANGE );

    if (dwNumDeliveryThreads)
    {
        //post delivery info
        if ( PostDeliveryInfo(pDelivery->w_id, pDelivery->o_carrier_id) )
            pDelivery->exec_status_code = eDeliveryFailed;
        else
            pDelivery->exec_status_code = eOK;
    }
    else // delivery is done synchronously if no delivery threads configured
        Term.pClientData[iTermId].pTxn->Delivery();

    pDelivery = Term.pClientData[iTermId].pTxn->BuffAddr_Delivery();
    MakeDeliveryForm(iTermId, pDelivery, OUTPUT_FORM, szBuffer);
}

/* FUNCTION: ProcessStockLevelForm
*
* PURPOSE:      This function gets and validates the input data from the Stock Level
*               form filling in the required input variables. It then calls the
*               SQLStockLevel transaction, constructs the output form and writes it
*               back to client browser.
*
* ARGUMENTS:    EXTENSION_CONTROL_BLOCK    *pECB    passed in structure pointer from inetsrv.
*               int                        iTermId  client
browser terminal id
*/

void ProcessStockLevelForm(EXTENSION_CONTROL_BLOCK *pECB, int iTermId, char *szBuffer)
{
    char      *ptr = pECB->lpszQueryString;

    PSTOCK_LEVEL_DATA    pStockLevel;

    pStockLevel = Term.pClientData[iTermId].pTxn->BuffAddr_StockLevel();
    ZeroMemory( pStockLevel, sizeof(STOCK_LEVEL_DATA) );

    pStockLevel->w_id = Term.pClientData[iTermId].w_id;
    pStockLevel->d_id = Term.pClientData[iTermId].d_id;

    pStockLevel->threshold = GetIntKeyValue(&ptr, "TT*", ERR_STOCKLEVEL_MISSING_THRESHOLD_KEY,
ERR_STOCKLEVEL_THRESHOLD_INVALID);
    if ( pStockLevel->threshold >= 100 || pStockLevel->threshold < 0 )
        throw new CWBCLNT_ERR( ERR_STOCKLEVEL_THRESHOLD_RANGE );

    Term.pClientData[iTermId].pTxn->StockLevel();

    pStockLevel = Term.pClientData[iTermId].pTxn->BuffAddr_StockLevel();
    MakeStockLevelForm(iTermId, pStockLevel, OUTPUT_FORM, szBuffer);
}

/* FUNCTION: GetNewOrderData
*
* PURPOSE:      This function extracts and validates the new order form data from an http command string.
*
* ARGUMENTS:    LPSTR                lpszQueryString                client browser http command string
*               NEW_ORDER_DATA        *pNewOrderData                pointer to new order data
structure
*/

void GetNewOrderData(LPSTR lpszQueryString, NEW_ORDER_DATA *pNewOrderData)
{
    char      szTmp[26];
    int       i;
    short     items;
    int       ol_i_id, ol_quantity;
    char      *ptr = lpszQueryString;

    static char szSP[MAX_OL_NEW_ORDER_ITEMS][6] =
    { "SP00*", "SP01*", "SP02*", "SP03*", "SP04*",
      "SP05*", "SP06*", "SP07*", "SP08*", "SP09*",
      "SP10*", "SP11*", "SP12*", "SP13*", "SP14*" };
}
```

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---

```
static char szIID[MAX_OL_NEW_ORDER_ITEMS][7] =
    { "IID00**", "IID01**", "IID02**", "IID03**", "IID04**",
      "IID05**", "IID06**", "IID07**", "IID08**", "IID09**",
      "IID10**", "IID11**", "IID12**", "IID13**", "IID14**" };
static char szQty[MAX_OL_NEW_ORDER_ITEMS][7] =
    { "Qty00**", "Qty01**", "Qty02**", "Qty03**", "Qty04**",
      "Qty05**", "Qty06**", "Qty07**", "Qty08**", "Qty09**",
      "Qty10**", "Qty11**", "Qty12**", "Qty13**", "Qty14**" };

pNewOrderData->d_id = GetIntKeyValue(&ptr, "DID*", ERR_NEWORDER_FORM_MISSING_DID,
ERR_NEWORDER_DISTRICT_INVALID);
pNewOrderData->c_id = GetIntKeyValue(&ptr, "CID*", ERR_NEWORDER_CUSTOMER_KEY, ERR_NEWORDER_CUSTOMER_INVALID);

for(i=0, items=0; i<MAX_OL_NEW_ORDER_ITEMS; i++)
{
    GetKeyValue(&ptr, szSP[i], szTmp, sizeof(szTmp), ERR_NEWORDER_MISSING_SUPPW_KEY);
    if ( szTmp[0] )
    {
        if ( !IsNumeric(szTmp) )
            throw new CWBCLNT_ERR( ERR_NEWORDER_SUPPW_INVALID );
        pNewOrderData->OL[items].ol_supply_w_id = atoi(szTmp);

        ol_i_id = pNewOrderData->OL[items].ol_i_id =
            GetIntKeyValue(&ptr, szIID[i], ERR_NEWORDER_MISSING_IID_KEY,
ERR_NEWORDER_ITEMID_INVALID);
        if ( ol_i_id > 999999 || ol_i_id < 1 )
            throw new CWBCLNT_ERR( ERR_NEWORDER_ITEMID_RANGE );

        ol_quantity = pNewOrderData->OL[items].ol_quantity =
            GetIntKeyValue(&ptr, szQty[i], ERR_NEWORDER_MISSING_QTY_KEY,
ERR_NEWORDER_QTY_INVALID);
        if ( ol_quantity > 99 || ol_quantity < 1 )
            throw new CWBCLNT_ERR( ERR_NEWORDER_QTY_RANGE );

        items++;
    }
    else
    {
        // nothing entered for supply warehouse, so item id and qty must also be blank
        GetKeyValue(&ptr, szIID[i], szTmp, sizeof(szTmp), ERR_NEWORDER_MISSING_IID_KEY);
        if ( szTmp[0] )
            throw new CWBCLNT_ERR( ERR_NEWORDER_ITEMID_WITHOUT_SUPPW );

        GetKeyValue(&ptr, szQty[i], szTmp, sizeof(szTmp), ERR_NEWORDER_MISSING_QTY_KEY);
        if ( szTmp[0] )
            throw new CWBCLNT_ERR( ERR_NEWORDER_QTY_WITHOUT_SUPPW );
    }
}
if ( items == 0 )
    throw new CWBCLNT_ERR( ERR_NEWORDER_NOITEMS_ENTERED );

pNewOrderData->o_ol_cnt = items;
}

/* FUNCTION: GetPaymentData
 *
 * PURPOSE:          This function extracts and validates the payment form data from an http command string.
 *
 * ARGUMENTS:       LPSTR                lpszQueryString                client browser http command string
 *                  PAYMENT_DATA        *pPaymentData                pointer to payment data
 */
void GetPaymentData(LPSTR lpszQueryString, PAYMENT_DATA *pPaymentData)
{
    char    szTmp[26];
    char    *ptr = lpszQueryString;
    BOOL    bCustIdBlank;

    pPaymentData->d_id = GetIntKeyValue(&ptr, "DID*", ERR_PAYMENT_MISSING_DID_KEY, ERR_PAYMENT_DISTRICT_INVALID);
    GetKeyValue(&ptr, "CID*", szTmp, sizeof(szTmp), ERR_PAYMENT_MISSING_CID_KEY);
    if ( szTmp[0] == 0 )
    {
        bCustIdBlank = TRUE;
        pPaymentData->c_id = 0;
    }
    else
    {
        // parse customer id and verify that last name was NOT entered
        bCustIdBlank = FALSE;
        if ( !IsNumeric(szTmp) )
            throw new CWBCLNT_ERR( ERR_PAYMENT_CUSTOMER_INVALID );
        pPaymentData->c_id = atoi(szTmp);
    }

    pPaymentData->c_w_id = GetIntKeyValue(&ptr, "CWI*", ERR_PAYMENT_MISSING_CWI_KEY, ERR_PAYMENT_CWI_INVALID);
    pPaymentData->c_d_id = GetIntKeyValue(&ptr, "CDI*", ERR_PAYMENT_MISSING_CDI_KEY, ERR_PAYMENT_CDI_INVALID);

    if ( bCustIdBlank )
    {
        // customer id is blank, so last name must be entered
        GetKeyValue(&ptr, "CLT*", szTmp, sizeof(szTmp), ERR_PAYMENT_MISSING_CLT_KEY);
        if ( szTmp[0] == 0 )
            throw new CWBCLNT_ERR( ERR_PAYMENT_MISSING_CID_CLT );
    }
}
```

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---

```
        _strupr( szTmp );
        if ( strlen(pPaymentData->c_last) > LAST_NAME_LEN )
            throw new CWEBCLNT_ERR( ERR_PAYMENT_LAST_NAME_TO_LONG );
        strcpy(pPaymentData->c_last, szTmp);
    }
    else
    {
        // parse customer id and verify that last name was NOT entered
        GetKeyValue(&ptr, "CLT*", szTmp, sizeof(szTmp), ERR_PAYMENT_MISSING_CLT_KEY);
        if ( szTmp[0] != 0 )
            throw new CWEBCLNT_ERR( ERR_PAYMENT_CID_AND_CLT );
    }

    GetKeyValue(&ptr, "HAM*", szTmp, sizeof(szTmp), ERR_PAYMENT_MISSING_HAM_KEY);
    if (!IsDecimal(szTmp))
        throw new CWEBCLNT_ERR( ERR_PAYMENT_HAM_INVALID );
    pPaymentData->h_amount = atof(szTmp);
    if ( pPaymentData->h_amount >= 10000.00 || pPaymentData->h_amount < 0 )
        throw new CWEBCLNT_ERR( ERR_PAYMENT_HAM_RANGE );
}

/* FUNCTION: GetOrderStatusData
 *
 * PURPOSE:          This function extracts and validates the payment form data from an http command string.
 *
 */
void GetOrderStatusData(LPSTR lpszQueryString, ORDER_STATUS_DATA *pOrderStatusData)
{
    char    szTmp[26];
    char    *ptr = lpszQueryString;

    pOrderStatusData->d_id = GetIntKeyValue(&ptr, "DID*", ERR_ORDERSTATUS_MISSING_DID_KEY,
ERR_ORDERSTATUS_DID_INVALID);

    GetKeyValue(&ptr, "CID*", szTmp, sizeof(szTmp), ERR_ORDERSTATUS_MISSING_CID_KEY);
    if ( szTmp[0] == 0 )
    {
        // customer id is blank, so last name must be entered
        pOrderStatusData->c_id = 0;
        GetKeyValue(&ptr, "CLT*", szTmp, sizeof(szTmp), ERR_ORDERSTATUS_MISSING_CLT_KEY);
        if ( szTmp[0] == 0 )
            throw new CWEBCLNT_ERR( ERR_ORDERSTATUS_MISSING_CID_CLT );

        _strupr( szTmp );
        if ( strlen(pOrderStatusData->c_last) > LAST_NAME_LEN )
            throw new CWEBCLNT_ERR( ERR_ORDERSTATUS_CLT_RANGE );
        strcpy(pOrderStatusData->c_last, szTmp);
    }
    else
    {
        // parse customer id and verify that last name was NOT entered
        if ( !IsNumeric(szTmp) )
            throw new CWEBCLNT_ERR( ERR_ORDERSTATUS_CID_INVALID );
        pOrderStatusData->c_id = atoi(szTmp);
        GetKeyValue(&ptr, "CLT*", szTmp, sizeof(szTmp), ERR_ORDERSTATUS_MISSING_CLT_KEY);
        if ( szTmp[0] != 0 )
            throw new CWEBCLNT_ERR( ERR_ORDERSTATUS_CID_AND_CLT );
    }
}

/* FUNCTION: BOOL IsNumeric(char *ptr)
 *
 * PURPOSE:          This function determines if a string is numeric. It fails if any characters other
 *                  than numeric and null terminator are present.
 *
 * ARGUMENTS:       char    *ptr    pointer to string to check.
 *
 * RETURNS:         BOOL    FALSE   if string is not all numeric
 *                  TRUE     TRUE    if string contains only numeric characters i.e.
 *                  '0' - '9'
 */
BOOL IsNumeric(char *ptr)
{
    if ( *ptr == 0 )
        return FALSE;

    while( *ptr && isdigit(*ptr) )
        ptr++;
    return ( !*ptr );
}

/* FUNCTION: BOOL IsDecimal(char *ptr)
 *
 * PURPOSE:          This function determines if a string is a non-negative decimal value.
 *                  It fails if any characters other than a series of numbers followed by
 *                  a decimal point, another series of numbers, and a null terminator are present.
 *
 * ARGUMENTS:       char    *ptr    pointer to string to check.
 *
 * RETURNS:         BOOL    FALSE   if string is not a valid non-negative decimal value
 *                  TRUE     TRUE    if string is OK
 */
BOOL IsDecimal(char *ptr)
```

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---

```
{
    char *dotptr;
    BOOL  bValid;

    if ( *ptr == 0 )
        return FALSE;

    // find decimal point
    dotptr = strchr( ptr, '.' );
    if (dotptr == NULL)
        // no decimal point, so just check for numeric
        return IsNumeric(ptr);
    *dotptr = 0; // temporarily replace decimal with a terminator

    if ( *ptr != 0 )
        bValid = IsNumeric(ptr);
    // string starts with decimal point
    else if (*(dotptr+1) == 0)
        return FALSE; // nothing but a decimal point is bad
    else
        bValid = TRUE;

    if (*(dotptr+1) != 0)
        // check text after decimal point
        bValid &= IsNumeric(dotptr+1);

    *dotptr = '.'; // replace decimal point
    return bValid;
}
```

### isapi\_dll/src/resource.h

```
//{{NO_DEPENDENCIES}}
// Microsoft Developer Studio generated include file.
// Used by tpcc.rc
//
#define IDD_DIALOG1          101

// Next default values for new objects
//
#ifdef APSTUDIO_INVOKED
#ifdef APSTUDIO_READONLY_SYMBOLS
#define _APS_NEXT_RESOURCE_VALUE        102
#define _APS_NEXT_COMMAND_VALUE        40001
#define _APS_NEXT_CONTROL_VALUE        1000
#define _APS_NEXT_SYMED_VALUE          101
#endif
#endif
#endif
```

### common/src/ReadRegistry.cpp

```
/*      FILE:          READREGISTRY.CPP
 *
 *      Microsoft TPC-C Kit Ver. 4.20.000
 *      Copyright Microsoft, 1999
 *
 *      All Rights Reserved
 *
 *      not yet audited
 *
 *      PURPOSE:      Implementation for TPC-C Tuxedo class.
 *      Contact:      Charles Levine (clevine@microsoft.com)
 *
 *      Change history:
 *      4.20.000 - first version
 */

/* FUNCTION: ReadTPCCRegistrySettings
 *
 * PURPOSE:      This function reads the NT registry for startup parameters. There parameters are
 *               under the TPCC key.
 *
 * RETURNS      FALSE = no errors
 *               TRUE  = error reading registry
 */
BOOL ReadTPCCRegistrySettings( TPCCREGISTRYDATA *pReg )
{
    HKEY    hKey;
    DWORD  size;
    DWORD  type;
    DWORD  dwTmp;
    char   szTmp[256];

    if ( RegOpenKeyEx(HKEY_LOCAL_MACHINE, "SOFTWARE\\Microsoft\\TPCC", 0, KEY_READ, &hKey) != ERROR_SUCCESS )
        return TRUE;

    // determine database protocol to use; may be either ODBC or DBLIB
```

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---

```
pReg->eDB_Protocol = Unspecified;
size = sizeof(szTmp);
if ( RegQueryValueEx(hKey, "DB_Protocol", 0, &type, (BYTE *)&szTmp, &size) == ERROR_SUCCESS )
{
    if ( !strcmp(szTmp, szDBNames[ODBC]) )
        pReg->eDB_Protocol = ODBC;
    else if ( !strcmp(szTmp, szDBNames[DBLIB]) )
        pReg->eDB_Protocol = DBLIB;
}

pReg->eTxnMon = None;
// determine txn monitor to use; may be either TUXEDO, or blank
size = sizeof(szTmp);
if ( RegQueryValueEx(hKey, "TxnMonitor", 0, &type, (BYTE *)&szTmp, &size) == ERROR_SUCCESS )
{
    if ( !strcmp(szTmp, szTxnMonNames[TUXEDO]) )
        pReg->eTxnMon = TUXEDO;
    else if ( !strcmp(szTmp, szTxnMonNames[ENCINA]) )
        pReg->eTxnMon = ENCINA;
    else if ( !strcmp(szTmp, szTxnMonNames[COM]) )
        pReg->eTxnMon = COM;
}

pReg->bCOM_SinglePool = FALSE;
size = sizeof(szTmp);
if ( RegQueryValueEx(hKey, "COM_SinglePool", 0, &type, (BYTE *)&szTmp, &size) == ERROR_SUCCESS )
{
    if ( !strcmp(szTmp, "YES") )
        pReg->bCOM_SinglePool = TRUE;
}

pReg->dwMaxConnections = 0;
size = sizeof(dwTmp);
if ( ( RegQueryValueEx(hKey, "MaxConnections", 0, &type, (LPBYTE)&dwTmp, &size) == ERROR_SUCCESS )
    && (type == REG_DWORD) )
    pReg->dwMaxConnections = dwTmp;

pReg->dwMaxPendingDeliveries = 0;
size = sizeof(dwTmp);
if ( ( RegQueryValueEx(hKey, "MaxPendingDeliveries", 0, &type, (LPBYTE)&dwTmp, &size) == ERROR_SUCCESS )
    && (type == REG_DWORD) )
    pReg->dwMaxPendingDeliveries = dwTmp;

pReg->dwNumberOfDeliveryThreads = 0;
size = sizeof(dwTmp);
if ( ( RegQueryValueEx(hKey, "NumberOfDeliveryThreads", 0, &type, (LPBYTE)&dwTmp, &size) == ERROR_SUCCESS )
    && (type == REG_DWORD) )
    pReg->dwNumberOfDeliveryThreads = dwTmp;

size = sizeof( pReg->szPath );
if ( RegQueryValueEx(hKey, "Path", 0, &type, (BYTE *)&pReg->szPath, &size) != ERROR_SUCCESS )
    pReg->szPath[0] = 0;

size = sizeof( pReg->szDbServer );
if ( RegQueryValueEx(hKey, "DbServer", 0, &type, (BYTE *)&pReg->szDbServer, &size) != ERROR_SUCCESS )
    pReg->szDbServer[0] = 0;

size = sizeof( pReg->szDbName );
if ( RegQueryValueEx(hKey, "DbName", 0, &type, (BYTE *)&pReg->szDbName, &size) != ERROR_SUCCESS )
    pReg->szDbName[0] = 0;

size = sizeof( pReg->szDbUser );
if ( RegQueryValueEx(hKey, "DbUser", 0, &type, (BYTE *)&pReg->szDbUser, &size) != ERROR_SUCCESS )
    pReg->szDbUser[0] = 0;

size = sizeof( pReg->szDbPassword );
if ( RegQueryValueEx(hKey, "DbPassword", 0, &type, (BYTE *)&pReg->szDbPassword, &size) != ERROR_SUCCESS )
    pReg->szDbPassword[0] = 0;

size = sizeof( pReg->szSPPrefix );
if ( RegQueryValueEx(hKey, "L"SPPrefix", 0, &type, (BYTE *)&pReg->szSPPrefix, &size) != ERROR_SUCCESS )
    pReg->szSPPrefix[0] = L'\0';

RegCloseKey(hKey);

return FALSE;
}
```

### common/src/ReadRegistry.h

```
/* FILE: ReadRegistry.h
 * Microsoft TPC-C Kit Ver. 4.20.000
 * Copyright Microsoft, 1999
 * All Rights Reserved
 *
 * not audited
 *
 * PURPOSE: Header for registry related code.
 *
 * Change history:
```

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---

```
*           4.20.000 - first version
*/

enum DBPROTOCOL { Unspecified, ODBC, DBLIB };
const char *szDBNames[] = { "Unspecified", "ODBC", "DBLIB" };

enum TXNMON { None, TUXEDO, ENCINA, COM };
const char *szTxnMonNames[] = { "NONE", "TUXEDO", "ENCINA", "COM" };

//This structure defines the data necessary to keep distinct for each terminal or client connection.
typedef struct _TPCCREGISTRYDATA
{
    enum DBPROTOCOL eDB_Protocol;
    enum TXNMON eTxnMon;
    BOOL bCOM_SinglePool;
    DWORD dwMaxConnections;
    DWORD dwMaxPendingDeliveries;
    DWORD dwNumberOfDeliveryThreads;
    char szPath[128];
    char szDbServer[32];
    char szDbName[32];
    char szDbUser[32];
    char szDbPassword[32];
    wchar_t szSPPrefix[32]; //tpcc_odbc.dll stored procedures prefix
} TPCCREGISTRYDATA, *PTPCCREGISTRYDATA;

BOOL ReadTPCCRegistrySettings( TPCCREGISTRYDATA *pReg );
```

## common/src/error.h

```
/*      FILE:          ERROR.H
 *
 *      Microsoft TPC-C Kit Ver. 4.20.000
 *      Copyright Microsoft, 1999
 *
 *      All Rights Reserved
 *
 *      Version 4.10.000 audited by Richard Gimarc, Performance Metrics, 3/17/99
 *
 *      PURPOSE:  Header file for error exception classes.
 *
 *      Change history:
 *      4.20.000 - updated rev number to match kit
 *      4.21.000 - fixed bug: ~CBaseErr needed to be declared virtual
 */

#pragma once

#ifndef _INC_STRING
#include <string.h>
#endif

const int m_szMsg_size = 512;
const int m_szApp_size = 64;
const int m_szLoc_size = 64;

//error message structure used in ErrorText routines
typedef struct _SERRORMSG
{
    int          iError; //error id of message
    char        szMsg[256]; //message to sent to browser
} SERRORMSG;

typedef enum _ErrorLevel
{
    ERR_FATAL_LEVEL          = 1,
    ERR_WARNING_LEVEL        = 2,
    ERR_INFORMATION_LEVEL    = 3
} ErrorLevel;

#define ERR_TYPE_LOGIC          -1 //logic
error in program; internal error
#define ERR_SUCCESS            0 //success
(a non-error error)
#define ERR_BAD_ITEM_ID        1
//expected abort record in txnRecord
#define ERR_TYPE_DELIVERY_POST 2 //expected delivery
post failed
#define ERR_TYPE_WEBDDL        3 //tpcc
web generated error
#define ERR_TYPE_SQL           4 //sql
server generated error
#define ERR_TYPE_DBLIB         5 //dblib
generated error
#define ERR_TYPE_ODBC          6 //odbc
generated error
#define ERR_TYPE_SOCKET        7 //error
on communication socket client rte only
#define ERR_TYPE_DEADLOCK      8 //dblib and odbc
only deadlock condition
```

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```
#define ERR_TYPE_COM 9 //error
from COM call
#define ERR_TYPE_TUXEDO 10 //tuxedo
error
#define ERR_TYPE_OS 11
//operating system error
#define ERR_TYPE_MEMORY 12 //memory
allocation error
#define ERR_TYPE_TPCC_ODBC 13 //error from tpcc
odbc txn module
#define ERR_TYPE_TPCC_DBLIB 14 //error from tpcc
dblib txn module
#define ERR_TYPE_DELISRV 15 //delivery server
error
#define ERR_TYPE_TXNLOG 16 //txn log
error
#define ERR_TYPE_BCONN 17
//Benchcraft connection class
#define ERR_TYPE_TPCC_CONN 18 //Benchcraft
connection class
#define ERR_TYPE_ENCINA 19 //Encina
error
#define ERR_TYPE_COMPONENT 20 //error from COM
component
#define ERR_TYPE_RTE 21
//Benchcraft rte
#define ERR_TYPE_AUTOMATION 22 //Benchcraft
automation errors
#define ERR_TYPE_DRIVER 23 //Driver
engine errors
#define ERR_TYPE_RTE_BASE 24 //Framework errors
#define ERR_BUF_OVERFLOW 25 //Buffer overflow
during receive
#define ERR_TYPE_SOAP_HTTP 26 //HTTP/SOAP dll
generated error
// TPC-W error types
#define ERR_TYPE_TPCW_CONN 50 //Benchcraft
connection class
#define ERR_TYPE_TPCW_HTML 51 //error from
TpcwHtml dll
#define ERR_TYPE_TPCW_USER 52 //error from TPC-W
user class
#define ERR_TYPE_TPCW_ENG_BASE 53
#define ERR_TYPE_TPCW_ENG_OS 54
#define ERR_TYPE_HTML_RESP 55
#define ERR_TYPE_TPCC_ODBC 56
#define ERR_TYPE_SCHANNEL 57
#define ERR_TYPE_THINK_LIST 58

#define ERR_INS_MEMORY "Insufficient Memory to continue."
#define ERR_UNKNOWN "Unknown error."
#define ERR_MSG_BUF_SIZE 512
#define INV_ERROR_CODE -1
#define ERR_INS_BUF_OVERFLOW "Insufficient Buffer size to receive HTML pages."

class CBaseErr
{
public:
    CBaseErr(LPCTSTR szLoc = NULL)
    {
        m_idMsg = GetLastError(); //take the error code immediately before it is reset by
other functions

        if (szLoc)
        {
            m_szLoc = new char[strlen(szLoc)+1/*m_szLoc_size*/];
            strcpy(m_szLoc, szLoc);
        }
        else
            m_szLoc = NULL;

        m_szApp = new char[m_szApp_size];
        GetModuleFileName(GetModuleHandle(NULL), m_szApp, m_szApp_size);
    }

    CBaseErr(int idMsg, LPCTSTR szLoc = NULL)
    {
        m_idMsg = idMsg;

        if (szLoc)
        {
            m_szLoc = new char[strlen(szLoc)+1/*m_szLoc_size*/];
            strcpy(m_szLoc, szLoc);
        }
        else
```

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---

```
        m_szLoc = NULL;

        m_szApp = new char[m_szApp_size];
        GetModuleFileName(GetModuleHandle(NULL), m_szApp, m_szApp_size);
    }

virtual ~CBaseErr(void)
{
    if (m_szApp)
        delete [] m_szApp;
    if (m_szLoc)
        delete [] m_szLoc;
};

virtual void Draw(HWND hwnd, LPCTSTR szStr = NULL)
{
    int j = 0;
    char szTmp[512];

    if (szStr)
        j = sprintf(szTmp, "%s\n", szStr);
    if (ErrorNum() != INV_ERROR_CODE)
        j += sprintf(szTmp+j, "Error = %d\n", ErrorNum());
    if (m_szLoc)
        j += sprintf(szTmp+j, "Location = %s\n", GetLocation());

    j += sprintf(szTmp+j, "%s\n", ErrorText());

    ::MessageBox(hwnd, szTmp, m_szApp, MB_OK);
}

char *GetApp(void) { return m_szApp; }
char *GetLocation(void) { return m_szLoc; }
virtual int ErrorNum() { return m_idMsg; }

virtual int ErrorType() = 0; // a value which distinguishes the kind of error that occurred
virtual char *ErrorText() = 0; // a string (i.e., human readable) representation of the error

protected:
    char *m_szApp;
    char *m_szLoc; // code location where the error occurred
    int m_idMsg;

    //short m_errType;
};

class CSocketErr : public CBaseErr
{
public:
    enum Action
    {
        eNone = 0,
        eSend,
        eSocket,
        eBind,
        eConnect,
        eListen,
        eHost,
        eRecv,
        eGetHostByName,
        eWSACreateEvent,
        eWSASend,
        eWSAGetOverlappedResult,
        eWSARecv,
        eWSAWaitForMultipleEvents,
        eWSAStartup,
        eWSAResetEvent,
        eNonRetryable,
    };

    CSocketErr(Action eAction, LPCTSTR szLocation = NULL);

    ~CSocketErr()
    {
        if (m_szErrorText != NULL)
            delete [] m_szErrorText;
    };

    Action m_eAction;
    char *m_szErrorText;

    int ErrorType() { return ERR_TYPE_SOCKET; };
    char *ErrorText(void);
};

class CSystemErr : public CBaseErr
{
public:
    enum Action
```



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---

```
{
    eNone = 0,
    eTransactNamedPipe,
    eWaitNamedPipe,
    eSetNamedPipeHandleState,
    eCreateFile,
    eCreateProcess,
    eCallNamedPipe,
    eCreateEvent,
    eCreateThread,
    eVirtualAlloc,
    eReadFile = 10,
    eWriteFile,
    eMapViewOfFile,
    eCreateFileMapping,
    eInitializeSecurityDescriptor,
    eSetSecurityDescriptorDacl,
    eCreateNamedPipe,
    eConnectNamedPipe,
    eWaitForSingleObject,
    eRegOpenKeyEx,
    eRegQueryValueEx = 20,
    ebeginthread,
    eRegEnumValue,
    eRegSetValueEx,
    eRegCreateKeyEx,
    eWaitForMultipleObjects,
    eRegisterClassEx,
    eCreateWindow,
    eCreateSemaphore,
    eReleaseSemaphore,
    eFSeek,
    eFRead,
    eFWrite,
    eTmpFile,
    eSetFilePointer,
    eNew,
    eCloseHandle,
};

        CSystemErr(Action eAction, LPCTSTR szLocation);
        CSystemErr(int iError, Action eAction, LPCTSTR szLocation);
    int      ErrorType() { return ERR_TYPE_OS;};
    char     *ErrorText(void);
    void     Draw(HWND hwnd, LPCTSTR szStr = NULL);

    Action   m_eAction;

private:
    char m_szMsg[ERR_MSG_BUF_SIZE];
};

class CMemoryErr : public CBaseErr
{
public:
    CMemoryErr();

    int ErrorType() {return ERR_TYPE_MEMORY;}
    char *ErrorText() {return ERR_INS_MEMORY;}
};

class CBufferOverflowErr : public CBaseErr
{
public:
    CBufferOverflowErr(int,LPTSTR);

    int ErrorType() {return ERR_BUF_OVERFLOW;}
    char *ErrorText() {return ERR_INS_BUF_OVERFLOW;}
};
```

### common/src/trans.h

```
/*      FILE:          TRANS.H
 *
 *      Microsoft TPC-C Kit Ver. 4.42.000
 *      Copyright Microsoft, 2002
 *
 *      All Rights Reserved
 *
 *      Version 4.10.000 audited by Richard Gimarc, Performance Metrics, 3/17/99
 *
 *      PURPOSE:  Header file for TPC-C structure templates.
 *
 *      Change history:
 *      4.42.000 - changed w_id fields from short to long to support >32K warehouses
 *      4.20.000 - updated rev number to match kit
 */
#pragma once

// String length constants
```

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---

```
#define SERVER_NAME_LEN      20
#define DATABASE_NAME_LEN   20
#define USER_NAME_LEN       20
#define PASSWORD_LEN        20
#define TABLE_NAME_LEN    20
#define I_DATA_LEN          50
#define I_NAME_LEN          24
#define BRAND_LEN           1
#define LAST_NAME_LEN       16
#define W_NAME_LEN          10
#define ADDRESS_LEN         20
#define STATE_LEN           2
#define ZIP_LEN              9
#define S_DIST_LEN          24
#define S_DATA_LEN          50
#define D_NAME_LEN          10
#define FIRST_NAME_LEN      16
#define MIDDLE_NAME_LEN     2
#define PHONE_LEN           16
#define DATETIME_LEN        30
#define CREDIT_LEN          2
#define C_DATA_LEN          250
#define H_DATA_LEN          24
#define DIST_INFO_LEN       24
#define MAX_OL_NEW_ORDER_ITEMS 15
#define MAX_OL_ORDER_STATUS_ITEMS 15
#define STATUS_LEN          25
#define OL_DIST_INFO_LEN    24

// TIMESTAMP_STRUCT is provided by the ODBC header file sqltypes.h, but is not available
// when compiling with dblink, so redefined here. Note: we are using the symbol "__SQLTYPES"
// (declared in sqltypes.h) as a way to determine if TIMESTAMP_STRUCT has been declared.
#ifndef __SQLTYPES
    typedef struct
    {
        short /* SQLSMALLINT */ year;
        unsigned short /* SQLUSMALLINT */ month;
        unsigned short /* SQLUSMALLINT */ day;
        unsigned short /* SQLUSMALLINT */ hour;
        unsigned short /* SQLUSMALLINT */ minute;
        unsigned short /* SQLUSMALLINT */ second;
        unsigned long /* SQLINTEGER */ fraction;
    } TIMESTAMP_STRUCT;
#endif

// possible values for exec_status_code after transaction completes
enum EXEC_STATUS
{
    eOK, // 0 "Transaction committed."
    eInvalidItem, // 1 "Item number is not valid."
    eDeliveryFailed // 2 "Delivery Post Failed."
};

// transaction structures
typedef struct
{
    // input params
    long ol_supply_w_id;
    long ol_i_id;
    short ol_quantity;

    // output params
    char ol_i_name[I_NAME_LEN+1];
    char ol_brand_generic[BRAND_LEN+1];
    double ol_i_price;
    double ol_amount;
    short ol_stock;
} OL_NEW_ORDER_DATA;

typedef struct
{
    // input params
    long w_id;
    short d_id;
    long c_id;
    short o_ol_cnt;

    // output params
    EXEC_STATUS exec_status_code;
    char c_last[LAST_NAME_LEN+1];
    char c_credit[CREDIT_LEN+1];
    double c_discount;
    double w_tax;
    double d_tax;
    long o_id;
    short o_commit_flag;
    TIMESTAMP_STRUCT o_entry_d;
    short o_all_local;
    double total_amount;
    OL_NEW_ORDER_DATA OL[MAX_OL_NEW_ORDER_ITEMS];
} NEW_ORDER_DATA, *PNEW_ORDER_DATA;

typedef struct
```

## Appendix B – Database Design

---

```
{
    // input params
    long                w_id;
    short               d_id;
    long                c_id;
    short               c_d_id;
    long                c_w_id;
    double              h_amount;
    char                c_last[LAST_NAME_LEN+1];

    // output params
    EXEC_STATUS        exec_status_code;
    TIMESTAMP_STRUCT   h_date;
    char                w_street_1[ADDRESS_LEN+1];
    char                w_street_2[ADDRESS_LEN+1];
    char                w_city[ADDRESS_LEN+1];
    char                w_state[STATE_LEN+1];
    char                w_zip[ZIP_LEN+1];
    char                d_street_1[ADDRESS_LEN+1];
    char                d_street_2[ADDRESS_LEN+1];
    char                d_city[ADDRESS_LEN+1];
    char                d_state[STATE_LEN+1];
    char                d_zip[ZIP_LEN+1];
    char                c_first[FIRST_NAME_LEN+1];
    char                c_middle[MIDDLE_NAME_LEN + 1];
    char                c_street_1[ADDRESS_LEN+1];
    char                c_street_2[ADDRESS_LEN+1];
    char                c_city[ADDRESS_LEN+1];
    char                c_state[STATE_LEN+1];
    char                c_zip[ZIP_LEN+1];
    char                c_phone[PHONE_LEN+1];
    TIMESTAMP_STRUCT   c_since;
    char                c_credit[CREDIT_LEN+1];
    double              c_credit_lim;
    double              c_discount;
    double              c_balance;
    char                c_data[200+1];
} PAYMENT_DATA, *PPAYMENT_DATA;

typedef struct
{
    long                ol_i_id;
    long                ol_supply_w_id;
    short               ol_quantity;
    double              ol_amount;
    TIMESTAMP_STRUCT   ol_delivery_d;
} OL_ORDER_STATUS_DATA;

typedef struct
{
    // input params
    long                w_id;
    short               d_id;
    long                c_id;
    char                c_last[LAST_NAME_LEN+1];

    // output params
    EXEC_STATUS        exec_status_code;
    char                c_first[FIRST_NAME_LEN+1];
    char                c_middle[MIDDLE_NAME_LEN+1];
    double              c_balance;
    long                o_id;
    TIMESTAMP_STRUCT   o_entry_d;
    short               o_carrier_id;
    OL_ORDER_STATUS_DATA OL[MAX_OL_ORDER_STATUS_ITEMS];
    short               o_ol_cnt;
} ORDER_STATUS_DATA, *PORDER_STATUS_DATA;

typedef struct
{
    // input params
    long                w_id;
    short               o_carrier_id;

    // output params
    EXEC_STATUS        exec_status_code;
    SYSTEMTIME         queue_time;
    long                o_id[10];           // id's of delivered orders for districts 1 to 10
} DELIVERY_DATA, *PDELIVERY_DATA;

//This structure is used for posting delivery transactions and for writing them to the delivery server.
typedef struct _DELIVERY_TRANSACTION
{
    SYSTEMTIME         queue;                //time delivery transaction queued
    long                w_id;                //delivery warehouse
    short               o_carrier_id;        //carrier id
} DELIVERY_TRANSACTION;

typedef struct
{
    // input params
    long                w_id;
    short               d_id;
    short               threshold;

    // output params
```

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---

```
EXEC_STATUS          exec_status_code;
long                 low_stock;
} STOCK_LEVEL_DATA, *PSTOCK_LEVEL_DATA;
```

### common/src/txn\_base.h

```
/*      FILE:          TXN_BASE.H
 *      Microsoft TPC-C Kit Ver. 4.20.000
 *      Copyright Microsoft, 1999
 *
 *      All Rights Reserved
 *
 *      Version 4.10.000 audited by Richard Gimarc, Performance Metrics, 3/17/99
 *
 *      PURPOSE:  Header file for TPC-C txn class implementation.
 *
 *      Change history:
 *      4.20.000 - updated rev number to match kit
 */

#pragma once

// need to declare functions for import, unless define has already been created
// by the DLL's .cpp module for export.
#ifndef DllDecl
#define DllDecl __declspec( dllimport )
#endif

class DllDecl CTPCC_BASE
{
public:
    CTPCC_BASE(void) {};
    virtual ~CTPCC_BASE(void) {};

    virtual PNEW_ORDER_DATA      BuffAddr_NewOrder()      = 0;
    virtual PPAYMENT_DATA        BuffAddr_Payment()        = 0;
    virtual PDELIVERY_DATA       BuffAddr_Delivery()       = 0;
    virtual PSTOCK_LEVEL_DATA     BuffAddr_StockLevel()     = 0;
    virtual PORDER_STATUS_DATA   BuffAddr_OrderStatus()    = 0;

    virtual void NewOrder        () = 0;
    virtual void Payment         () = 0;
    virtual void Delivery        () = 0;
    virtual void StockLevel      () = 0;
    virtual void OrderStatus     () = 0;
};
```

### install\src\install.c

```
/*      FILE:          INSTALL.C
 *      Microsoft TPC-C Kit Ver. 4.51.000
 *      Copyright Microsoft, 2003
 *
 *      All Rights Reserved
 *
 *      not audited
 *
 *      PURPOSE:  Automated installation application for TPC-C Web Kit
 *      Contact:  Charles Levine (clevine@microsoft.com)
 *
 *      Change history:
 *      4.20.000 - added COM installation steps
 *      4.50.000 - added IIS6 configuration options
 *      4.51.000 - added routines to copy Visual Studio runtime module (MSVCR70.DLL)
 *                  to SystemRoot\System32
 */

#include <windows.h>
#include <direct.h>
#include <io.h>
#include <stdlib.h>
#include <stdio.h>
#include <commctrl.h>
#include "..\..\common\src\ReadRegistry.h"
#include <process.h>

#include "resource.h"

#define WM_INITTEXT WM_USER+100

HICON hIcon;
HINSTANCE hInst;

DWORD versionExeMS;
DWORD versionExeLS;
DWORD versionExeMM;
DWORD versionDllMS;
```

# Appendix B – Database Design

```
DWORD                                versionDlls;

// TPC-C registry settings
TPCCREGISTRYDATA    Reg;

static    int                iPoolThreadLimit;
static    int                iMaxPoolThreads;
static    int                iThreadTimeout;
static    int                iListenBackLog;
static    int                iAcceptExOutstanding;
static    int                iUriEnableCache;
static    int                iUriScavengerPeriod;
static    int                iMaxConnections;

static    int                iIISMajorVersion;
static    int                iNumberOfProcessors;

static    int                iMaxPhysicalMemory;           //max physical memory in MB
static    char                szLastFileName[64];          // last file we worked on (for error reporting)

BOOL    CALLBACK    LicenseDlgProc(HWND hwnd, UINT uMsg, WPARAM wParam, LPARAM lParam);
BOOL    CALLBACK    UpdatedDlgProc(HWND hwnd, UINT uMsg, WPARAM wParam, LPARAM lParam);
BOOL    CALLBACK    MainDlgProc(HWND hwnd, UINT uMsg, WPARAM wParam, LPARAM lParam);
BOOL    CALLBACK    CopyDlgProc(HWND hwnd, UINT uMsg, WPARAM wParam, LPARAM lParam);
static    void        ProcessOK(HWND hwnd, char *szDllPath, char *szWindowsPath);
static    void        ReadRegistrySettings(void);
static    void        WriteRegistrySettings(char *szDllPath);
static    BOOL        RegisterDLL(char *szFileName);
static    int        CopyFiles(HWND hDlg, char *szDllPath, char *szWindowsPath);
static    BOOL        GetInstallPath(char *szDllPath);
static    BOOL        GetWindowsInstallPath(char *szWindowsPath);
static    void        GetVersionInfo(char *szDLLPath, char *szExePath);
static    BOOL        CheckWWWebService(void);
static    BOOL        StartWWWebService(void);
static    BOOL        StopWWWebService(void);
static    void        UpdateDialog(HWND hDlg);
static    void        ConfigureIIS6(HWND hwnd, HWND hDlg);

SYSTEM_INFO    siSysInfo;

BOOL    install_com(char *szDllPath);

#include "..\..\common\src\ReadRegistry.cpp"

int    WINAPI    WinMain( HINSTANCE hInstance, HINSTANCE hPrevInstance, LPSTR lpCmdLine, int nCmdShow )
{
    int    iRc;

    hInst = hInstance;

    InitCommonControls();

    hIcon = LoadIcon(hInstance, MAKEINTRESOURCE(IDI_ICON1));

    iRc = DialogBox(hInstance, MAKEINTRESOURCE(IDD_DIALOG4), GetDesktopWindow(), LicenseDlgProc);
    if ( iRc )
    {
        iRc = DialogBox(hInstance, MAKEINTRESOURCE(IDD_DIALOG1), GetDesktopWindow(), MainDlgProc);
        if ( iRc )
        {
            DialogBoxParam(hInstance, MAKEINTRESOURCE(IDD_DIALOG2), GetDesktopWindow(),
                UpdatedDlgProc, (LPARAM)iRc);
        }
    }

    DestroyIcon(hIcon);
    return 0;
}

BOOL    CALLBACK    LicenseDlgProc(HWND hwnd, UINT uMsg, WPARAM wParam, LPARAM lParam)
{
    HGLOBAL                hRes;
    HRSRC                  hResInfo;
    BYTE                    *pSrc, *pDst;
    DWORD                  dwSize;
    static    HFONT        hFont;

    switch(uMsg)
    {
        case WM_INITDIALOG:
            hFont = CreateFont(-12, 0, 0, 0, 400, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, "Arial");
            SendMessage( GetDlgItem(hwnd, IDR_LICENSE1), WM_SETFONT, (WPARAM)hFont, MAKELPARAM(0, 0) );

            PostMessage(hwnd, WM_INITTEXT, (WPARAM)0, (LPARAM)0);
            return TRUE;

        case WM_INITTEXT:
            hResInfo = FindResource(hInst, MAKEINTRESOURCE(IDR_LICENSE1), "LICENSE");
            dwSize = SizeofResource(hInst, hResInfo);
            hRes = LoadResource(hInst, hResInfo);
            pSrc = (BYTE *)LockResource(hRes);
            pDst = (unsigned char *)malloc(dwSize+1);
            if ( pDst )
    
```

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---

```
        {
            memcopy(pDst, pSrc, dwSize);
            pDst[dwSize] = 0;
            SetDlgItemText(hwnd, IDC_LICENSE, (const char *)pDst);
            free(pDst);
        }
        else
            SetDlgItemText(hwnd, IDC_LICENSE, (const char *)pSrc);
        return TRUE;
    case WM_DESTROY:
        DeleteObject(hFont);
        return TRUE;
    case WM_COMMAND:
        if ( wParam == IDOK )
            EndDialog(hwnd, TRUE);
        if ( wParam == IDCANCEL )
            EndDialog(hwnd, FALSE);
        default:
            break;
    }
    return FALSE;
}

BOOL CALLBACK UpdatedDlgProc(HWND hwnd, UINT uMsg, WPARAM wParam, LPARAM lParam)
{
    switch(uMsg)
    {
        case WM_INITDIALOG:
            switch(lParam)
            {
                case 1:
                case 2:
                    SetDlgItemText(hwnd, IDC_RESULTS, "TPC-C Web Client Installed");
                    break;
            }
            return TRUE;
        case WM_COMMAND:
            if ( wParam == IDOK )
                EndDialog(hwnd, TRUE);
            break;
        default:
            break;
    }
    return FALSE;
}

BOOL CALLBACK MainDlgProc(HWND hwnd, UINT uMsg, WPARAM wParam, LPARAM lParam)
{
    PAINTSTRUCT          ps;
    MEMORYSTATUS         memoryStatus;
    OSVERSIONINFO        VI;
    char                 szTmp[256];
    static char          szDllPath[256];
    static char          szWindowsPath[256];
    static char          szExePath[256];

    switch(uMsg)
    {
        case WM_INITDIALOG:
            GlobalMemoryStatus(&memoryStatus);
            iMaxPhysicalMemory = (memoryStatus.dwTotalPhys/ 1048576);

            if ( GetWindowsInstallPath(szWindowsPath) )
            {
                MB_ICONSTOP | MB_OK);
                MessageBox(hwnd, "Error: Cannot determine Windows System Root.", NULL,
                    EndDialog(hwnd, FALSE);
                    return TRUE;
            }

            if ( GetInstallPath(szDllPath) )
            {
                MB_ICONSTOP | MB_OK);
                MessageBox(hwnd, "Error internet service inetsrv is not installed.", NULL,
                    EndDialog(hwnd, FALSE);
                    return TRUE;
            }

            // set default values
            ZeroMemory( &Reg, sizeof(Reg) );
            Reg.dwNumberOfDeliveryThreads = 4;
            Reg.dwMaxConnections = 100;
            Reg.dwMaxPendingDeliveries = 100;
            Reg.eDB_Protocol = DBLIB;
            Reg.eTxnMon = None;
            strcpy(Reg.szDbServer,          "");
            strcpy(Reg.szDbName,           "tpcc");
            strcpy(Reg.szDbUser,          "sa");
            strcpy(Reg.szDbPassword,      "");

            iPoolThreadLimit = iMaxPhysicalMemory * 2;
            iThreadTimeout = 86400;
            iListenBackLog = 15;
    }
}
```

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---

```
iAcceptExOutstanding = 40;

ReadTPCCRegistrySettings( &Reg );
ReadRegistrySettings();

// copy the hardware information to the SYSTEM_INFO structure
GetSystemInfo(&siSysInfo);
// store the number of processors on this system
iNumberOfProcessors = siSysInfo.dwNumberOfProcessors;

GetModuleFileName(hInst, szExePath, sizeof(szExePath));
GetVersionInfo(szDllPath, szExePath);

wprintf(szTmp, "Version %d.%2.2d.%3.3d", versionExeMS, versionExeMM, versionExeLS);
SetDlgItemText(hwnd, IDC_VERSION, szTmp);

SetDlgItemText(hwnd, IDC_PATH, szDllPath);

SetDlgItemText(hwnd, ED_DB_SERVER, Reg.szDbServer);
SetDlgItemText(hwnd, ED_DB_USER_ID, Reg.szDbUser);
SetDlgItemText(hwnd, ED_DB_PASSWORD, Reg.szDbPassword);
SetDlgItemText(hwnd, ED_DB_NAME, Reg.szDbName);

SetDlgItemInt(hwnd, ED_THREADS, Reg.dwNumberOfDeliveryThreads, FALSE);
SetDlgItemInt(hwnd, ED_MAXCONNECTION, Reg.dwMaxConnections, FALSE);
SetDlgItemInt(hwnd, ED_MAXDELIVERIES, Reg.dwMaxPendingDeliveries, FALSE);
SetDlgItemInt(hwnd, ED_IIS_MAX_THREAD_POOL_LIMIT, iPoolThreadLimit, FALSE);
SetDlgItemInt(hwnd, ED_IIS_THREAD_TIMEOUT, iThreadTimeout, FALSE);
SetDlgItemInt(hwnd, ED_IIS_LISTEN_BACKLOG, iListenBackLog, FALSE);
SetDlgItemInt(hwnd, ED_WEB_SERVICE_BACKLOG_QUEUE_SIZE, iAcceptExOutstanding, FALSE);

CheckDlgButton(hwnd, IDC_DBLIB, 0);
CheckDlgButton(hwnd, IDC_ODBC, 0);
if ( Reg.eDB_Protocol == DBLIB )
    CheckDlgButton(hwnd, IDC_DBLIB, 1);
else
    CheckDlgButton(hwnd, IDC_ODBC, 1);

// check OS version level for COM. Must be at least Windows 2000
VI.dwOSVersionInfoSize = sizeof(VI);
GetVersionEx( &VI );
if (VI.dwMajorVersion < 5)
{
    HWND hDlg = GetDlgItem( hwnd, IDC_TM_MTS );
    EnableWindow( hDlg, 0 ); // disable COM option
    if (Reg.eTxnMon == COM)
        Reg.eTxnMon = None;
}

CheckDlgButton(hwnd, IDC_TM_NONE, 0);
CheckDlgButton(hwnd, IDC_TM_TUXEDO, 0);
CheckDlgButton(hwnd, IDC_TM_MTS, 0);
CheckDlgButton(hwnd, IDC_TM_ENCINA, 0);
switch (Reg.eTxnMon)
{
case None:
    CheckDlgButton(hwnd, IDC_TM_NONE, 1);
    break;
case TUXEDO:
    CheckDlgButton(hwnd, IDC_TM_TUXEDO, 1);
    break;
case ENCINA:
    CheckDlgButton(hwnd, IDC_TM_ENCINA, 1);
    break;
case COM:
    CheckDlgButton(hwnd, IDC_TM_MTS, 1);
    break;
}

return TRUE;
case WM_PAINT:
if ( IsIconic(hwnd) )
{
    BeginPaint(hwnd, &ps);
    DrawIcon(ps.hdc, 0, 0, hIcon);
    EndPaint(hwnd, &ps);
    return TRUE;
}
break;
case WM_COMMAND:
if ( HIWORD(wParam) == BN_CLICKED )
{
    switch( LOWORD(wParam) )
    {
        case IDC_DBLIB:
            return TRUE;
        case IDC_ODBC:
            return TRUE;
        case IDOK:
            ProcessOK(hwnd, szDllPath, szWindowsPath);
            return TRUE;
        case IDCANCEL:
            EndDialog(hwnd, FALSE);
    }
}
}
```

## Appendix B – Database Design

---

```

                                return TRUE;
                                default:
                                return FALSE;
                                }
                                break;
                                default:
                                break;
                                }
                                return FALSE;
                                }
}

static void ProcessOK(HWND hwnd, char *szDllPath, char *szWindowsPath)
{
    int            d;
    HWND          hDlg;
    int           rc;
    BOOL          bSvcRunning;

    char          szFullName[256];
    char          szErrTxt[128];

    // read settings from dialog
    Reg.dwNumberOfDeliveryThreads = GetDlgItemInt(hwnd, ED_THREADS, &d, FALSE);
    Reg.dwMaxConnections = GetDlgItemInt(hwnd, ED_MAXCONNECTION, &d, FALSE);
    Reg.dwMaxPendingDeliveries = GetDlgItemInt(hwnd, ED_MAXDELIVERIES, &d, FALSE);

    GetDlgItemText(hwnd, ED_DB_SERVER, Reg.szDbServer, sizeof(Reg.szDbServer));
    GetDlgItemText(hwnd, ED_DB_USER_ID, Reg.szDbUser, sizeof(Reg.szDbUser));
    GetDlgItemText(hwnd, ED_DB_PASSWORD, Reg.szDbPassword, sizeof(Reg.szDbPassword));
    GetDlgItemText(hwnd, ED_DB_NAME, Reg.szDbName, sizeof(Reg.szDbName));

    if ( IsDlgButtonChecked(hwnd, IDC_DBLIB) )
    {
        Reg.eDB_Protocol = DBLIB;
        rc = 1;
    }
    else if ( IsDlgButtonChecked(hwnd, IDC_ODBC) )
    {
        Reg.eDB_Protocol = ODBC;
        rc = 2;
    }

    if ( IsDlgButtonChecked(hwnd, IDC_TM_NONE) )
        Reg.eTxnMon = None;
    else if ( IsDlgButtonChecked(hwnd, IDC_TM_TUXEDO) )
        Reg.eTxnMon = TUXEDO;
    else if ( IsDlgButtonChecked(hwnd, IDC_TM_MTS) )
        Reg.eTxnMon = COM;
    else if ( IsDlgButtonChecked(hwnd, IDC_TM_ENCINA) )
        Reg.eTxnMon = ENCINA;

    iPoolThreadLimit = GetDlgItemInt(hwnd, ED_IIS_MAX_THREAD_POOL_LIMIT, &d, FALSE);
    iThreadTimeout = GetDlgItemInt(hwnd, ED_IIS_THREAD_TIMEOUT, &d, FALSE);
    iListenBackLog = GetDlgItemInt(hwnd, ED_IIS_LISTEN_BACKLOG, &d, FALSE);
    iAcceptExOutstanding = GetDlgItemInt(hwnd, ED_WEB_SERVICE_BACKLOG_QUEUE_SIZE, &d, FALSE);

    ShowWindow(hwnd, SW_HIDE);
    hDlg = CreateDialog(hInst, MAKEINTRESOURCE(IDD_DIALOG3), hwnd, CopyDlgProc);
    ShowWindow(hDlg, SW_SHOWNA);
    UpdateDialog(hDlg);

    // check to see if the web services are running
    bSvcRunning = CheckWWWWebService();
    if ( bSvcRunning )
    {
        SetDlgItemText(hDlg, IDC_STATUS, "Stopping Web Service.");
        SendDlgItemMessage(hDlg, IDC_PROGRESS1, PBM_STEPIT, 0, 0);
        UpdateDialog(hDlg);

        StopWWWWebService();
        SendDlgItemMessage(hDlg, IDC_PROGRESS1, PBM_STEPIT, 0, 0);
        UpdateDialog(hDlg);
    }

    // write binaries to inetpub\wwwroot
    rc = CopyFiles(hDlg, szDllPath, szWindowsPath);
    if ( !rc )
    {
        ShowWindow(hwnd, SW_SHOWNA);
        DestroyWindow(hDlg);
        strcpy( szErrTxt, "Error(s) occurred when creating " );
        strcat( szErrTxt, szLastFileName );
        MessageBox(hwnd, szErrTxt, NULL, MB_ICONSTOP | MB_OK);
        EndDialog(hwnd, 0);
        return;
    }

    // while we have the web services shutdown, check to see if this
    // is IIS6.  If it is, then call ConfigureIIS6
    if ( iIISMajorVersion == 6 )
    {

```



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---

```
        ConfigureIIS6(hwnd, hDlg);
    }

    //if we stopped service restart it.
    if ( bSvcRunning )
    {
        SetDlgItemText(hDlg, IDC_STATUS, "Starting Web Service.");
        SendDlgItemMessage(hDlg, IDC_PROGRESS1, PBM_STEPIT, 0, 0);
        UpdateDialog(hDlg);
        StartWWWebService();
    }

    // update registry
    SetDlgItemText(hDlg, IDC_STATUS, "Updating Registry.");
    SendDlgItemMessage(hDlg, IDC_PROGRESS1, PBM_STEPIT, 0, 0);
    UpdateDialog(hDlg);
    WriteRegistrySettings(szDllPath);

    // register com proxy stub
    strcpy(szFullName, szDllPath);
    strcat(szFullName, "tpcc_com_ps.dll");
    if (!RegisterDLL(szFullName))
    {
        ShowWindow(hwnd, SW_SHOWNA);
        DestroyWindow(hDlg);
        strcpy( szErrTxt, "Error occured when registering " );
        strcat( szErrTxt, szFullName );
        MessageBox(hwnd, szErrTxt, NULL, MB_ICONSTOP | MB_OK);
        EndDialog(hwnd, 0);
        return;
    }

    // if using COM
    if (Reg.eTxnMon == COM)
    {
        SetDlgItemText(hDlg, IDC_STATUS, "Configuring COM.");
        SendDlgItemMessage(hDlg, IDC_PROGRESS1, PBM_STEPIT, 0, 0);
        UpdateDialog(hDlg);

        if (install_com(szDllPath))
        {
            ShowWindow(hwnd, SW_SHOWNA);
            DestroyWindow(hDlg);
            strcpy( szErrTxt, "Error occured when configuring COM settings." );
            MessageBox(hwnd, szErrTxt, NULL, MB_ICONSTOP | MB_OK);
            EndDialog(hwnd, 0);
            return;
        }
    }

    Sleep(100);

    ShowWindow(hwnd, SW_SHOWNA);
    DestroyWindow(hDlg);

    EndDialog(hwnd, rc);
    return;
}

static void ReadRegistrySettings(void)
{
    HKEY    hKey;
    DWORD   size;
    DWORD   type;

    if ( RegOpenKeyEx(HKEY_LOCAL_MACHINE, "SOFTWARE\\Microsoft\\InetStp", 0, KEY_READ, &hKey) == ERROR_SUCCESS )
    {
        size = sizeof(iIISMajorVersion);
        if ( RegQueryValueEx(hKey, "MajorVersion", 0, &type, (char *)&iIISMajorVersion, &size) ==
ERROR_SUCCESS )
            if ( !iIISMajorVersion )
                iIISMajorVersion = 5;
    }

    if ( RegOpenKeyEx(HKEY_LOCAL_MACHINE, "SYSTEM\\CurrentControlSet\\Services\\Inetinfo\\Parameters", 0,
KEY_READ, &hKey) == ERROR_SUCCESS )
    {
        if ( iIISMajorVersion == 6)
        {
            // since IIS6 handles the pool thread parameters differently, we need to fill in the
dialog
            // with the MaxPoolThreads rather than PoolThreadLimit
            // for ease of coding, we are just going to stuff the value into iPoolThreadLimit
            size = sizeof(iPoolThreadLimit);
            if ( RegQueryValueEx(hKey, "MaxPoolThreads", 0, &type, (char *)&iPoolThreadLimit, &size)
== ERROR_SUCCESS )
                if ( !iPoolThreadLimit )
                    iPoolThreadLimit = iMaxPhysicalMemory * 2;
        }
        else
        {
            size = sizeof(iPoolThreadLimit);
        }
    }
}
```

# Appendix B – Database Design

---

```
        if ( RegQueryValueEx(hKey, "MaxPoolThreads", 0, &type, (char *)&iPoolThreadLimit, &size)
== ERROR_SUCCESS )
        {
            if ( !iPoolThreadLimit )
                iPoolThreadLimit = iMaxPhysicalMemory * 2;
        }

        size = sizeof(iThreadTimeout);
        if ( RegQueryValueEx(hKey, "ThreadTimeout", 0, &type, (char *)&iThreadTimeout, &size) ==
ERROR_SUCCESS )
        {
            if ( !iThreadTimeout )
                iThreadTimeout = 86400;

            size = sizeof(iListenBackLog);
            if ( RegQueryValueEx(hKey, "ListenBackLog", 0, &type, (char *)&iListenBackLog, &size) ==
ERROR_SUCCESS )
            {
                if ( !iListenBackLog )
                    iListenBackLog = 15;

                RegCloseKey(hKey);
            }
        }

        if ( RegOpenKeyEx(HKEY_LOCAL_MACHINE, "SYSTEM\\CurrentControlSet\\Services\\W3SVC\\Parameters", 0, KEY_READ,
&hKey) == ERROR_SUCCESS )
        {
            size = sizeof(iAcceptExOutstanding);
            if ( RegQueryValueEx(hKey, "AcceptExOutstanding", 0, &type, (char *)&iAcceptExOutstanding, &size)
== ERROR_SUCCESS )
            {
                if ( !iAcceptExOutstanding )
                    iAcceptExOutstanding = 40;

                RegCloseKey(hKey);
            }
        }

        if ( RegOpenKeyEx(HKEY_LOCAL_MACHINE, "SYSTEM\\CurrentControlSet\\Services\\HTTP\\Parameters", 0, KEY_READ,
&hKey) == ERROR_SUCCESS )
        {
            size = sizeof(iUriEnableCache);
            if ( RegQueryValueEx(hKey, "UriEnableCache", 0, &type, (char *)&iUriEnableCache, &size) ==
ERROR_SUCCESS )
            {
                if ( !iUriEnableCache )
                    iUriEnableCache = 0;

                size = sizeof(iUriScavengerPeriod);
                if ( RegQueryValueEx(hKey, "UriScavengerPeriod", 0, &type, (char *)&iUriScavengerPeriod, &size) ==
ERROR_SUCCESS )
                {
                    if ( !iUriScavengerPeriod )
                        iUriScavengerPeriod = 10800;

                    size = sizeof(iMaxConnections);
                    if ( RegQueryValueEx(hKey, "MaxConnections", 0, &type, (char *)&iMaxConnections, &size) ==
ERROR_SUCCESS )
                    {
                        if ( !iMaxConnections )
                            iMaxConnections = 100000;

                        RegCloseKey(hKey);
                    }
                }
            }
        }
    }

static void WriteRegistrySettings(char *szDllPath)
{
    HKEY    hKey;
    DWORD   dwDisposition;
    char    szTmp[256];
    char    *ptr;
    int     iRc;

    if ( RegCreateKeyEx(HKEY_LOCAL_MACHINE, "SOFTWARE\\Microsoft\\TPCC", 0, NULL, REG_OPTION_NON_VOLATILE,
KEY_ALL_ACCESS, NULL, &hKey, &dwDisposition) == ERROR_SUCCESS )
    {
        strcpy(szTmp, szDllPath);
        ptr = strstr(szTmp, "tpcc");
        if ( ptr )
            *ptr = 0;

        RegSetValueEx(hKey, "Path", 0, REG_SZ, szTmp, strlen(szTmp)+1);

        RegSetValueEx(hKey, "NumberOfDeliveryThreads", 0, REG_DWORD, (char
*)&Reg.dwNumberOfDeliveryThreads, sizeof(Reg.dwNumberOfDeliveryThreads));
        RegSetValueEx(hKey, "MaxConnections", 0, REG_DWORD, (char *)&Reg.dwMaxConnections,
sizeof(Reg.dwMaxConnections));
        RegSetValueEx(hKey, "MaxPendingDeliveries", 0, REG_DWORD, (char *)&Reg.dwMaxPendingDeliveries,
sizeof(Reg.dwMaxPendingDeliveries));

        RegSetValueEx(hKey, "DB_Protocol", 0, REG_SZ, szDBNames[Reg.eDB_Protocol],
strlen(szDBNames[Reg.eDB_Protocol])+1);
        RegSetValueEx(hKey, "TxnMonitor", 0, REG_SZ, szTxnMonNames[Reg.eTxnMon],
strlen(szTxnMonNames[Reg.eTxnMon])+1);

        RegSetValueEx(hKey, "DbServer", 0, REG_SZ, Reg.szDbServer, strlen(Reg.szDbServer)+1);
        RegSetValueEx(hKey, "DbName", 0, REG_SZ, Reg.szDbName, strlen(Reg.szDbName)+1);
        RegSetValueEx(hKey, "DbUser", 0, REG_SZ, Reg.szDbUser, strlen(Reg.szDbUser)+1);
        RegSetValueEx(hKey, "DbPassword", 0, REG_SZ, Reg.szDbPassword, strlen(Reg.szDbPassword)+1);
    }
}
```

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---

```
        strcpy(szTmp, "YES");
        RegSetValueEx(hKey, "COM_SinglePool", 0, REG_SZ, szTmp, strlen(szTmp)+1);

        RegFlushKey(hKey);
        RegCloseKey(hKey);
    }

    if ( (iRc=RegCreateKeyEx(HKEY_LOCAL_MACHINE, "SYSTEM\\CurrentControlSet\\Services\\Inetinfo\\Parameters", 0,
        NULL, REG_OPTION_NON_VOLATILE, KEY_ALL_ACCESS, NULL, &hKey, &dwDisposition)) != ERROR_SUCCESS )
    {
        // if this is IIS6, then we need to treat the PoolThreadLimit differently
        // if IIS6, then PoolThreadLimit is the maximum number of threads for the entire system.
        // IIS6 added MaxPoolThreads which controls the number of threads per processor. For IIS6
        // we will set MaxPoolThreads to the value the user provided in the dialog and then set
        // PoolThreadLimit to MaxPoolThreads * number of processors on this system
        if ( iIISMajorVersion == 6 )
        {
            iMaxPoolThreads = iPoolThreadLimit;
            iPoolThreadLimit = iMaxPoolThreads * iNumberOfProcessors;
            RegSetValueEx(hKey, "PoolThreadLimit", 0, REG_DWORD, (char *)&iPoolThreadLimit,
                sizeof(iPoolThreadLimit));
            RegSetValueEx(hKey, "MaxPoolThreads", 0, REG_DWORD, (char *)&iMaxPoolThreads,
                sizeof(iMaxPoolThreads));
        }
        else
        {
            RegSetValueEx(hKey, "PoolThreadLimit", 0, REG_DWORD, (char *)&iPoolThreadLimit,
                sizeof(iPoolThreadLimit));
        }

        RegSetValueEx(hKey, "ThreadTimeout", 0, REG_DWORD, (char *)&iThreadTimeout,
            sizeof(iThreadTimeout));
        RegSetValueEx(hKey, "ListenBackLog", 0, REG_DWORD, (char *)&iListenBackLog,
            sizeof(iListenBackLog));

        RegFlushKey(hKey);
        RegCloseKey(hKey);
    }

    if ( (iRc=RegCreateKeyEx(HKEY_LOCAL_MACHINE, "SYSTEM\\CurrentControlSet\\Services\\W3SVC\\Parameters", 0,
        NULL, REG_OPTION_NON_VOLATILE, KEY_ALL_ACCESS, NULL, &hKey, &dwDisposition)) != ERROR_SUCCESS )
    {
        RegSetValueEx(hKey, "AcceptExOutstanding", 0, REG_DWORD, (char *)&iAcceptExOutstanding,
            sizeof(iAcceptExOutstanding));

        RegFlushKey(hKey);
        RegCloseKey(hKey);
    }

    return;
}

BOOL CALLBACK CopyDlgProc(HWND hwnd, UINT uMsg, WPARAM wParam, LPARAM lParam)
{
    if ( uMsg == WM_INITDIALOG )
    {
        SendDlgItemMessage(hwnd, IDC_PROGRESS1, PBM_SETRANGE, 0, MAKELPARAM(0, 16));
        SendDlgItemMessage(hwnd, IDC_PROGRESS1, PBM_SETSTEP, (WPARAM)1, 0);
        return TRUE;
    }
    return FALSE;
}

BOOL RegisterDLL(char *szFileName)
{
    HINSTANCE hLib;
    FARPROC lpDllEntryPoint;

    hLib = LoadLibrary(szFileName);
    if ( hLib == NULL )
        return FALSE;
    // Find the entry point.
    lpDllEntryPoint = GetProcAddress(hLib, "DllRegisterServer");
    if (lpDllEntryPoint != NULL)
    {
        return ((*lpDllEntryPoint)()) == S_OK;
    }
    else
        return FALSE; //unable to locate entry point
}

BOOL FileFromResource( char *szResourceName, int iResourceId, char *szDllPath, char *szFileName )
{
    HGLOBAL hDLL;
    HRSRC hResInfo;
    HANDLE hFile;
    DWORD dwSize;
    BYTE *pSrc;
    DWORD d;
    char szFullName[256];

    hResInfo = FindResource(hInst, MAKEINTRESOURCE(iResourceId), szResourceName);
```

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---

```
    strcpy(szFullName, szDllPath);
    strcat(szFullName, szFileName);

    dwSize = SizeofResource(hInst, hResInfo);
    hDLL = LoadResource(hInst, hResInfo );
    pSrc = (BYTE *)LockResource(hDLL);
    remove(szFullName);

    if ( !(hFile = CreateFile(szFullName, GENERIC_WRITE, 0, NULL, CREATE_ALWAYS, FILE_ATTRIBUTE_NORMAL, NULL)) )
        return FALSE;

    if ( !WriteFile(hFile, pSrc, dwSize, &d, NULL) )
        return FALSE;

    CloseHandle(hFile);

    UnlockResource(hDLL);
    FreeResource(hDLL);
    return TRUE;
}

static int CopyFiles(HWND hDlg, char *szDllPath, char *szWindowsPath)
{
    SetDlgItemText(hDlg, IDC_STATUS, "Copying Files...");
    SendDlgItemMessage(hDlg, IDC_PROGRESS1, PBM_STEPIT, 0, 0);
    UpdateDialog(hDlg);

    // install TPCC.DLL
    strcpy( szLastFileName, "tpcc.dll" );
    if (!FileFromResource( "TPCCDLL", IDR_TPCCDLL, szDllPath, szLastFileName ))
        return 0;
    SendDlgItemMessage(hDlg, IDC_PROGRESS1, PBM_STEPIT, 0, 0);
    UpdateDialog(hDlg);

    // install MSVCR70.DLL
    strcpy( szLastFileName, "msvcr70.dll" );
    if (!FileFromResource( "MSVCRT70", IDR_MSVCRT701, szWindowsPath, szLastFileName ))
        return 0;
    SendDlgItemMessage(hDlg, IDC_PROGRESS1, PBM_STEPIT, 0, 0);
    UpdateDialog(hDlg);

    // install tpcc_dblib.dll
    strcpy( szLastFileName, "tpcc_dblib.dll" );
    if (!FileFromResource( "DBLIB_DLL", IDR_DBLIB_DLL, szDllPath, szLastFileName ))
        return 0;
    SendDlgItemMessage(hDlg, IDC_PROGRESS1, PBM_STEPIT, 0, 0);
    UpdateDialog(hDlg);

    // install tpcc_odbc.dll
    strcpy( szLastFileName, "tpcc_odbc.dll" );
    if (!FileFromResource( "ODBC_DLL", IDR_ODBC_DLL, szDllPath, szLastFileName ))
        return 0;
    SendDlgItemMessage(hDlg, IDC_PROGRESS1, PBM_STEPIT, 0, 0);
    UpdateDialog(hDlg);

    // install tuxapp.exe
    strcpy( szLastFileName, "tuxapp.exe" );
    if (!FileFromResource( "TUXEDO_APP", IDR_TUXEDO_APP, szDllPath, szLastFileName ))
        return 0;
    //SendDlgItemMessage(hDlg, IDC_PROGRESS1, PBM_STEPIT, 0, 0);
    //UpdateDialog(hDlg);

    // install tpcc_tuxedo.dll
    strcpy( szLastFileName, "tpcc_tuxedo.dll" );
    if (!FileFromResource( "TUXEDO_DLL", IDR_TUXEDO_DLL, szDllPath, szLastFileName ))
        return 0;
    //SendDlgItemMessage(hDlg, IDC_PROGRESS1, PBM_STEPIT, 0, 0);
    //UpdateDialog(hDlg);

    // install tpcc_com.dll
    strcpy( szLastFileName, "tpcc_com.dll" );
    if (!FileFromResource( "COM_DLL", IDR_COM_DLL, szDllPath, szLastFileName ))
        return 0;
    SendDlgItemMessage(hDlg, IDC_PROGRESS1, PBM_STEPIT, 0, 0);
    UpdateDialog(hDlg);

    // install tpcc_com_all.tlb
    strcpy( szLastFileName, "tpcc_com_all.tlb" );
    if (!FileFromResource( "COM_TYPLIB", IDR_COMTYPLIB_DLL, szDllPath, szLastFileName ))
        return 0;
    SendDlgItemMessage(hDlg, IDC_PROGRESS1, PBM_STEPIT, 0, 0);
    UpdateDialog(hDlg);

    // install tpcc_com_ps.dll
    strcpy( szLastFileName, "tpcc_com_ps.dll" );
    if (!FileFromResource( "COM_PS_DLL", IDR_COMPS_DLL, szDllPath, szLastFileName ))
        return 0;
    SendDlgItemMessage(hDlg, IDC_PROGRESS1, PBM_STEPIT, 0, 0);
    UpdateDialog(hDlg);

    // install tpcc_com_all.dll
    strcpy( szLastFileName, "tpcc_com_all.dll" );
```

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---

```
        if (!FileFromResource( "COM_ALL_DLL", IDR_COMALL_DLL, szDllPath, szLastFileName ))
            return 0;
        SendDlgItemMessage(hDlg, IDC_PROGRESS1, PBM_STEPIT, 0, 0);
        UpdateDialog(hDlg);

        SendDlgItemMessage(hDlg, IDC_PROGRESS1, PBM_STEPIT, 0, 0);
        UpdateDialog(hDlg);

        return 1;
    }

static BOOL GetInstallPath(char *szDllPath)
{
    HKEY  hKey;
    BYTE  szData[256];
    DWORD sv;
    BOOL  bRc;
    int   len;
    int   iRc;

    // Registry key HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\InetStp\PathWWWRoot is used to find the
    // IIS default web site directory and determine that IIS is installed.

    szDllPath[0] = 0;
    bRc = TRUE;
    if ( RegOpenKeyEx(HKEY_LOCAL_MACHINE, "SOFTWARE\\Microsoft\\InetStp", 0, KEY_ALL_ACCESS, &hKey) ==
ERROR_SUCCESS )
    {
        sv = sizeof(szData);
        iRc = RegQueryValueEx( hKey, "PathWWWRoot", NULL, NULL, szData, &sv ); // used by IIS 5.0 & 6.0
        if (iRc == ERROR_SUCCESS)
        {
            bRc = FALSE;
            strcpy(szDllPath, szData);
            len = strlen(szDllPath);
            if ( szDllPath[len-1] != '\\ ' )
            {
                szDllPath[len] = '\\';
                szDllPath[len+1] = 0;
            }
        }
        RegCloseKey(hKey);
    }

    return bRc;
}

static BOOL GetWindowsInstallPath(char *szWindowsPath)
{
    HKEY  hKey;
    BYTE  szData[256];
    DWORD sv;
    BOOL  bRc;
    int   len;
    int   iRc;

    // Registry key HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\SystemRoot is used to find
the
    // system root to install the VC70 DLL.

    szWindowsPath[0] = 0;
    bRc = TRUE;
    if ( RegOpenKeyEx(HKEY_LOCAL_MACHINE, "SOFTWARE\\Microsoft\\Windows NT\\CurrentVersion", 0, KEY_ALL_ACCESS,
&hKey) == ERROR_SUCCESS )
    {
        sv = sizeof(szData);
        iRc = RegQueryValueEx( hKey, "SystemRoot", NULL, NULL, szData, &sv );
        if (iRc == ERROR_SUCCESS)
        {
            bRc = FALSE;
            strcpy(szWindowsPath, szData);
            len = strlen(szWindowsPath);
            if ( szWindowsPath[len-1] != '\\ ' )
            {
                szWindowsPath[len] = '\\';
                szWindowsPath[len+1] = 0;
            }
            // now append the path to SYSTEM32
            strcat(szWindowsPath, "SYSTEM32\\");
        }
        RegCloseKey(hKey);
    }

    return bRc;
}

static void GetVersionInfo(char *szDLLPath, char *szExePath)
{
    DWORD d;
    DWORD dwSize;

```

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---

```
DWORD                dwBytes;
char                 *ptr;
VS_FIXEDFILEINFO    *vs;

versionDllMS = 0;
versionDllLS = 0;
if ( _access(szDLLPath, 00) == 0 )
{
    dwSize = GetFileVersionInfoSize(szDLLPath, &d);
    if ( dwSize )
    {
        ptr = (char *)malloc(dwSize);
        GetFileVersionInfo(szDLLPath, 0, dwSize, ptr);
        VerQueryValue(ptr, "\\",&vs, &dwBytes);
        versionDllMS = vs->dwProductVersionMS;
        versionDllLS = vs->dwProductVersionLS;
        free(ptr);
    }
}

versionExeMS = 0x7FFF;
versionExeLS = 0x7FFF;
dwSize = GetFileVersionInfoSize(szExePath, &d);
if ( dwSize )
{
    ptr = (char *)malloc(dwSize);
    GetFileVersionInfo(szExePath, 0, dwSize, ptr);
    VerQueryValue(ptr, "\\",&vs, &dwBytes);

    versionExeMS = vs->dwProductVersionMS;
    versionExeLS = LOWORD(vs->dwProductVersionLS);
    versionExeMM = HIWORD(vs->dwProductVersionLS);
    free(ptr);
}
return;
}

static BOOL CheckWWWWebService(void)
{
    SC_HANDLE        schSCManager;
    SC_HANDLE        schService;
    SERVICE_STATUS   ssStatus;

    schSCManager = OpenSCManager(NULL, NULL, SC_MANAGER_ALL_ACCESS);
    schService = OpenService(schSCManager, TEXT("W3SVC"), SERVICE_ALL_ACCESS);
    if (schService == NULL)
        return FALSE;

    if (! QueryServiceStatus(schService, &ssStatus) )
        goto ServiceNotRunning;

    if ( !ControlService(schService, SERVICE_CONTROL_STOP, &ssStatus) )
        goto ServiceNotRunning;
    //start Service pending, Check the status until the service is running.
    if (! QueryServiceStatus(schService, &ssStatus) )
        goto ServiceNotRunning;

    CloseServiceHandle(schService);
    return TRUE;
}

ServiceNotRunning:

    CloseServiceHandle(schService);
    return FALSE;
}

static BOOL StartWWWWebService(void)
{
    SC_HANDLE        schSCManager;
    SC_HANDLE        schService;
    SERVICE_STATUS   ssStatus;
    DWORD            dwOldCheckPoint;

    schSCManager = OpenSCManager(NULL, NULL, SC_MANAGER_ALL_ACCESS);
    schService = OpenService(schSCManager, TEXT("W3SVC"), SERVICE_ALL_ACCESS);
    if (schService == NULL)
        return FALSE;

    if (! StartService(schService, 0, NULL) )
        goto StartWWWWebErr;
    //start Service pending, Check the status until the service is running.
    if (! QueryServiceStatus(schService, &ssStatus) )
        goto StartWWWWebErr;
    while( ssStatus.dwCurrentState != SERVICE_RUNNING)
    {
        dwOldCheckPoint = ssStatus.dwCheckPoint;                //Save the current
        Sleep(ssStatus.dwWaitHint);                               //Wait
        for the specified interval.
        if ( !QueryServiceStatus(schService, &ssStatus) ) //Check the status again.
            break;
    }
}
```

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---

```
        incremented.        if (dwOldCheckPoint >= ssStatus.dwCheckPoint)        //Break if the checkpoint has not been
                                break;
    }
    if (ssStatus.dwCurrentState == SERVICE_RUNNING)
        goto StartWWWebErr;

    CloseServiceHandle(schService);
    return TRUE;

StartWWWebErr:
    CloseServiceHandle(schService);
    return FALSE;
}

static BOOL StopWWWebService(void)
{
    SC_HANDLE        schSCManager;
    SC_HANDLE        schService;
    SERVICE_STATUS  ssStatus;
    DWORD            dwOldCheckPoint;

    schSCManager = OpenSCManager(NULL, NULL, SC_MANAGER_ALL_ACCESS);
    //schService = OpenService(schSCManager, TEXT("W3SVC"), SERVICE_ALL_ACCESS);
    schService = OpenService(schSCManager, TEXT("IISADMIN"), SERVICE_ALL_ACCESS);
    if (schService == NULL)
        return FALSE;

    if (! QueryServiceStatus(schService, &ssStatus) )
        goto StopWWWebErr;

    if ( !ControlService(schService, SERVICE_CONTROL_STOP, &ssStatus) )
        goto StopWWWebErr;
    //start Service pending, Check the status until the service is running.
    if (! QueryServiceStatus(schService, &ssStatus) )
        goto StopWWWebErr;
    while( ssStatus.dwCurrentState == SERVICE_RUNNING)
    {
        dwOldCheckPoint = ssStatus.dwCheckPoint;        //Save the current
        Sleep(ssStatus.dwWaitHint);        //Wait
        for the specified interval.
        if ( !QueryServiceStatus(schService, &ssStatus) ) //Check the status again.
            break;
        incremented.        if (dwOldCheckPoint >= ssStatus.dwCheckPoint)        //Break if the checkpoint has not been
                                break;
    }
    if (ssStatus.dwCurrentState == SERVICE_RUNNING)
        goto StopWWWebErr;

    CloseServiceHandle(schService);
    return TRUE;

StopWWWebErr:
    CloseServiceHandle(schService);
    return FALSE;
}

static void UpdateDialog(HWND hDlg)
{
    MSG msg;

    UpdateWindow(hDlg);
    while( PeekMessage(&msg, hDlg, 0, 0, PM_REMOVE) )
    {
        TranslateMessage(&msg);
        DispatchMessage(&msg);
    }
    Sleep(250);
    return;
}

static void ConfigureIIS6(HWND hwnd, HWND hDlg)
{
    int        irc;
    char        szErrTxt[128];
    FILE        *fErrorFile;

    SetDlgItemText(hDlg, IDC_STATUS, "Configuring IIS6...");
    //SendDlgItemMessage(hDlg, IDC_PROGRESS1, PBM_STEPIT, 0, 0);
    UpdateDialog(hDlg);

    irc = system("IIS6_CONFIG.CMD");

    // since the return code from the command file is always 1,
    // check to see if the file iis6_config.err exists
    // if it does, then something hosed
    fErrorFile = fopen("IIS6_CONFIG.err", "r");
    if ( fErrorFile != NULL )
```

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---

```
    {
        ShowWindow(hwnd, SW_SHOWNA);
        DestroyWindow(hDlg);
        strcpy( szErrTxt, "IIS6 configuration error." );
        strcat( szErrTxt, "Check iis6_config.err" );
        MessageBox(hwnd, szErrTxt, NULL, MB_ICONSTOP | MB_OK);
        EndDialog(hwnd, 0);
        return;
    }
}
```

### install\src\install\_com.cpp

```
/*      FILE:          INSTALL_COM.CPP
 *
 *          Microsoft TPC-C Kit Ver. 4.51.000
 *          Copyright Microsoft, 1999
 *
 *          All Rights Reserved
 *
 *          not audited
 *
 *      PURPOSE:  installation code for COM application for TPC-C Web Kit
 *      Contact:  Charles Levine (clevine@microsoft.com)
 *
 *      Change history:
 *      4.20.000 - first version
 */

#define _WIN32_WINNT 0x0500

#include <comdef.h>
#include <comadmin.h>
#include <stdio.h>
#include <tchar.h>

extern "C"
{
    BOOL install_com(char *szDllPath);
}

BOOL install_com(char *szDllPath)
{
    ICOMAdminCatalog*   pCOMAdminCat = NULL;
    ICatalogCollection* pCatalogCollectionApp = NULL;
    ICatalogCollection* pCatalogCollectionCo = NULL;
    ICatalogCollection* pCatalogCollectionItf = NULL;
    ICatalogCollection* pCatalogCollectionMethod = NULL;

    ICatalogObject*     pCatalogObjectApp = NULL;
    ICatalogObject*     pCatalogObjectCo = NULL;
    ICatalogObject*     pCatalogObjectItf = NULL;
    ICatalogObject*     pCatalogObjectMethod = NULL;

    _bstr_t              bstrTemp, bstrTemp2, bstrTemp3, bstrTemp4;
    _bstr_t              bstrDllPath = szDllPath;
    _variant_t           vTmp, vKey;
    long                 lActProp, lCount, lCountCo, lCountItf, lCountMethod;
    bool                 bTmp;

    CoInitializeEx(NULL, COINIT_MULTITHREADED);

    HRESULT hr = CoCreateInstance(CLSID_COMAdminCatalog,
                                  NULL,
                                  CLSCTX_INPROC_SERVER,
                                  IID_ICOMAdminCatalog,
                                  (void**) &pCOMAdminCat);

    if (!SUCCEEDED(hr)) goto Error;

    bstrTemp = "Applications";

    // Attempt to connect to "Applications" in the Catalog
    hr = pCOMAdminCat->GetCollection(bstrTemp,
                                     (IDispatch**)
    &pCatalogCollectionApp);
    if (!SUCCEEDED(hr)) goto Error;

    // Attempt to load the "Applications" collection
    hr = pCatalogCollectionApp->Populate();
    if (!SUCCEEDED(hr)) goto Error;

    hr = pCatalogCollectionApp->get_Count(&lCount);
    if (!SUCCEEDED(hr)) goto Error;

    // iterate through applications to delete existing "TPC-C" application (if any)
    while (lCount > 0)
    {
        hr = pCatalogCollectionApp->get_Item(lCount - 1, (IDispatch**) &pCatalogObjectApp);

```



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---

```
        if (!SUCCEEDED(hr)) goto Error;

        hr = pCatalogObjectApp->get_Name(&vTmp);
        if (!SUCCEEDED(hr)) goto Error;

        if (wcsncmp(vTmp.bstrVal, L"TPC-C"))
        {
            lCount--;
            continue;
        }
        else
        {
            hr = pCatalogCollectionApp->Remove(lCount - 1);
            if (!SUCCEEDED(hr)) goto Error;
            break;
        }
    }

    hr = pCatalogCollectionApp->SaveChanges(&lActProp);
    if (!SUCCEEDED(hr)) goto Error;

    // add the new application
    hr = pCatalogCollectionApp->Add((IDispatch**) &pCatalogObjectApp);
    if (!SUCCEEDED(hr)) goto Error;

    // set properties
    bstrTemp = "Name";
    vTmp = "TPC-C";
    hr = pCatalogObjectApp->put_Value(bstrTemp, vTmp);
    if (!SUCCEEDED(hr)) goto Error;

    // set as a library (in process) application
    bstrTemp = "Activation";
    lActProp = COMAdminActivationInproc;
    vTmp = lActProp;
    hr = pCatalogObjectApp->put_Value(bstrTemp, vTmp);
    if (!SUCCEEDED(hr)) goto Error;

    // set security level to process
    bstrTemp = "AccessChecksLevel";
    lActProp = COMAdminAccessChecksApplicationLevel;
    vTmp = lActProp;
    hr = pCatalogObjectApp->put_Value(bstrTemp, vTmp);
    if (!SUCCEEDED(hr)) goto Error;

    // save key to get the Components collection later
    hr = pCatalogObjectApp->get_Key(&vKey);
    if (!SUCCEEDED(hr)) goto Error;

    // save changes (app creation) so component installation will work
    hr = pCatalogCollectionApp->SaveChanges(&lActProp);
    if (!SUCCEEDED(hr)) goto Error;

    pCatalogObjectApp->Release();
    pCatalogObjectApp = NULL;

    bstrTemp = "TPC-C"; // app name
    bstrTemp2 = bstrDllPath + "tpcc_com_all.dll"; // DLL
    bstrTemp3 = bstrDllPath + "tpcc_com_all.tlb"; // type library (TLB)
    bstrTemp4 = bstrDllPath + "tpcc_com_ps.dll"; // proxy/stub dll

    hr = pCOMAdminCat->InstallComponent(bstrTemp,

    bstrTemp2,

    bstrTemp3,

    bstrTemp4);
    if (!SUCCEEDED(hr)) goto Error;

    bstrTemp = "Components";
    hr = pCatalogCollectionApp->GetCollection(bstrTemp, vKey, (IDispatch**) &pCatalogCollectionCo);
    if (!SUCCEEDED(hr)) goto Error;

    hr = pCatalogCollectionCo->Populate();
    if (!SUCCEEDED(hr)) goto Error;

    hr = pCatalogCollectionCo->get_Count(&lCountCo);
    if (!SUCCEEDED(hr)) goto Error;

    // iterate through components in application and set the properties
    while (lCountCo > 0)
    {
        hr = pCatalogCollectionCo->get_Item(lCountCo - 1, (IDispatch**) &pCatalogObjectCo);
        if (!SUCCEEDED(hr)) goto Error;

        // used for debugging (view the name)
        hr = pCatalogObjectCo->get_Name(&vTmp);
        if (!SUCCEEDED(hr)) goto Error;

        bstrTemp = "ConstructionEnabled";
        bTmp = TRUE;
    }
}
```

## Appendix B – Database Design

---

```
vTmp = bTmp;
hr = pCatalogObjectCo->put_Value(bstrTemp, vTmp);
if (!SUCCEEDED(hr)) goto Error;

bstrTemp = "ConstructorString";
bstrTemp2 = "dummy string (do not remove)";
vTmp = bstrTemp2;
hr = pCatalogObjectCo->put_Value(bstrTemp, vTmp);
if (!SUCCEEDED(hr)) goto Error;

bstrTemp = "JustInTimeActivation";
bTmp = TRUE;
vTmp = bTmp;
hr = pCatalogObjectCo->put_Value(bstrTemp, vTmp);
if (!SUCCEEDED(hr)) goto Error;

bstrTemp = "MaxPoolSize";
vTmp.Clear(); // clear variant so it isn't stored as a bool (_variant_t feature)
vTmp = (long)30;
hr = pCatalogObjectCo->put_Value(bstrTemp, vTmp);
if (!SUCCEEDED(hr)) goto Error;

bstrTemp = "ObjectPoolingEnabled";
bTmp = TRUE;
vTmp = bTmp;
hr = pCatalogObjectCo->put_Value(bstrTemp, vTmp);
if (!SUCCEEDED(hr)) goto Error;

// save key to get the InterfacesForComponent collection
hr = pCatalogObjectCo->get_Key(&vKey);
if (!SUCCEEDED(hr)) goto Error;

bstrTemp = "InterfacesForComponent";
hr = pCatalogCollectionCo->GetCollection(bstrTemp, vKey, (IDispatch**) &pCatalogCollectionItf);
if (!SUCCEEDED(hr)) goto Error;

hr = pCatalogCollectionItf->Populate();
if (!SUCCEEDED(hr)) goto Error;

hr = pCatalogCollectionItf->get_Count(&lCountItf);
if (!SUCCEEDED(hr)) goto Error;

// iterate through interfaces in component
while (lCountItf > 0)
{
    hr = pCatalogCollectionItf->get_Item(lCountItf - 1, (IDispatch**) &pCatalogObjectItf);
    if (!SUCCEEDED(hr)) goto Error;

    // save key to get the MethodsForInterface collection
    hr = pCatalogObjectItf->get_Key(&vKey);
    if (!SUCCEEDED(hr)) goto Error;

    bstrTemp = "MethodsForInterface";
    hr = pCatalogCollectionItf->GetCollection(bstrTemp, vKey, (IDispatch**)
&pCatalogCollectionMethod);
    if (!SUCCEEDED(hr)) goto Error;

    hr = pCatalogCollectionMethod->Populate();
    if (!SUCCEEDED(hr)) goto Error;

    hr = pCatalogCollectionMethod->get_Count(&lCountMethod);
    if (!SUCCEEDED(hr)) goto Error;

    // iterate through methods of interface
    while (lCountMethod > 0)
    {
        hr = pCatalogCollectionMethod->get_Item(lCountMethod - 1, (IDispatch**)
&pCatalogObjectMethod);
        if (!SUCCEEDED(hr)) goto Error;

        bstrTemp = "AutoComplete";
        bTmp = TRUE;
        vTmp = bTmp;
        hr = pCatalogObjectMethod->put_Value(bstrTemp, vTmp);
        if (!SUCCEEDED(hr)) goto Error;

        pCatalogObjectMethod->Release();
        pCatalogObjectMethod = NULL;

        lCountMethod--;
    }

    // save changes
    hr = pCatalogCollectionMethod->SaveChanges(&lActProp);
    if (!SUCCEEDED(hr)) goto Error;

    pCatalogObjectItf->Release();
    pCatalogObjectItf = NULL;

    lCountItf--;
}
```

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---

```
    }

    pCatalogObjectCo->Release();
    pCatalogObjectCo = NULL;

    lCountCo--;
}

// save changes
hr = pCatalogCollectionCo->SaveChanges(&lActProp);
if (!SUCCEEDED(hr)) goto Error;

pCatalogCollectionApp->Release();
pCatalogCollectionApp = NULL;

pCatalogCollectionCo->Release();
pCatalogCollectionCo = NULL;

pCatalogCollectionItf->Release();
pCatalogCollectionItf = NULL;

pCatalogCollectionMethod->Release();
pCatalogCollectionMethod = NULL;

Error:
CoUninitialize();

if (!SUCCEEDED(hr))
{
    LPTSTR lpBuf;
    DWORD dwRes = FormatMessage(FORMAT_MESSAGE_ALLOCATE_BUFFER | FORMAT_MESSAGE_FROM_SYSTEM,
                                NULL,
                                hr,
                                MAKELANGID(LANG_NEUTRAL,
                                SUBLANG_DEFAULT),
                                (LPTSTR) &lpBuf,
                                0,
                                NULL);

    // _tprintf(__T("Error adding components. HRESULT: 0x%x\n%s"), hr, lpBuf);
    return TRUE;
}
else
    return FALSE;
}
```

### db\_dblib\_dll/src/tpcc\_dblib.cpp

```
/*      FILE:          TPCC_DBLIB.CPP
 *
 *      Microsoft TPC-C Kit Ver. 4.42.000
 *      Copyright Microsoft, 2002
 *
 *      All Rights Reserved
 *
 *      Version 4.10.000 audited by Richard Gimarc, Performance Metrics, 3/17/99
 *
 *      PURPOSE:  Implements dblib calls for TPC-C txns.
 *      Contact:  Charles Levine (clevine@microsoft.com)
 *
 *      Change history:
 *      4.42.000 - changed w_id fields from short to long to support >32K warehouses
 *      4.20.000 - updated rev number to match kit
 *      4.10.001 - not deleting error class in catch handler on deadlock retry;
 *                  not a functional bug, but a memory leak
 *                  - had to tweak some declarations to compile with latest SDK; no functional
change
*/

#include <windows.h>
#include <stdio.h>
#include <assert.h>

#define DBNTWIN32
#include <sqlfront.h>
#include <sqldb.h>

#ifdef ICECAP
#include <icapexp.h>
#endif

// need to declare functions for export
#define DllDecl __declspec( dllexport )

#include "..\..\common\src\error.h"
#include "..\..\common\src\trans.h"
```

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---

```
#include "..\..\common\src\txn_base.h"
#include "tpcc_dblib.h"

#define DEFCLPACKSIZE 4096

// version string; must match return value from tpcc_version stored proc
const char sVersion[] = "4.10.000";

const long iMaxRetries = 10; // how many retries on deadlock
static long iConnectionCount = 0; // number of current dblib connections

const int iErrOleDbProvider = 7312;
const char sErrTimeoutExpired[] = "Timeout expired";

BOOL WINAPIENTRY DllMain(HMODULE hModule, DWORD ul_reason_for_call, LPVOID lpReserved)
{
    switch( ul_reason_for_call )
    {
        case DLL_PROCESS_ATTACH:
            DisableThreadLibraryCalls(hModule);
            dbinit(); // initialize dblib
            break;

        case DLL_PROCESS_DETACH:
            dbexit(); // close all dblib structures/connections
            break;

        default:
            /* nothing */;
    }
    return TRUE;
}

int err_handler(DBPROCESS *dbproc, int severity, int dberr, int oserr, LPCSTR dberrstr, LPCSTR oserrstr)
{
    CTPCC_DBLIB *pConn;

    assert(dbproc != NULL);
    pConn = (CTPCC_DBLIB*)dbgetuserdata(dbproc);

    if (pConn != NULL)
    {
        pConn->SetDbLibError( severity, dberr, oserr, dberrstr, oserrstr );
    }
    return INT_CANCEL;
}

/* FUNCTION: int msg_handler(DBPROCESS *dbproc, DBINT msgno, int msgstate, int severity, char *msgtext)
 *
 * PURPOSE: This function handles DB-Library SQL Server error messages
 *
 * ARGUMENTS: DBPROCESS *dbproc DBPROCESS id pointer
 *             int msgno message number
 *             int msgstate message state
 *             int severity message severity
 *             char *msgtext printable message description
 *
 * RETURNS: int INT_CONTINUE continue if error is SQLETIME
 *           else INT_CANCEL action
 *
 * operation
 *
 * COMMENTS: This function also sets the dead lock dbproc variable if necessary.
 *
 */

// typedef INT (SQLAPI *DBMSGHANDLE_PROC)(PDBPROCESS, DBINT, INT, INT, LPCSTR, LPCSTR, LPCSTR, DBUSMALLINT);

int msg_handler(DBPROCESS *dbproc, DBINT msgno, int msgstate, int severity,
                LPCSTR msgtext, LPCSTR srvname, LPCSTR procname, DBUSMALLINT line)
{
    CTPCC_DBLIB *pConn;

    assert(dbproc != NULL);
    pConn = (CTPCC_DBLIB*)dbgetuserdata(dbproc);

    if (pConn != NULL)
    {
        pConn->SetSqlError( msgno, msgstate, severity, msgtext );
    }

    return 0;
}

/* FUNCTION: void UtilStrCpy(char * pDest, char * pSrc, int n)
 *
 * PURPOSE: This function copies n characters from string pSrc to pDst and places a
 *          null character at the end of the destination string.
 *
 * ARGUMENTS: char *pDest destination string pointer
 *            char *pSrc source string pointer
 */
```

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---

```
*
characters to copy          int          n          number of
*
* RETURNS:                  None
*
* COMMENTS:                Unlike strncpy this function ensures that the result string is
*                          always null terminated.
*
*/

inline static void UtilStrCpy(char * pDest, const BYTE * pSrc, int n)
{
    strncpy(pDest, (char *)pSrc, n);
    pDest[n] = '\0';

    return;
}

/* FUNCTION: CTPCC_DBLIB_ERR::ErrorText
*
*/

char* CTPCC_DBLIB_ERR::ErrorText(void)
{
    int i;

    static SERRORMSG errorMsgs[] =
    {
        { ERR_WRONG_SP_VERSION,          "Wrong version of stored procs on database server"
        },
        { ERR_INVALID_CUST,              "Invalid Customer id,name."
        },
        { ERR_NO_SUCH_ORDER,             "No orders found for customer."
        },
        { ERR_RETRIED_TRANS,             "Retries before transaction succeeded."
        },
        { 0,                             ""
        }
    };

    static char szNotFound[] = "Unknown error number.";

    for(i=0; errorMsgs[i].szMsg[0]; i++)
    {
        if ( m_errno == errorMsgs[i].iError )
            break;
    }
    if ( !errorMsgs[i].szMsg[0] )
        return szNotFound;
    else
        return errorMsgs[i].szMsg;
}

// wrapper routine for class constructor
__declspec(dllexport) CTPCC_DBLIB* CTPCC_DBLIB_new(
    LPCSTR szServer,          // name of SQL server
    LPCSTR szUser,           // user name for login
    LPCSTR szPassword,       // password for login
    LPCSTR szHost,          // workstation name; shows up in sp_who; max 30 chars, only first 10
    kept by SQL Server
    LPCSTR szDatabase )     // name of database to use
{
    return new CTPCC_DBLIB( szServer, szUser, szPassword, szHost, szDatabase );
}

CTPCC_DBLIB::CTPCC_DBLIB (
    LPCSTR szServer,          // name of SQL server
    LPCSTR szUser,           // user name for login
    LPCSTR szPassword,       // password for login
    LPCSTR szHost,          // workstation name; shows up in sp_who; max 30 chars, only first 10
    kept by SQL Server
    LPCSTR szDatabase )     // name of database to use
{
    LOGINREC *login;
    const BYTE *pData;

    // initialization
    m_dbproc = NULL;
    m_DbLibErr = (CDBLIBERR*)NULL;
    m_SqlErr = (CSQLERR*)NULL;

    m_MaxRetries = 10;      // how many retries on deadlock

    // increase max number of connections if getting close
    if ( dbgetmaxprocs() < (iConnectionCount+5) )
    {
        if ( dbsetmaxprocs(iConnectionCount+10) == FAIL )
            ThrowError(CDBLIBERR::eDbSetMaxProcs);
    }

    // allocate a login structure
    login = dblogin();
}
```

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---

```
if (login == NULL)
    ThrowError(CDBLIBERR::eLogin);
InterlockedIncrement( &iConnectionCount );

// register error and message handler functions
if (dbprocerrhandle(login, err_handler) == NULL)
    ThrowError(CDBLIBERR::eDbProcHandler);

if (dbprocmsghandle(login, msg_handler) == NULL)
    ThrowError(CDBLIBERR::eDbProcHandler);

DBSETLUSER(login, szUser);
DBSETLPWD(login, szPassword);
DBSETLHOST(login, szHost);
DBSETLPACKET(login, (unsigned short)DEFCLPACKSIZE);
DBSETLVERSION(login, DBVER60); // use dlib ver 6.0 client behavior

// set time to wait for login
if (dbsetlogintime(60) == FAIL)
    ThrowError(CDBLIBERR::eDbSet);

// set time to wait for statement execution
if (dbsettime(180) == FAIL)
    ThrowError(CDBLIBERR::eDbSet);

m_dbproc = dbopen(login, szServer);

// deallocate login structure before checking for success
dbfreelogin( login );

if (m_dbproc == NULL)
    ThrowError(CDBLIBERR::eDbOpen);

// save address of class instance so that the message and error handler
// can get to data.
dbsetuserdata(m_dbproc, (LPVOID)this);

// Use the the right database
if (dbuse(m_dbproc, szDatabase) == FAIL)
    ThrowError(CDBLIBERR::eDbUse);

dbcmd(m_dbproc, "set nocount on "); // do not return row counts
dbcmd(m_dbproc, "set XACT_ABORT ON"); // rollback transaction on abort

if (dbsqlxexec(m_dbproc) == FAIL)
    ThrowError(CDBLIBERR::eDbSqlExec);

DiscardNextResults(2);

// verify that version of stored procs on server is correct
dbrpcinit(m_dbproc, "tpcc_version", 0);

if (dbrpcexec(m_dbproc) == FAIL)
    ThrowError(CDBLIBERR::eDbRpcExec);

if (dbresults(m_dbproc) != SUCCEED)
    ThrowError(CDBLIBERR::eDbResults);

if (dbnextrow(m_dbproc) != REG_ROW)
    ThrowError(CDBLIBERR::eDbNextRow);

char szSrvVersion[16];
pData=dbdata(m_dbproc, 1);
if (pData)
    UtilStrCpy(szSrvVersion, pData, dbdatlen(m_dbproc, 1));
else
    szSrvVersion[0]=0;
if (strcmp(szSrvVersion,sVersion))
    throw new CTPCC_DBLIB_ERR( CTPCC_DBLIB_ERR::ERR_WRONG_SP_VERSION );

DiscardNextRows(0);
DiscardNextResults(0);
}

CTPCC_DBLIB::~CTPCC_DBLIB( void )
{
    // close db connection and deallocate resources
    dbclose(m_dbproc);
    InterlockedDecrement( &iConnectionCount );
    if (m_DbLibErr != NULL)
        delete m_DbLibErr;
    if (m_SqlErr != NULL)
        delete m_SqlErr;
}

void CTPCC_DBLIB::SetDbLibError(int severity, int dberr, int oserr, LPCSTR dberrstr, LPCSTR oserrstr)
{
    delete m_DbLibErr;
    m_DbLibErr = new CDBLIBERR(CDBLIBERR::eUnknown, severity, dberr, oserr);
}
```

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---

```
        if (dberrstr != NULL)
        {
            m_DbLibErr->m_dberrstr = new char[ strlen(dberrstr)+1 ];
            strcpy( m_DbLibErr->m_dberrstr, dberrstr );
        }

        if (oserrstr != NULL)
        {
            m_DbLibErr->m_oserrstr = new char[ strlen(oserrstr)+1 ];
            strcpy( m_DbLibErr->m_oserrstr, oserrstr );
        }
    }

void CTPCC_DBLIB::SetSqlError( int /*DBINT*/ msgno, int msgstate, int severity, LPCSTR msgtext )
{
    if (m_SqlErr == NULL)
        m_SqlErr = new CSQLERR();

    m_SqlErr->m_msgno = msgno;
    m_SqlErr->m_msgstate = msgstate;
    m_SqlErr->m_severity = severity;

    delete [] m_SqlErr->m_msgtext;
    if (msgtext != NULL)
    {
        m_SqlErr->m_msgtext = new char[ strlen(msgtext)+1 ];
        strcpy( m_SqlErr->m_msgtext, msgtext );
    }
}

void CTPCC_DBLIB::ThrowError( CDBLIBERR::ACTION eAction )
{
    // discard anything still in return buffer
    DiscardNextRows(-1);
    DiscardNextResults(-1);

    // check for SQL Server error first; if yes, throw it and ignore any DBLib error.
    if (m_SqlErr != NULL)
    {
        CSQLERR *pSqlErr;
        pSqlErr = m_SqlErr;
        m_SqlErr = NULL; // clear our pointer to instance; catch handler will delete
        throw pSqlErr;
    }

    CDBLIBERR *pDbLibErr;
    if (m_DbLibErr == NULL)
        // this case isn't expected to happen, since it means that an error was returned
        // but the error handlers were not called.
        pDbLibErr = new CDBLIBERR(eAction);
    else
    {
        pDbLibErr = m_DbLibErr;
        pDbLibErr->m_eAction = eAction;
        m_DbLibErr = NULL; // clear our pointer to instance; catch handler will delete
    }

    throw pDbLibErr;
}

// Read and discard rows until no more. Throw an exception if number of rows read doesn't
// match number of rows expected. The row count will be ignored if the expected count value
// passed in is negative. A typical use of this routine is to verify that there are no more
// rows to be read.
void CTPCC_DBLIB::DiscardNextRows(int iExpectedCount)
{
    int iRowsRead = 0;
    RETCODE rc;

    while (TRUE)
    {
        rc = dbnextrow(m_dbproc);
        if (rc == NO_MORE_ROWS)
            break;
        if (rc == FAIL)
        {
            if (iExpectedCount >= 0)
                ThrowError(CDBLIBERR::eDbNextRow);
            else
                break;
        }
        iRowsRead++;
    }

    if ((iExpectedCount >= 0) &&
        (iExpectedCount != iRowsRead))
        ThrowError(CDBLIBERR::eWrongRowCount);
}

// Read and discard results until no more. Throw an exception if number of result sets read doesn't
// match number expected. The result set count will be ignored if the expected count value
// passed in is negative. A typical use of this routine is to verify that there are no more
```

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---

```
// result sets to be read.
void CTPCC_DBLIB::DiscardNextResults(int iExpectedCount)
{
    int          iResultsRead = 0;
    RETCODE      rc;

    while (TRUE)
    {
        rc = dbresults(m_dbproc);
        if (rc == NO_MORE_RESULTS)
            break;
        if (rc == FAIL)
        {
            if (iExpectedCount >= 0)
                ThrowError(CDBLIBERR::eDbResults);
            else
                break;
        }

        DiscardNextRows(-1);
        iResultsRead++;
    }

    if ((iExpectedCount >= 0) &&
        (iExpectedCount != iResultsRead))
        ThrowError(CDBLIBERR::eWrongRowCount);
}

void CTPCC_DBLIB::StockLevel()
{
    int          iTryCount = 0;
    const BYTE   *pData;

    ResetError();

    while (TRUE)
    {
        try
        {
            dbrpcinit(m_dbproc, "tpcc_stocklevel", 0);

            dbrpcparam(m_dbproc, NULL, 0, SQLINT4, -1, -1, (BYTE *) &m_txn.StockLevel.w_id);
            // @w_id int

            dbrpcparam(m_dbproc, NULL, 0, SQLINT1, -1, -1, (BYTE *) &m_txn.StockLevel.d_id);
            // @d_id tinyint

            dbrpcparam(m_dbproc, NULL, 0, SQLINT2, -1, -1, (BYTE *) &m_txn.StockLevel.threshold);
            // @threshold smallint

            if (dbrpcexec(m_dbproc) == FAIL)
                ThrowError(CDBLIBERR::eDbRpcExec);

            if (dbresults(m_dbproc) != SUCCEEDED)
                ThrowError(CDBLIBERR::eDbResults);

            if (dbnextrow(m_dbproc) != REG_ROW)
                ThrowError(CDBLIBERR::eDbNextRow);

            if (pData=dbdata(m_dbproc, 1))
                m_txn.StockLevel.low_stock = *((long *) pData);

            DiscardNextRows(0);
            DiscardNextResults(0);

            m_txn.StockLevel.exec_status_code = eOK;
            return;
        }
        catch (CSQLERR *e)
        {
            if ((e->m_msgno == 1205 ||
                (e->m_msgno == iErrOleDbProvider &&
                 strstr(e->m_msgtext, sErrTimeoutExpired) != NULL)) &&
                (++iTryCount <= iMaxRetries))
            {
                // hit deadlock; backoff for increasingly longer period
                delete e;
                Sleep(10 * iTryCount);
            }
            else
                throw;
        }
    } // while (TRUE)

    //if (iTryCount)
    //    throw new CTPCC_DBLIB_ERR(CTPCC_DBLIB_ERR::ERR_RETRIED_TRANS, iTryCount);
}

void CTPCC_DBLIB::NewOrder()
{
    int          i;
    DBINT        commit_flag;
    DBDATETIME   datetime;
    DBDATETIME   daterec;

```



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---

```
int          iTryCount = 0;
const BYTE  *pData;

ResetError();

while (TRUE)
{
    try
    {
        dbrpcinit(m_dbproc, "tpcc_neworder", 0);

        dbrpcparam(m_dbproc, NULL, 0, SQLINT4, -1, -1, (BYTE *) &m_txn.NewOrder.w_id);
        dbrpcparam(m_dbproc, NULL, 0, SQLINT1, -1, -1, (BYTE *) &m_txn.NewOrder.d_id);
        dbrpcparam(m_dbproc, NULL, 0, SQLINT4, -1, -1, (BYTE *) &m_txn.NewOrder.c_id);
        dbrpcparam(m_dbproc, NULL, 0, SQLINT1, -1, -1, (BYTE *) &m_txn.NewOrder.o_ol_cnt);

        // check whether any order lines are for a remote warehouse
        m_txn.NewOrder.o_all_local = 1;
        for (i = 0; i < m_txn.NewOrder.o_ol_cnt; i++)
        {
            if (m_txn.NewOrder.OL[i].ol_supply_w_id != m_txn.NewOrder.w_id)
            {
                m_txn.NewOrder.o_all_local = 0; // at least one remote warehouse
                break;
            }
        }
        dbrpcparam(m_dbproc, NULL, 0, SQLINT1, -1, -1, (BYTE *) &m_txn.NewOrder.o_all_local);

        for (i = 0; i < m_txn.NewOrder.o_ol_cnt; i++)
        {
            dbrpcparam(m_dbproc, NULL, 0, SQLINT4, -1, -1, (BYTE *)
&m_txn.NewOrder.OL[i].ol_i_id);
            dbrpcparam(m_dbproc, NULL, 0, SQLINT4, -1, -1, (BYTE *)
&m_txn.NewOrder.OL[i].ol_supply_w_id);
            dbrpcparam(m_dbproc, NULL, 0, SQLINT2, -1, -1, (BYTE *)
&m_txn.NewOrder.OL[i].ol_quantity);
        }

        if (dbrpcexec(m_dbproc) == FAIL)
            ThrowError(CDBLIBERR::eDbRpcExec);

        // Get order line results
        m_txn.NewOrder.total_amount = 0;
        for (i = 0; i < m_txn.NewOrder.o_ol_cnt; i++)
        {
            if (dbresults(m_dbproc) != SUCCEED)
                ThrowError(CDBLIBERR::eDbResults);

            if (dbnumcols(m_dbproc) != 5)
                ThrowError(CDBLIBERR::eWrongNumCols);

            if (dbnextrow(m_dbproc) != REG_ROW)
                ThrowError(CDBLIBERR::eDbNextRow);

            if (pData=dbdata(m_dbproc, 1))
                UtilStrCpy(m_txn.NewOrder.OL[i].ol_i_name, pData, dbdatlen(m_dbproc,
1));

            if (pData=dbdata(m_dbproc, 2))
                m_txn.NewOrder.OL[i].ol_stock = (*(DBSMALLINT *) pData);
            if (pData=dbdata(m_dbproc, 3))
                UtilStrCpy(m_txn.NewOrder.OL[i].ol_brand_generic, pData,
dbdatlen(m_dbproc, 3));

            if (pData=dbdata(m_dbproc, 4))
                dbconvert(m_dbproc, SQLNUMERIC, (LPCBYTE)pData, dbdatlen(m_dbproc,4),
SQLFLT8, (BYTE *)&m_txn.NewOrder.OL[i].ol_i_price, 8);
            if (pData=dbdata(m_dbproc, 5))

                dbconvert(m_dbproc, SQLNUMERIC, (LPCBYTE)pData, dbdatlen(m_dbproc,5),
SQLFLT8, (BYTE *)&m_txn.NewOrder.OL[i].ol_amount, 8);

            m_txn.NewOrder.total_amount = m_txn.NewOrder.total_amount +

m_txn.NewOrder.OL[i].ol_amount;

            DiscardNextRows(0);
        }

        // get remaining values for w_tax, d_tax, o_id, c_last, c_discount, c_credit, o_entry_d,
commit_flag
        if (dbresults(m_dbproc) != SUCCEED)
            ThrowError(CDBLIBERR::eDbResults);

        if (dbnextrow(m_dbproc) != REG_ROW)
            ThrowError(CDBLIBERR::eDbNextRow);

        if (dbnumcols(m_dbproc) != 8)
            ThrowError(CDBLIBERR::eWrongNumCols);

        if (pData=dbdata(m_dbproc, 1))
```

## Appendix B – Database Design

---

```

        dbconvert(m_dbproc, SQLNUMERIC, (LPCBYTE)pData, dbdatlen(m_dbproc,1), SQLFLT8,
(BYTE *)&m_txn.NewOrder.w_tax, 8);
        if (pData=dbdata(m_dbproc, 2))
            dbconvert(m_dbproc, SQLNUMERIC, (LPCBYTE)pData, dbdatlen(m_dbproc,2), SQLFLT8,
(BYTE *)&m_txn.NewOrder.d_tax, 8);
        if (pData=dbdata(m_dbproc, 3))
            m_txn.NewOrder.o_id = (*(DBINT *) pData);
        if (pData=dbdata(m_dbproc, 4))
            UtilStrCpy(m_txn.NewOrder.c_last, pData, dbdatlen(m_dbproc, 4));
        if (pData=dbdata(m_dbproc, 5))
            dbconvert(m_dbproc, SQLNUMERIC, (LPCBYTE)pData, dbdatlen(m_dbproc,5), SQLFLT8,
(BYTE *)&m_txn.NewOrder.c_discount, 8);
        if (pData=dbdata(m_dbproc, 6))
            UtilStrCpy(m_txn.NewOrder.c_credit, pData, dbdatlen(m_dbproc, 6));
        if (pData=dbdata(m_dbproc, 7))
        {
            datetime = *((DBDATETIME *) pData);
            dbdatecrack(m_dbproc, &daterec, &datetime);
            m_txn.NewOrder.o_entry_d.year = daterec.year;
            m_txn.NewOrder.o_entry_d.month = daterec.month;
            m_txn.NewOrder.o_entry_d.day = daterec.day;
            m_txn.NewOrder.o_entry_d.hour = daterec.hour;
            m_txn.NewOrder.o_entry_d.minute = daterec.minute;
            m_txn.NewOrder.o_entry_d.second = daterec.second;
        }
        if (pData=dbdata(m_dbproc, 8))
            commit_flag = (*(DBTINYINT *) pData);

        DiscardNextRows(0);
        DiscardNextResults(0);

        if (commit_flag == 1)
        {
            m_txn.NewOrder.total_amount *= ((1 + m_txn.NewOrder.w_tax +
m_txn.NewOrder.d_tax) * (1 - m_txn.NewOrder.c_discount));
            m_txn.NewOrder.exec_status_code = eOK;
        }
        else
            m_txn.NewOrder.exec_status_code = eInvalidItem;

        return;
    }
    catch (CSQLERR *e)
    {
        if ((e->m_msgno == 1205 ||
            (e->m_msgno == iErrOleDbProvider &&
            strstr(e->m_msgtext, sErrTimeoutExpired) != NULL)) &&
            (++iTryCount <= iMaxRetries))
        {
            // hit deadlock; backoff for increasingly longer period
            delete e;
            Sleep(10 * iTryCount);
        }
        else
            throw;
    }
} // while (TRUE)

// if (iTryCount)
// throw new CTPCC_DBLIB_ERR(CTPCC_DBLIB_ERR::ERR_RETRIED_TRANS, iTryCount);
}

void CTPCC_DBLIB::Payment()
{
    DBDATETIME datetime;
    DBDATERECC daterec;

    int iTryCount = 0;
    const BYTE *pData;

    ResetError();

    while (TRUE)
    {
        try
        {
            dbrpcinit(m_dbproc, "tpcc_payment", 0);

            dbrpcparam(m_dbproc, NULL, 0, SQLINT4, -1, -1, (BYTE *) &m_txn.Payment.w_id);
            dbrpcparam(m_dbproc, NULL, 0, SQLINT4, -1, -1, (BYTE *) &m_txn.Payment.c_w_id);
            dbrpcparam(m_dbproc, NULL, 0, SQLFLT8, -1, -1, (BYTE *) &m_txn.Payment.h_amount);
            dbrpcparam(m_dbproc, NULL, 0, SQLINT1, -1, -1, (BYTE *) &m_txn.Payment.d_id);
            dbrpcparam(m_dbproc, NULL, 0, SQLINT1, -1, -1, (BYTE *) &m_txn.Payment.c_d_id);
            dbrpcparam(m_dbproc, NULL, 0, SQLINT4, -1, -1, (BYTE *) &m_txn.Payment.c_id);

            // if customer id is zero, then payment is by name
            if (m_txn.Payment.c_id == 0)
                dbrpcparam(m_dbproc, NULL, 0, SQLCHAR, -1, strlen(m_txn.Payment.c_last),
(unsigned char *)m_txn.Payment.c_last);

```

## Appendix B – Database Design

---

```
if (dbrpcexec(m_dbproc) == FAIL)
    ThrowError(CDBLIBERR::eDbRpcExec);

if (dbresults(m_dbproc) != SUCCEEDED)
    ThrowError(CDBLIBERR::eDbResults);

if (dbnextrow(m_dbproc) != REG_ROW)
    ThrowError(CDBLIBERR::eDbNextRow);

if (dbnumcols(m_dbproc) != 27)
    ThrowError(CDBLIBERR::eWrongNumCols);

if (pData=dbdata(m_dbproc, 1))
    m_txn.Payment.c_id = *((DBINT *) pData);
if (pData=dbdata(m_dbproc, 2))
    UtilStrCpy(m_txn.Payment.c_last, pData, dbdatlen(m_dbproc, 2));
if (pData=dbdata(m_dbproc, 3))
{
    datetime = *((DBDATETIME *) pData);
    dbdatecrack(m_dbproc, &daterec, &datetime);
    m_txn.Payment.h_date.year = daterec.year;
    m_txn.Payment.h_date.month = daterec.month;
    m_txn.Payment.h_date.day = daterec.day;
    m_txn.Payment.h_date.hour = daterec.hour;
    m_txn.Payment.h_date.minute = daterec.minute;
    m_txn.Payment.h_date.second = daterec.second;
}
if (pData=dbdata(m_dbproc, 4))
    UtilStrCpy(m_txn.Payment.w_street_1, pData, dbdatlen(m_dbproc, 4));
if (pData=dbdata(m_dbproc, 5))
    UtilStrCpy(m_txn.Payment.w_street_2, pData, dbdatlen(m_dbproc, 5));
if (pData=dbdata(m_dbproc, 6))
    UtilStrCpy(m_txn.Payment.w_city, pData, dbdatlen(m_dbproc, 6));
if (pData=dbdata(m_dbproc, 7))
    UtilStrCpy(m_txn.Payment.w_state, pData, dbdatlen(m_dbproc, 7));
if (pData=dbdata(m_dbproc, 8))
    UtilStrCpy(m_txn.Payment.w_zip, pData, dbdatlen(m_dbproc, 8));
if (pData=dbdata(m_dbproc, 9))
    UtilStrCpy(m_txn.Payment.d_street_1, pData, dbdatlen(m_dbproc, 9));
if (pData=dbdata(m_dbproc, 10))
    UtilStrCpy(m_txn.Payment.d_street_2, pData, dbdatlen(m_dbproc, 10));
if (pData=dbdata(m_dbproc, 11))
    UtilStrCpy(m_txn.Payment.d_city, pData, dbdatlen(m_dbproc, 11));
if (pData=dbdata(m_dbproc, 12))
    UtilStrCpy(m_txn.Payment.d_state, pData, dbdatlen(m_dbproc, 12));
if (pData=dbdata(m_dbproc, 13))
    UtilStrCpy(m_txn.Payment.d_zip, pData, dbdatlen(m_dbproc, 13));
if (pData=dbdata(m_dbproc, 14))
    UtilStrCpy(m_txn.Payment.c_first, pData, dbdatlen(m_dbproc, 14));
if (pData=dbdata(m_dbproc, 15))
    UtilStrCpy(m_txn.Payment.c_middle, pData, dbdatlen(m_dbproc, 15));
if (pData=dbdata(m_dbproc, 16))
    UtilStrCpy(m_txn.Payment.c_street_1, pData, dbdatlen(m_dbproc, 16));
if (pData=dbdata(m_dbproc, 17))
    UtilStrCpy(m_txn.Payment.c_street_2, pData, dbdatlen(m_dbproc, 17));
if (pData=dbdata(m_dbproc, 18))
    UtilStrCpy(m_txn.Payment.c_city, pData, dbdatlen(m_dbproc, 18));
if (pData=dbdata(m_dbproc, 19))
    UtilStrCpy(m_txn.Payment.c_state, pData, dbdatlen(m_dbproc, 19));
if (pData=dbdata(m_dbproc, 20))
    UtilStrCpy(m_txn.Payment.c_zip, pData, dbdatlen(m_dbproc, 20));
if (pData=dbdata(m_dbproc, 21))
    UtilStrCpy(m_txn.Payment.c_phone, pData, dbdatlen(m_dbproc, 21));
if (pData=dbdata(m_dbproc, 22))
{
    datetime = *((DBDATETIME *) pData);
    dbdatecrack(m_dbproc, &daterec, &datetime);
    m_txn.Payment.c_since.year = daterec.year;
    m_txn.Payment.c_since.month = daterec.month;
    m_txn.Payment.c_since.day = daterec.day;
    m_txn.Payment.c_since.hour = daterec.hour;
    m_txn.Payment.c_since.minute = daterec.minute;
    m_txn.Payment.c_since.second = daterec.second;
}
if (pData=dbdata(m_dbproc, 23))
    UtilStrCpy(m_txn.Payment.c_credit, pData, dbdatlen(m_dbproc, 23));
if (pData=dbdata(m_dbproc, 24))
    dbconvert(m_dbproc, SQLNUMERIC, (LPCBYTE)pData, dbdatlen(m_dbproc, 24), SQLFLT8,
(BYTE *)&m_txn.Payment.c_credit_lim, 8);
if (pData=dbdata(m_dbproc, 25))
    dbconvert(m_dbproc, SQLNUMERIC, (LPCBYTE)pData, dbdatlen(m_dbproc, 25), SQLFLT8,
(BYTE *)&m_txn.Payment.c_discount, 8);
if (pData=dbdata(m_dbproc, 26))
    dbconvert(m_dbproc, SQLNUMERIC, (LPCBYTE)pData, dbdatlen(m_dbproc, 26), SQLFLT8,
(BYTE *)&m_txn.Payment.c_balance, 8);
if (pData=dbdata(m_dbproc, 27))
    UtilStrCpy(m_txn.Payment.c_data, pData, dbdatlen(m_dbproc, 27));

DiscardNextRows(0);
DiscardNextResults(0);

if (m_txn.Payment.c_id == 0)
```

## Appendix B – Database Design

---

```
        else
            throw new CTPCC_DBLIB_ERR( CTPCC_DBLIB_ERR::ERR_INVALID_CUST );
        m_txn.Payment.exec_status_code = eOK;
    }
    return;
}
catch (CSQLERR *e)
{
    if ((e->m_msgno == 1205 ||
        (e->m_msgno == iErrOleDbProvider &&
         strstr(e->m_msgtext, sErrTimeoutExpired) != NULL)) &&
        (++iTryCount <= iMaxRetries))
    {
        // hit deadlock; backoff for increasingly longer period
        delete e;
        Sleep(10 * iTryCount);
    }
    else
        throw;
}
} // while (TRUE)

// if (iTryCount)
//     throw new CTPCC_DBLIB_ERR(CTPCC_DBLIB_ERR::ERR_RETRIED_TRANS, iTryCount);
// }

void CTPCC_DBLIB::OrderStatus()
{
    int i;
    DBDATETIME datetime;
    DBDATETIME daterec;

    int iTryCount = 0;
    RETCODE rc;
    const BYTE *pData;

    ResetError();

    while (TRUE)
    {
        try
        {
            dbrpcinit(m_dbproc, "tpcc_orderstatus", 0);

            dbrpcparam(m_dbproc, NULL, 0, SQLINT4, -1, -1, (BYTE *) &m_txn.OrderStatus.w_id);
            dbrpcparam(m_dbproc, NULL, 0, SQLINT1, -1, -1, (BYTE *) &m_txn.OrderStatus.d_id);
            dbrpcparam(m_dbproc, NULL, 0, SQLINT4, -1, -1, (BYTE *) &m_txn.OrderStatus.c_id);

            // if customer id is zero, then order status is by name
            if (m_txn.OrderStatus.c_id == 0)
                dbrpcparam(m_dbproc, NULL, 0, SQLCHAR, -1, strlen(m_txn.OrderStatus.c_last),
                (unsigned char *)m_txn.OrderStatus.c_last);

            if (dbrpcexec(m_dbproc) == FAIL)
                ThrowError(CDBLIBERR::eDbRpcExec);

            // Get order lines
            if (dbresults(m_dbproc) != SUCCEED)
            {
                if ((m_DbLibErr == NULL) && (m_SqlErr == NULL))
                    throw new CTPCC_DBLIB_ERR( CTPCC_DBLIB_ERR::ERR_NO_SUCH_ORDER );
                else
                    ThrowError(CDBLIBERR::eDbResults);
            }

            if (dbnumcols(m_dbproc) != 5)
                ThrowError(CDBLIBERR::eWrongNumCols);

            i = 0;
            while (TRUE)
            {
                rc = dbnextrow(m_dbproc);
                if (rc == NO_MORE_ROWS)
                    break;
                if (rc != REG_ROW)
                    ThrowError(CDBLIBERR::eDbNextRow);

                if(pData=dbdata(m_dbproc, 1))
                    m_txn.OrderStatus.OL[i].ol_supply_w_id = (*(DBSMALLINT *) pData);
                if(pData=dbdata(m_dbproc, 2))
                    m_txn.OrderStatus.OL[i].ol_i_id = (*(DBINT *) pData);
                if(pData=dbdata(m_dbproc, 3))
                    m_txn.OrderStatus.OL[i].ol_quantity = (*(DBSMALLINT *) pData);
                if(pData=dbdata(m_dbproc, 4))
                    dbconvert(m_dbproc, SQLNUMERIC, (LPCBYTE)pData, dbdatlen(m_dbproc,4),
                    SQLFLT8, (BYTE
                * )&m_txn.OrderStatus.OL[i].ol_amount, 8);
                if(pData=dbdata(m_dbproc, 5))
                {
                    datetime = (*(DBDATETIME *) pData);
                }
            }
        }
    }
}
```

## Appendix B – Database Design

---

```
        dbdatecrack(m_dbproc, &daterec, &datetime);
        m_txn.OrderStatus.OL[i].ol_delivery_d.year = daterec.year;
        m_txn.OrderStatus.OL[i].ol_delivery_d.month = daterec.month;
        m_txn.OrderStatus.OL[i].ol_delivery_d.day = daterec.day;
        m_txn.OrderStatus.OL[i].ol_delivery_d.hour = daterec.hour;
        m_txn.OrderStatus.OL[i].ol_delivery_d.minute = daterec.minute;
        m_txn.OrderStatus.OL[i].ol_delivery_d.second = daterec.second;
    }
    i++;
}
m_txn.OrderStatus.o_ol_cnt = i;

if (dbresults(m_dbproc) != SUCCEEDED)
    ThrowError(CDBLIBERR::eDbResults);

if (dbnextrow(m_dbproc) != REG_ROW)
    ThrowError(CDBLIBERR::eDbNextRow);

if (dbnumcols(m_dbproc) != 8)
    ThrowError(CDBLIBERR::eWrongNumCols);

if(pData=dbdata(m_dbproc, 1))
    m_txn.OrderStatus.c_id = (*(DBINT *) pData);
if(pData=dbdata(m_dbproc, 2))
    UtilStrCpy(m_txn.OrderStatus.c_last, pData, dbdatlen(m_dbproc,2));
if(pData=dbdata(m_dbproc, 3))
    UtilStrCpy(m_txn.OrderStatus.c_first, pData, dbdatlen(m_dbproc,3));
if(pData=dbdata(m_dbproc, 4))
    UtilStrCpy(m_txn.OrderStatus.c_middle, pData, dbdatlen(m_dbproc, 4));
if(pData=dbdata(m_dbproc, 5))
{
    datetime = (*(DBDATETIME *) pData);
    dbdatecrack(m_dbproc, &daterec, &datetime);
    m_txn.OrderStatus.o_entry_d.year = daterec.year;
    m_txn.OrderStatus.o_entry_d.month = daterec.month;
    m_txn.OrderStatus.o_entry_d.day = daterec.day;
    m_txn.OrderStatus.o_entry_d.hour = daterec.hour;
    m_txn.OrderStatus.o_entry_d.minute = daterec.minute;
    m_txn.OrderStatus.o_entry_d.second = daterec.second;
}
if(pData=dbdata(m_dbproc, 6))
    m_txn.OrderStatus.o_carrier_id = (*(DBSMALLINT *) pData);
if(pData=dbdata(m_dbproc, 7))
    dbconvert(m_dbproc, SQLNUMERIC, (LPCBYTE)pData, dbdatlen(m_dbproc,7),
        SQLFLT8, (BYTE *)&m_txn.OrderStatus.c_balance, 8);
if(pData=dbdata(m_dbproc, 8))
    m_txn.OrderStatus.o_id = (*(DBINT *) pData);

DiscardNextRows(0);
DiscardNextResults(0);

if (m_txn.OrderStatus.o_ol_cnt == 0)
    throw new CTPCC_DBLIB_ERR( CTPCC_DBLIB_ERR::ERR_NO_SUCH_ORDER );
else if (m_txn.OrderStatus.c_id == 0 && m_txn.OrderStatus.c_last[0] == 0)
    throw new CTPCC_DBLIB_ERR( CTPCC_DBLIB_ERR::ERR_INVALID_CUST );
else
    m_txn.OrderStatus.exec_status_code = eOK;

return;
}
catch (CSQLERR *e)
{
    if ((e->m_msgno == 1205 ||
        (e->m_msgno == iErrOleDbProvider &&
        strstr(e->m_msgtext, sErrTimeoutExpired) != NULL)) &&
        (++iTryCount <= iMaxRetries))
    {
        // hit deadlock; backoff for increasingly longer period
        delete e;
        Sleep(10 * iTryCount);
    }
    else
        throw;
}
} // while (TRUE)

// if (iTryCount)
//     throw new CTPCC_DBLIB_ERR(CTPCC_DBLIB_ERR::ERR_RETRIED_TRANS, iTryCount);
}

void CTPCC_DBLIB::Delivery()
{
    int i;
    int iTryCount = 0;
    const BYTE *pData;

    ResetError();

    while (TRUE)
    {
```

## Appendix B – Database Design

---

```
try
{
    dbrpcinit(m_dbproc, "tpcc_delivery", 0);

    dbrpcparam(m_dbproc, NULL, 0, SQLINT4, -1, -1, (BYTE *) &m_txn.Delivery.w_id);
    dbrpcparam(m_dbproc, NULL, 0, SQLINT1, -1, -1, (BYTE *) &m_txn.Delivery.o_carrier_id);

    if (dbrpcexec(m_dbproc) == FAIL)
        ThrowError(CDBLIBERR::eDbRpcExec);

    if (dbresults(m_dbproc) != SUCCEEDED)
        ThrowError(CDBLIBERR::eDbResults);

    if (dbnextrow(m_dbproc) != REG_ROW)
        ThrowError(CDBLIBERR::eDbNextRow);

    if (dbnumcols(m_dbproc) != 10)
        ThrowError(CDBLIBERR::eWrongNumCols);

    for (i=0; i<10; i++)
    {
        if (pData = dbdata(m_dbproc, i+1))
            m_txn.Delivery.o_id[i] = *((DBINT *)pData);
    }

    DiscardNextRows(0);
    DiscardNextResults(0);

    m_txn.Delivery.exec_status_code = eOK;
    return;
}
catch (CSQLERR *e)
{
    if ((e->m_msgno == 1205 ||
        (e->m_msgno == iErrOleDbProvider &&
         strstr(e->m_msgtext, sErrTimeoutExpired) != NULL) &&
         (++iTryCount <= iMaxRetries))
        {
            // hit deadlock; backoff for increasingly longer period
            delete e;
            Sleep(10 * iTryCount);
        }
        else
            throw;
    }
    // while (TRUE)
}

// if (iTryCount)
// throw new CTPCC_DBLIB_ERR(CTPCC_DBLIB_ERR::ERR_RETRIED_TRANS, iTryCount);
}

void CTPCC_DBLIB::ResetError()
{
    if (m_DbLibErr != NULL)
    {
        delete m_DbLibErr;
        m_DbLibErr = (CDBLIBERR*)NULL;
    }

    if (m_SqlErr != NULL)
    {
        delete m_SqlErr;
        m_SqlErr = (CSQLERR*)NULL;
    }

    return;
}
```

### db\_dblib\_dll/src/tpcc\_dblib.h

```
/* FILE: TPCC_DBLIB.H
 * Microsoft TPC-C Kit Ver. 4.20.000
 * Copyright Microsoft, 1999
 * All Rights Reserved
 *
 * Version 4.10.000 audited by Richard Gimarc, Performance Metrics, 3/17/99
 *
 * PURPOSE: Header file for TPC-C txn class implementation.
 *
 * Change history:
 * 4.20.000 - updated rev number to match kit
 */
#pragma once

#ifndef PDBPROCESS
#define DBPROCESS void // dbprocess structure type
typedef DBPROCESS * PDBPROCESS;
#endif

// need to declare functions for import, unless define has already been created
```

## Appendix B – Database Design

---

```
// by the DLL's .cpp module for export.
#ifndef DllDecl
#define DllDecl __declspec( dllimport )
#endif

class CSQLErr : public CBaseErr
{
public:
    CSQLErr(void)
    {
        m_msgno = 0;
        m_msgstate = 0;
        m_severity = 0;
        m_msgtext = NULL;
    };

    ~CSQLErr()
    {
        delete [] m_msgtext;
    };

    int m_msgno;
    int m_msgstate;
    int m_severity;
    char *m_msgtext;

    int ErrorType() {return ERR_TYPE_SQL;};
    int ErrorNum() {return m_msgno;};
    char *ErrorText() {return m_msgtext;};
};

class CDBLIBERR : public CBaseErr
{
public:
    enum ACTION
    {
        eNone,
        eUnknown,
        eLogin, // error from dblogin
        eDbOpen, // error from dbopen
        eDbUse, // error from dbuse
        eDbSqlExec, // error from dbsqlxec
        eDbSet, // error from one of the dbset* routines
        eDbNextRow, // error from dbnextrow
        eWrongRowCount, // more or less rows returned than expected
        eWrongNumCols, // more or less columns returned than expected
        eDbResults, // error from dbresults
        eDbRpcExec, // error from dbrpcexec
        eDbSetMaxProcs, // error from dbsetmaxprocs
        eDbProcHandler // error from either dbprocerrhandle or dbprocmsghandle
    };

    CDBLIBERR(ACTION eAction, int severity = 0, int dberror = 0, int oserr = 0)
    {
        m_eAction = eAction;
        m_severity = severity;
        m_dberror = dberror;
        m_oserr = oserr;

        m_dberrstr = NULL;
        m_oserrstr = NULL;
    };

    ~CDBLIBERR()
    {
        delete [] m_dberrstr;
        delete [] m_oserrstr;
    };

    ACTION m_eAction;
    int m_severity;
    int m_dberror;
    int m_oserr;
    char *m_dberrstr;
    char *m_oserrstr;

    int ErrorType() {return ERR_TYPE_DBLIB;};
    int ErrorNum() {return m_dberror;};
    char *ErrorText() {return m_dberrstr;};
};

class CTPCC_DBLIB_ERR : public CBaseErr
{
public:
    enum CTPCC_DBLIB_ERRS
    {
        ERR_WRONG_SP_VERSION = 1, // "Wrong version of stored procs on database server"
        ERR_INVALID_CUST, // "Invalid Customer id,name."
        ERR_NO_SUCH_ORDER // "No orders found for customer."
    };
};
```

## Appendix B – Database Design

---

```
CTPCC_DBLIB_ERR( int iErr ) { m_errno = iErr; };

int m_errno;

int ErrorType() {return ERR_TYPE_TPCC_DBLIB;};
int ErrorNum() {return m_errno;};

char *ErrorText();

};

class DllDecl CTPCC_DBLIB : public CTPCC_BASE
{
private:
    // declare variables and private functions here...
    PDBPROCESS m_dbproc;
    CDBLIBERR *m_DbLibErr; // not allocated until needed (maybe never)
    CSQLErr *m_SqlErr; // not allocated until needed (maybe never)

    int m_MaxRetries; // retry count on deadlock

    void DiscardNextRows(int iExpectedCount);
    void DiscardNextResults(int iExpectedCount);
    void ThrowError( CDBLIBERR::ACTION eAction );
    void ResetError();

    union
    {
        NEW_ORDER_DATA NewOrder;
        PAYMENT_DATA Payment;
        DELIVERY_DATA Delivery;
        STOCK_LEVEL_DATA StockLevel;
        ORDER_STATUS_DATA OrderStatus;
        m_txn;
    }

public:
    CTPCC_DBLIB(LPCSTR szServer, LPCSTR szUser, LPCSTR szPassword, LPCSTR szHost, LPCSTR szDatabase );
    ~CTPCC_DBLIB(void);

    inline PNEW_ORDER_DATA BuffAddr_NewOrder() { return &m_txn.NewOrder; };
    inline PPAYMENT_DATA BuffAddr_Payment() { return &m_txn.Payment; };
    inline PDELIVERY_DATA BuffAddr_Delivery() { return &m_txn.Delivery; };

    inline PSTOCK_LEVEL_DATA BuffAddr_StockLevel() { return &m_txn.StockLevel; };
    inline PORDER_STATUS_DATA BuffAddr_OrderStatus() { return &m_txn.OrderStatus; };

    void NewOrder ();
    void Payment ();
    void Delivery ();
    void StockLevel ();
    void OrderStatus ();

    // these are public because they must be called from the dblink err_handler and msg_hangler
    // outside of the class
    void SetDbLibError(int severity, int dberr, int oserr, LPCSTR dberrstr, LPCSTR oserrstr);
    void SetSqlError( int msgno, int msgstate, int severity, LPCSTR msgtext );

};

extern "C" DllDecl CTPCC_DBLIB* CTPCC_DBLIB_new
( LPCSTR szServer, LPCSTR szUser, LPCSTR szPassword, LPCSTR szHost, LPCSTR szDatabase );

typedef CTPCC_DBLIB* (TYPE_CTPCC_DBLIB)(LPCSTR, LPCSTR, LPCSTR, LPCSTR, LPCSTR);
```

### tm\_com\_dll/src/tpcc\_com.cpp

```
/* FILE: TPCC_COM.CPP
 * Microsoft TPC-C Kit Ver. 4.20.000
 * Copyright Microsoft, 1999
 *
 * All Rights Reserved
 *
 * not yet audited
 *
 * PURPOSE: Source file for TPC-C COM+ class implementation.
 * Contact: Charles Levine (clevine@microsoft.com)
 *
 * Change history:
 * 4.20.000 - first version
 */

// needed for CoInitializeEx
#define _WIN32_WINNT 0x0400

#include <windows.h>

// need to declare functions for export
```



# Appendix B – Database Design

---

```
#define DllDecl __declspec( dllexport )

#include "..\..\common\src\trans.h" //tpckit transaction header contains definitions of structures
specific to TPC-C
#include "..\..\common\src\error.h"
#include "..\..\common\src\txn_base.h"
#include "tpcc_com.h"

#include "..\..\tpcc_com_ps\src\tpcc_com_ps_i.c"
#include "..\..\tpcc_com_all\src\tpcc_com_all_i.c"

// wrapper routine for class constructor
__declspec(dllexport) CTPCC_COM* CTPCC_COM_new(BOOL bSinglePool)
{
    return new CTPCC_COM(bSinglePool);
}

CTPCC_COM::CTPCC_COM(BOOL bSinglePool)
{
    HRESULT hr = NULL;
    long lRet = 0;
    ULONG ulTmpSize = 0;

    m_pTxn = NULL;
    m_pNewOrder = NULL;
    m_pPayment = NULL;
    m_pStockLevel = NULL;
    m_pOrderStatus = NULL;

    m_bSinglePool = bSinglePool;

    ulTmpSize = (ULONG) sizeof(COM_DATA);
    VariantInit(&m_vTxn);
    m_vTxn.vt = VT_SAFEARRAY;

    m_vTxn.parray = SafeArrayCreateVector(VT_UI1, ulTmpSize, ulTmpSize);
    if (!m_vTxn.parray)
        throw new CCOMERR( E_FAIL );

    memset((void*)m_vTxn.parray->pvData, 0, ulTmpSize);
    m_pTxn = (COM_DATA*)m_vTxn.parray->pvData;

    hr = CoInitializeEx(NULL, COINIT_MULTITHREADED);
    if (FAILED(hr))
    {
        throw new CCOMERR( hr );
    }

    // create components
    if (m_bSinglePool)
    {
        hr = CoCreateInstance(CLSID_TPCC, NULL, CLSCTX_SERVER, IID_ITPCC, (void **)&m_pNewOrder);
        if (FAILED(hr))
            throw new CCOMERR(hr);

        // all txns will use same component
        m_pPayment = m_pNewOrder;
        m_pStockLevel = m_pNewOrder;
        m_pOrderStatus = m_pNewOrder;
    }
    else
    {
        // use different components for each txn

        hr = CoCreateInstance(CLSID_NewOrder, NULL, CLSCTX_SERVER, IID_ITPCC, (void **)&m_pNewOrder);
        if (FAILED(hr))
            throw new CCOMERR(hr);

        hr = CoCreateInstance(CLSID_Payment, NULL, CLSCTX_SERVER, IID_ITPCC, (void **)&m_pPayment);
        if (FAILED(hr))
            throw new CCOMERR(hr);

        hr = CoCreateInstance(CLSID_StockLevel, NULL, CLSCTX_SERVER, IID_ITPCC, (void **)&m_pStockLevel);
        if (FAILED(hr))
            throw new CCOMERR(hr);

        hr = CoCreateInstance(CLSID_OrderStatus, NULL, CLSCTX_SERVER, IID_ITPCC, (void **)&m_pOrderStatus);
        if (FAILED(hr))
            throw new CCOMERR(hr);
    }

    // call setcomplete to release each component back into pool
    hr = m_pNewOrder->CallSetComplete();
    if (FAILED(hr))
        throw new CCOMERR(hr);

    if (!m_bSinglePool)
    {
        hr = m_pPayment->CallSetComplete();
        if (FAILED(hr))
            throw new CCOMERR(hr);

        hr = m_pStockLevel->CallSetComplete();
    }
}
```

## Appendix B – Database Design

---

```
        if (FAILED(hr))
            throw new CCOMERR(hr);

        hr = m_pOrderStatus->CallSetComplete();
        if (FAILED(hr))
            throw new CCOMERR(hr);
    }
}

CTPCC_COM::~CTPCC_COM()
{
    if (m_pTxn)
        SafeArrayDestroy(m_vTxn.parray);

    ReleaseInterface(m_pNewOrder);
    if (!m_bSinglePool)
    {
        ReleaseInterface(m_pPayment);
        ReleaseInterface(m_pStockLevel);
        ReleaseInterface(m_pOrderStatus);
    }
    CoUninitialize();
}

void CTPCC_COM::NewOrder()
{
    VARIANT    vTxn_out;

    HRESULT hr = m_pNewOrder->NewOrder(m_vTxn, &vTxn_out);
    if (FAILED(hr))
        throw new CCOMERR( hr );
    memcpy(m_pTxn, (void *)vTxn_out.parray->pvData, vTxn_out.parray->rgsabound[0].cElements);
    SafeArrayDestroy(vTxn_out.parray);

    if ( m_pTxn->ErrorType != ERR_SUCCESS )
        throw new CCOMERR( m_pTxn->ErrorType, m_pTxn->error );
}

void CTPCC_COM::Payment()
{
    VARIANT    vTxn_out;

    HRESULT hr = m_pPayment->Payment(m_vTxn, &vTxn_out);
    if (FAILED(hr))
        throw new CCOMERR( hr );
    memcpy(m_pTxn, (void *)vTxn_out.parray->pvData, vTxn_out.parray->rgsabound[0].cElements);
    SafeArrayDestroy(vTxn_out.parray);

    if ( m_pTxn->ErrorType != ERR_SUCCESS )
        throw new CCOMERR( m_pTxn->ErrorType, m_pTxn->error );
}

void CTPCC_COM::StockLevel()
{
    VARIANT    vTxn_out;

    HRESULT hr = m_pStockLevel->StockLevel(m_vTxn, &vTxn_out);
    if (FAILED(hr))
        throw new CCOMERR( hr );
    memcpy(m_pTxn, (void *)vTxn_out.parray->pvData, vTxn_out.parray->rgsabound[0].cElements);
    SafeArrayDestroy(vTxn_out.parray);

    if ( m_pTxn->ErrorType != ERR_SUCCESS )
        throw new CCOMERR( m_pTxn->ErrorType, m_pTxn->error );
}

void CTPCC_COM::OrderStatus()
{
    VARIANT    vTxn_out;

    HRESULT hr = m_pOrderStatus->OrderStatus(m_vTxn, &vTxn_out);
    if (FAILED(hr))
        throw new CCOMERR( hr );
    memcpy(m_pTxn, (void *)vTxn_out.parray->pvData, vTxn_out.parray->rgsabound[0].cElements);
    SafeArrayDestroy(vTxn_out.parray);

    if ( m_pTxn->ErrorType != ERR_SUCCESS )
        throw new CCOMERR( m_pTxn->ErrorType, m_pTxn->error );
}
}
```

### tm\_com\_dll/src/tpcc\_com.h

```
/*      FILE:          TPCC_COM.H
 *      Microsoft TPC-C Kit Ver. 4.20.000
 *      Copyright Microsoft, 1999
 *      All Rights Reserved
 *
 *      not yet audited
 *
```

## Appendix B – Database Design

---

```
*      PURPOSE:  Header file for TPC-C COM+ class implementation.
*
*      Change history:
*          4.20.000 - first version
*/

#pragma once

#include <stdio.h>
#include "..\..\tpcc_com_ps\src\tpcc_com_ps.h"

// need to declare functions for import, unless define has already been created
// by the DLL's .cpp module for export.
#ifndef DllDecl
#define DllDecl __declspec( dllimport )
#endif

class CCOMERR : public CBaseErr
{
private:
    char m_szErrorText[64];

public:
    // use this interface for genuine COM errors
    CCOMERR( HRESULT hr )
    {
        m_hr = hr;
        m_iErrorType = 0;
        m_iError = 0;
    }

    // use this interface to impersonate a non-COM error type
    CCOMERR( int iErrorType, int iError )
    {
        m_iErrorType = iErrorType;
        m_iError = iError;
        m_hr = S_OK;
    }

    int          m_hr;
    int          m_iErrorType;
    int          m_iError;

    // A CCOMERR class can impersonate another class, which happens if the error
    // was not actually a COM Services error, but was simply transmitted back via COM.
    int ErrorType()
    {
        if (m_iErrorType == 0)
            return ERR_TYPE_COM;
        else
            return m_iErrorType;
    }

    int ErrorNum() {return m_hr;}

    char *ErrorText()
    {
        if (m_hr == S_OK)
            sprintf( m_szErrorText, "Error: Class %d, error # %d", m_iErrorType, m_iError );
        else
            sprintf( m_szErrorText, "Error: COM HRESULT %x", m_hr );
        return m_szErrorText;
    }
};

class DllDecl CTPCC_COM : public CTPCC_BASE
{
private:
    BOOL m_bSinglePool;

    // COM Interface pointers
    ITPCC*          m_pNewOrder;
    ITPCC*          m_pPayment;
    ITPCC*          m_pStockLevel;
    ITPCC*          m_pOrderStatus;

    struct COM_DATA
    {
        int ErrorType;
        int error;
        union
        {
            NEW_ORDER_DATA          NewOrder;
            PAYMENT_DATA            Payment;
            DELIVERY_DATA           Delivery;
            STOCK_LEVEL_DATA        StockLevel;
            ORDER_STATUS_DATA       OrderStatus;
        } u;
    } *m_pTxn;

    VARIANT m_vTxn;

public:
```

## Appendix B – Database Design

---

```
CTPCC_COM(BOOL bSinglePool);
~CTPCC_COM(void);

};
inline PNEW_ORDER_DATA      BuffAddr_NewOrder()      { return &m_pTxn->u.NewOrder;
};
inline PPAYMENT_DATA        BuffAddr_Payment()        { return &m_pTxn->u.Payment;
};
inline PDELIVERY_DATA       BuffAddr_Delivery()       { return &m_pTxn->u.Delivery;
};
inline PSTOCK_LEVEL_DATA    BuffAddr_StockLevel()     { return &m_pTxn->u.StockLevel; };
inline PORDER_STATUS_DATA   BuffAddr_OrderStatus()    { return &m_pTxn->u.OrderStatus; };

void NewOrder      ();
void Payment       ();
void StockLevel    ();
void OrderStatus   ();
void Delivery      () { throw new CCOMERR(E_NOTIMPL); } // not supported

};

inline void ReleaseInterface(IUnknown *pUnk)
{
    if (pUnk)
    {
        pUnk->Release();
        pUnk = NULL;
    }
}

// wrapper routine for class constructor
extern "C" __declspec(dllexport) CTPCC_COM* CTPCC_COM_new(BOOL);

typedef CTPCC_COM* (TYPE_CTPCC_COM)(BOOL);
```

### tpcc\_com\_all/src/methods.h

```
/*      FILE:          METHODS.H
 *
 *      Microsoft TPC-C Kit Ver. 4.20.000
 *      Copyright Microsoft, 1999
 *
 *      All Rights Reserved
 *
 *      not yet audited
 *
 *      PURPOSE:  Header file for COM components.
 *
 *      Change history:
 *      4.20.000 - first version
 */

enum COMPONENT_ERROR
{
    ERR_MISSING_REGISTRY_ENTRIES = 1,
    ERR_LOADDLL_FAILED,
    ERR_GETPROCADDR_FAILED,
    ERR_UNKNOWN_DB_PROTOCOL
};

class CCOMPONENT_ERR : public CBaseErr
{
public:
    CCOMPONENT_ERR(COMPONENT_ERROR Err)
    {
        m_Error = Err;
        m_szTextDetail = NULL;
        m_SystemErr = 0;
        m_szErrorText = NULL;
    };

    CCOMPONENT_ERR(COMPONENT_ERROR Err, char *szTextDetail, DWORD dwSystemErr)
    {
        m_Error = Err;
        m_szTextDetail = new char[strlen(szTextDetail)+1];
        strcpy( m_szTextDetail, szTextDetail );
        m_SystemErr = dwSystemErr;
        m_szErrorText = NULL;
    };

    ~CCOMPONENT_ERR()
    {
        if (m_szTextDetail != NULL)
            delete [] m_szTextDetail;
        if (m_szErrorText != NULL)
            delete [] m_szErrorText;
    };

    COMPONENT_ERROR    m_Error;
    char               *m_szTextDetail;
};
```

## Appendix B – Database Design

---

```
        char                *m_szErrorText;
        DWORD               m_SystemErr;

        int ErrorType() {return ERR_TYPE_COMPONENT;};
        int ErrorNum() {return m_Error;};
        char *ErrorText();
};

static void WriteMessageToEventLog(LPTSTR lpszMsg);

////////////////////////////////////
// CTPCC_Common
class CTPCC_Common :
    public ITPCC,
    public IObjectControl,
    public IObjectConstruct,
    public CComObjectRootEx<CComSingleThreadModel>
{
public:
BEGIN_COM_MAP(CTPCC_Common)
    COM_INTERFACE_ENTRY(ITPCC)
    COM_INTERFACE_ENTRY(IObjectControl)
    COM_INTERFACE_ENTRY(IObjectConstruct)
END_COM_MAP()

    CTPCC_Common();
    ~CTPCC_Common();

// ITPCC
public:
    HRESULT __stdcall NewOrder(          VARIANT txn_in, VARIANT* txn_out);
    HRESULT __stdcall Payment(          VARIANT txn_in, VARIANT* txn_out);
    HRESULT __stdcall Delivery(         VARIANT txn_in, VARIANT* txn_out) {return E_NOTIMPL;};
    HRESULT __stdcall StockLevel(      VARIANT txn_in, VARIANT* txn_out);
    HRESULT __stdcall OrderStatus(     VARIANT txn_in, VARIANT* txn_out);

    HRESULT __stdcall CallSetComplete();

// IObjectControl
    STDMETHODIMP_(BOOL) CanBePooled() { return m_bCanBePooled; }
    STDMETHODIMP Activate() { return S_OK; } // we don't support COM Services transactions (no
enlistment)
    STDMETHODIMP_(void) Deactivate() { /* nothing to do */ }

// IObjectConstruct
    STDMETHODIMP Construct(IDispatch * pUnk);

// helper methods
private:
    BOOL                m_bCanBePooled;
    CTPCC_BASE         *m_pTxn;

    struct COM_DATA
    {
        int retval;
        int error;
        union
        {
            NEW_ORDER_DATA          NewOrder;
            PAYMENT_DATA             Payment;
            DELIVERY_DATA            Delivery;
            STOCK_LEVEL_DATA         StockLevel;
            ORDER_STATUS_DATA        OrderStatus;
        } u;
    };
};

////////////////////////////////////
// CTPCC
class CTPCC :
    public CTPCC_Common,
    public CComCoClass<CTPCC, &CLSID_TPCC>
{
public:
    DECLARE_REGISTRY_RESOURCEID(IDR_TPCC)

BEGIN_COM_MAP(CTPCC)
    COM_INTERFACE_ENTRY2(IUnknown, CComObjectRootEx)
    COM_INTERFACE_ENTRY_CHAIN(CTPCC_Common)
END_COM_MAP()
};

////////////////////////////////////
// CNewOrder
class CNewOrder :
    public CTPCC_Common,
    public CComCoClass<CNewOrder, &CLSID_NewOrder>
{
```

# Appendix B – Database Design

---

```
public:
DECLARE_REGISTRY_RESOURCEID(IDR_NEWORDER)

BEGIN_COM_MAP(CNewOrder)
    COM_INTERFACE_ENTRY2(IUnknown, CComObjectRootEx)
    COM_INTERFACE_ENTRY_CHAIN(CTPCC_Common)
END_COM_MAP()

// ITPCC
public:
//
    HRESULT __stdcall NewOrder(          VARIANT txn_in, VARIANT* txn_out) {return E_NOTIMPL;}
    HRESULT __stdcall Payment(          VARIANT txn_in, VARIANT* txn_out) {return E_NOTIMPL;}
    HRESULT __stdcall StockLevel(       VARIANT txn_in, VARIANT* txn_out) {return E_NOTIMPL;}
    HRESULT __stdcall OrderStatus(      VARIANT txn_in, VARIANT* txn_out) {return E_NOTIMPL;}
};

// COrderStatus
class COrderStatus :
    public CTPCC_Common,
    public CComCoClass<COrderStatus, &CLSID_OrderStatus>
{
public:
DECLARE_REGISTRY_RESOURCEID(IDR_ORDERSTATUS)

BEGIN_COM_MAP(COrderStatus)
    COM_INTERFACE_ENTRY2(IUnknown, CComObjectRootEx)
    COM_INTERFACE_ENTRY_CHAIN(CTPCC_Common)
END_COM_MAP()

// ITPCC
public:
    HRESULT __stdcall NewOrder(          VARIANT txn_in, VARIANT* txn_out) {return E_NOTIMPL;}
    HRESULT __stdcall Payment(          VARIANT txn_in, VARIANT* txn_out) {return E_NOTIMPL;}
    HRESULT __stdcall StockLevel(       VARIANT txn_in, VARIANT* txn_out) {return E_NOTIMPL;}
    HRESULT __stdcall OrderStatus(      VARIANT txn_in, VARIANT* txn_out) {return E_NOTIMPL;}
};

// CPayment
class CPayment :
    public CTPCC_Common,
    public CComCoClass<CPayment, &CLSID_Payment>
{
public:
DECLARE_REGISTRY_RESOURCEID(IDR_PAYMENT)

BEGIN_COM_MAP(CPayment)
    COM_INTERFACE_ENTRY2(IUnknown, CComObjectRootEx)
    COM_INTERFACE_ENTRY_CHAIN(CTPCC_Common)
END_COM_MAP()

// ITPCC
public:
    HRESULT __stdcall NewOrder(          VARIANT txn_in, VARIANT* txn_out) {return E_NOTIMPL;}
    HRESULT __stdcall Payment(          VARIANT txn_in, VARIANT* txn_out) {return E_NOTIMPL;}
    HRESULT __stdcall StockLevel(       VARIANT txn_in, VARIANT* txn_out) {return E_NOTIMPL;}
    HRESULT __stdcall OrderStatus(      VARIANT txn_in, VARIANT* txn_out) {return E_NOTIMPL;}
};

// CStockLevel
class CStockLevel :
    public CTPCC_Common,
    public CComCoClass<CStockLevel, &CLSID_StockLevel>
{
public:
DECLARE_REGISTRY_RESOURCEID(IDR_STOCKLEVEL)

BEGIN_COM_MAP(CStockLevel)
    COM_INTERFACE_ENTRY2(IUnknown, CComObjectRootEx)
    COM_INTERFACE_ENTRY_CHAIN(CTPCC_Common)
END_COM_MAP()

// ITPCC
public:
    HRESULT __stdcall NewOrder(          VARIANT txn_in, VARIANT* txn_out) {return E_NOTIMPL;}
    HRESULT __stdcall Payment(          VARIANT txn_in, VARIANT* txn_out) {return E_NOTIMPL;}
    HRESULT __stdcall StockLevel(       VARIANT txn_in, VARIANT* txn_out) {return E_NOTIMPL;}
    HRESULT __stdcall OrderStatus(      VARIANT txn_in, VARIANT* txn_out) {return E_NOTIMPL;}
};
```

tpcc\_com\_all/src/resource.h

```
//{{NO_DEPENDENCIES}}
```

## Appendix B – Database Design

---

```
// Microsoft Developer Studio generated include file.
// Used by tpcc_com_all.rc
//
#define IDS_PROJNAME            100
#define IDR_TPCC                101
#define IDR_NEWORDER           102
#define IDR_ORDERSTATUS        103
#define IDR_PAYMENT            104
#define IDR_STOCKLEVEL         105

// Next default values for new objects
//
#ifndef APSTUDIO_INVOKED
#ifndef APSTUDIO_READONLY_SYMBOLS
#define _APS_NEXT_RESOURCE_VALUE        202
#define _APS_NEXT_COMMAND_VALUE        32768
#define _APS_NEXT_CONTROL_VALUE        201
#define _APS_NEXT_SYMED_VALUE          106
#endif
#endif
#endif
```

### tpcc\_com\_all/src/tpcc\_com\_all.cpp

```
/*      FILE:                TPCC_COM_ALL.CPP
 *
 *      Microsoft TPC-C Kit Ver. 4.20.000
 *      Copyright Microsoft, 1999
 *
 *      All Rights Reserved
 *
 *
 *      Version 4.10.000 audited by Richard Gimarc, Performance Metrics, 3/17/99
 *
 *      PURPOSE:  Implementation for TPC-C Tuxedo class.
 *      Contact:  Charles Levine (clevine@microsoft.com)
 *
 *      Change history:
 *      4.20.000 - updated rev number to match kit
 */

#define STRICT
#define _WIN32_WINNT 0x0400
#define _ATL_APARTMENT_THREADED

#include <stdio.h>
#include <atlbase.h>
//You may derive a class from CComModule and use it if you want to override
//something, but do not change the name of _Module
extern CComModule _Module;

#include <atlcom.h>
#include <initguid.h>
#include <transact.h>
#include <atlimpl.cpp>
#include <comsvcs.h>

#include <sqltypes.h>
#include <sql.h>
#include <sqlext.h>

#include "tpcc_com_ps.h"
#include "..\..\common\src\trans.h" //tpckit transaction header contains
definitions of structures specific to TPC-C
#include "..\..\common\src\txn_base.h"
#include "..\..\common\src\error.h"
#include "..\..\common\src\ReadRegistry.h"
#include "..\..\db_dblib_dll\src\tpcc_dblib.h" // DBLIB implementation of TPC-C txns
#include "..\..\db_odbc_dll\src\tpcc_odbc.h" // ODBC implementation of TPC-C txns

#include "resource.h"
#include "tpcc_com_all.h"
#include "tpcc_com_all_i.c"
#include "Methods.h"
#include "..\..\tpcc_com_ps\src\tpcc_com_ps_i.c"
#include "..\..\common\src\ReadRegistry.cpp"

CComModule _Module;

BEGIN_OBJECT_MAP(ObjectMap)
    OBJECT_ENTRY(CLSID_TPCC, CTPCC)
    OBJECT_ENTRY(CLSID_NewOrder, CNewOrder)
    OBJECT_ENTRY(CLSID_OrderStatus, COrderStatus)
    OBJECT_ENTRY(CLSID_Payment, CPayment)
    OBJECT_ENTRY(CLSID_StockLevel, CStockLevel)
END_OBJECT_MAP()

// configuration settings from registry
TPCCREGISTRYDATA Reg;
char szMyComputerName[MAX_COMPUTERNAME_LENGTH+1];
```

# Appendix B – Database Design

---

```
static HINSTANCE hLibInstanceDb = NULL;

TYPE_CTPCC_DBLIB *pCTPCC_DBLIB_new;
TYPE_CTPCC_ODBC *pCTPCC_ODBC_new;

////////////////////////////////////
// DLL Entry Point

extern "C"
BOOL WINAPI DllMain(HINSTANCE hInstance, DWORD dwReason, LPVOID /*lpReserved*/)
{
    char szDllName[128];

    try
    {
        if (dwReason == DLL_PROCESS_ATTACH)
        {
            _Module.Init(ObjectMap, hInstance);
            DisableThreadLibraryCalls(hInstance);

            DWORD dwSize = MAX_COMPUTERNAME_LENGTH+1;
            GetComputerName(szMyComputerName, &dwSize);
            szMyComputerName[dwSize] = 0;

            if ( ReadTPCCRegistrySettings( &Reg ) )
                throw new CCOMPONENT_ERR( ERR_MISSING_REGISTRY_ENTRIES );

            if (Reg.eDB_Protocol == DBLIB)
            {
                strcpy( szDllName, Reg.szPath );
                strcat( szDllName, "tpcc_dblib.dll");
                hLibInstanceDb = LoadLibrary( szDllName );
                if (hLibInstanceDb == NULL)
                    throw new CCOMPONENT_ERR( ERR_LOADDLL_FAILED, szDllName,

GetLastError() );

                // get function pointer to wrapper for class constructor
                pCTPCC_DBLIB_new = (TYPE_CTPCC_DBLIB*)
GetProcAddress(hLibInstanceDb,"CTPCC_DBLIB_new");
                if (pCTPCC_DBLIB_new == NULL)
                    throw new CCOMPONENT_ERR( ERR_GETPROCADDR_FAILED, szDllName,

GetLastError() );
            }
            else if (Reg.eDB_Protocol == ODBC)
            {
                strcpy( szDllName, Reg.szPath );
                strcat( szDllName, "tpcc_odbc.dll");
                hLibInstanceDb = LoadLibrary( szDllName );
                if (hLibInstanceDb == NULL)
                    throw new CCOMPONENT_ERR( ERR_LOADDLL_FAILED, szDllName,

GetLastError() );

                // get function pointer to wrapper for class constructor
                pCTPCC_ODBC_new = (TYPE_CTPCC_ODBC*)
GetProcAddress(hLibInstanceDb,"CTPCC_ODBC_new");
                if (pCTPCC_ODBC_new == NULL)
                    throw new CCOMPONENT_ERR( ERR_GETPROCADDR_FAILED, szDllName,

GetLastError() );
            }
            else
                throw new CCOMPONENT_ERR( ERR_UNKNOWN_DB_PROTOCOL );
        }
        else if (dwReason == DLL_PROCESS_DETACH)
            _Module.Term();

    }
    catch (CBaseErr *e)
    {
        WriteMessageToEventLog(e->ErrorText());
        delete e;
        return FALSE;
    }
    catch (...)
    {
        WriteMessageToEventLog(TEXT("Unhandled exception in object DllMain"));
        return FALSE;
    }

    return TRUE; // OK
}

////////////////////////////////////
// Used to determine whether the DLL can be unloaded by OLE

STDAPI DllCanUnloadNow(void)
{
    return (_Module.GetLockCount()==0) ? S_OK : S_FALSE;
}

////////////////////////////////////
// Returns a class factory to create an object of the requested type
```



## Appendix B – Database Design

---

```
STDAPI DllGetClassObject(REFCLSID rclsid, REFIID riid, LPVOID* ppv)
{
    return _Module.GetClassObject(rclsid, riid, ppv);
}

////////////////////////////////////
// DllRegisterServer - Adds entries to the system registry

STDAPI DllRegisterServer(void)
{
    // registers object, typelib and all interfaces in typelib
    return _Module.RegisterServer(TRUE);
}

////////////////////////////////////
// DllUnregisterServer - Removes entries from the system registry

STDAPI DllUnregisterServer(void)
{
    _Module.UnregisterServer();
    return S_OK;
}

static void WriteMessageToEventLog(LPTSTR lpszMsg)
{
    TCHAR    szMsg[256];
    HANDLE   hEventSource;
    LPTSTR   lpszStrings[2];

    // Use event logging to log the error.
    //
    hEventSource = RegisterEventSource(NULL, TEXT("tpcc_com_all.dll"));

    _stprintf(szMsg, TEXT("Error in COM+ TPC-C Component: "));
    lpszStrings[0] = szMsg;
    lpszStrings[1] = lpszMsg;

    if (hEventSource != NULL)
    {
        ReportEvent(hEventSource, // handle of event source
            EVENTLOG_ERROR_TYPE, // event type
            0, // event category
            0, // event ID
            NULL, // current user's SID
            2, // strings in lpszStrings
            0, // no bytes of raw data
            (LPCTSTR *)lpszStrings, // array of error strings
            NULL); // no raw data

        (VOID) DeregisterEventSource(hEventSource);
    }
}

inline void ReleaseInterface(IUnknown *pUnk)
{
    if (pUnk)
    {
        pUnk->Release();
        pUnk = NULL;
    }
}

/* FUNCTION: CCOMPONENT_ERR::ErrorText
 *
 */

char* CCOMPONENT_ERR::ErrorText(void)
{
    static SERRORMSG errorMsgs[] =
    {
        { ERR_MISSING_REGISTRY_ENTRIES, "Required entries missing from registry." },
        { ERR_LOADDLL_FAILED, "Load of DLL failed. DLL=" },
        { ERR_GETPROCADDR_FAILED, "Could not map proc in DLL. GetProcAddress error. DLL=" },
        { ERR_UNKNOWN_DB_PROTOCOL, "Unknown database protocol specified in registry." },
        { 0, "" }
    };

    char szTmp[256];
    int i = 0;
    while (TRUE)
    {
        if (errorMsgs[i].szMsg[0] == 0)
        {
            strcpy( szTmp, "Unknown error number." );
            break;
        }
        if (m_Error == errorMsgs[i].iError)
    }
}
```

## Appendix B – Database Design

---

```
        {
            strcpy( szTmp, errorMsgs[i].szMsg );
            break;
        }
        i++;
    }

    if (m_szTextDetail)
        strcat( szTmp, m_szTextDetail );
    if (m_SystemErr)
        wsprintf( szTmp+strlen(szTmp), " Error=%d", m_SystemErr );

    m_szErrorText = new char[strlen(szTmp)+1];
    strcpy( m_szErrorText, szTmp );
    return m_szErrorText;
}

CTPCC_Common::CTPCC_Common()
{
    m_pTxn = NULL;
    m_bCanBePooled = TRUE;
}

CTPCC_Common::~CTPCC_Common()
{
    if (m_pTxn)
        delete m_pTxn;
}

HRESULT CTPCC_Common::CallSetComplete()
{
    IObjectContext* pObjectContext = NULL;

    // get our object context
    HRESULT hr = CoGetObjectContext( IID_IObjectContext, (void **)&pObjectContext );
    pObjectContext->SetComplete();
    ReleaseInterface(pObjectContext);
    return hr;
}

//
// called by the ctor activator
//
STDMETHODIMP CTPCC_Common::Construct(IDispatch * pUnk)
{
    // Code to access construction string, if needed later...
    // if (!pUnk)
    //     return E_UNEXPECTED;
    // IObjectConstructString * pString = NULL;
    // HRESULT hr = pUnk->QueryInterface(IID_IObjectConstructString, (void **)&pString);
    // pString->Release();

    try
    {
        if (Reg.eDB_Protocol == ODBC)
            m_pTxn = pCTPCC_ODBC_new( Reg.szDbServer, Reg.szDbUser, Reg.szDbPassword,
szMyComputerName, Reg.szDbName );
        else if (Reg.eDB_Protocol == DBLIB)
            m_pTxn = pCTPCC_DBLIB_new( Reg.szDbServer, Reg.szDbUser, Reg.szDbPassword,
szMyComputerName, Reg.szDbName );
    }
    catch (CBaseErr *e)
    {
        WriteMessageToEventLog(e->ErrorText());
        delete e;
        return E_FAIL;
    }
    catch (...)
    {
        WriteMessageToEventLog(TEXT("Unhandled exception in object ::Construct"));
        return E_FAIL;
    }
}

return S_OK;

HRESULT CTPCC_Common::NewOrder(VARIANT txn_in, VARIANT* txn_out)
{
    PNEW_ORDER_DATA    pNewOrder;
    COM_DATA            *pData;
    try
    {
        pData = (COM_DATA*)txn_in.parray->pvData;
        pNewOrder = m_pTxn->BuffAddr_NewOrder();

        memcpy(pNewOrder, &pData->u.NewOrder, sizeof(NEW_ORDER_DATA));

        m_pTxn->NewOrder();           // do the actual txn

        VariantInit(txn_out);
        txn_out->vt = VT_SAFEARRAY;
        txn_out->parray = SafeArrayCreateVector(VT_UI1,
```

## Appendix B – Database Design

---

```

                                                                 txn_in.parray->rgsabound->cElements,
                                                                 txn_in.parray->rgsabound->cElements);
    pData = (COM_DATA*) txn_out->parray->pvData;

    memcpy( &pData->u.NewOrder, pNewOrder, sizeof(NEW_ORDER_DATA));

    pData->retval = ERR_SUCCESS;
    pData->error = 0;
    return S_OK;
}
catch (CBaseErr *e)
{
    // check for lost database connection; if yes, component is toast
    if ( ((e->ErrorType() == ERR_TYPE_DBLIB) && (e->ErrorNum() == 10005)) ||
         ((e->ErrorType() == ERR_TYPE_ODBC) && (e->ErrorNum() == 10054)) )
        m_bCanBePooled = FALSE;

    pData->retval = e->ErrorType();
    pData->error = e->ErrorNum();
    delete e;
    return E_FAIL;
}
catch (...)
{
    WriteMessageToEventLog(TEXT("Unhandled exception."));
    pData->retval = ERR_TYPE_LOGIC;
    pData->error = 0;
    m_bCanBePooled = FALSE;
    return E_FAIL;
}
}

HRESULT CTPCC_Common::Payment(VARIANT txn_in, VARIANT* txn_out)
{
    PPAYMENT_DATA      pPayment;
    COM_DATA           *pData;
    try
    {
        pData = (COM_DATA*)txn_in.parray->pvData;
        pPayment = m_pTxn->BuffAddr_Payment();

        memcpy(pPayment, &pData->u.Payment, sizeof(PAYMENT_DATA));

        m_pTxn->Payment();           // do the actual txn

        VariantInit(txn_out);
        txn_out->vt = VT_SAFEARRAY;
        txn_out->parray = SafeArrayCreateVector( VT_UI1,
                                                                 txn_in.parray->rgsabound->cElements,
                                                                 txn_in.parray->rgsabound->cElements);

        pData = (COM_DATA*) txn_out->parray->pvData;

        memcpy( &pData->u.Payment, pPayment, sizeof(PAYMENT_DATA));

        pData->retval = ERR_SUCCESS;
        pData->error = 0;
        return S_OK;
    }
    catch (CBaseErr *e)
    {
        // check for lost database connection; if yes, component is toast
        if ( ((e->ErrorType() == ERR_TYPE_DBLIB) && (e->ErrorNum() == 10005)) ||
             ((e->ErrorType() == ERR_TYPE_ODBC) && (e->ErrorNum() == 10054)) )
            m_bCanBePooled = FALSE;

        pData->retval = e->ErrorType();
        pData->error = e->ErrorNum();
        delete e;
        return E_FAIL;
    }
    catch (...)
    {
        WriteMessageToEventLog(TEXT("Unhandled exception."));
        pData->retval = ERR_TYPE_LOGIC;
        pData->error = 0;
        m_bCanBePooled = FALSE;
        return E_FAIL;
    }
}

HRESULT CTPCC_Common::StockLevel(VARIANT txn_in, VARIANT* txn_out)
{
    PSTOCK_LEVEL_DATA  pStockLevel;
    COM_DATA           *pData;

    try
    {
        pData = (COM_DATA*)txn_in.parray->pvData;
        pStockLevel = m_pTxn->BuffAddr_StockLevel();

        memcpy(pStockLevel, &pData->u.StockLevel, sizeof(STOCK_LEVEL_DATA));

        m_pTxn->StockLevel();
    }

```

## Appendix B – Database Design

---

```
VariantInit(txn_out);
txn_out->vt = VT_SAFEARRAY;
txn_out->parray = SafeArrayCreateVector( VT_UI1,
                                       txn_in.parray->rgsabound->cElements,
                                       txn_in.parray->rgsabound->cElements);

pData = (COM_DATA*)txn_out->parray->pvData;

memcpy( &pData->u.StockLevel, pStockLevel, sizeof(STOCK_LEVEL_DATA));

pData->retval = ERR_SUCCESS;
pData->error = 0;
return S_OK;
}
catch (CBaseErr *e)
{
    // check for lost database connection; if yes, component is toast
    if ( ((e->ErrorType() == ERR_TYPE_DBLIB) && (e->ErrorNum() == 10005)) ||
         ((e->ErrorType() == ERR_TYPE_ODBC) && (e->ErrorNum() == 10054)) )
        m_bCanBePooled = FALSE;

    pData->retval = e->ErrorType();
    pData->error = e->ErrorNum();
    delete e;
    return E_FAIL;
}
catch (...)
{
    WriteMessageToEventLog(TEXT("Unhandled exception."));
    pData->retval = ERR_TYPE_LOGIC;
    pData->error = 0;
    m_bCanBePooled = FALSE;
    return E_FAIL;
}
}

HRESULT CTPCC_Common::OrderStatus(VARIANT txn_in, VARIANT* txn_out)
{
    ORDER_STATUS_DATA pOrderStatus;
    COM_DATA          *pData;
    try
    {
        pData = (COM_DATA*)txn_in.parray->pvData;
        pOrderStatus = m_pTxn->BuffAddr_OrderStatus();

        memcpy(pOrderStatus, &pData->u.OrderStatus, sizeof(ORDER_STATUS_DATA));

        m_pTxn->OrderStatus();

        VariantInit(txn_out);
        txn_out->vt = VT_SAFEARRAY;
        txn_out->parray = SafeArrayCreateVector( VT_UI1,
                                               txn_in.parray->rgsabound->cElements,
                                               txn_in.parray->rgsabound->cElements);

        pData = (COM_DATA*)txn_out->parray->pvData;

        memcpy( &pData->u.OrderStatus, pOrderStatus, sizeof(ORDER_STATUS_DATA));

        pData->retval = ERR_SUCCESS;
        pData->error = 0;
        return S_OK;
    }
    catch (CBaseErr *e)
    {
        // check for lost database connection; if yes, component is toast
        if ( ((e->ErrorType() == ERR_TYPE_DBLIB) && (e->ErrorNum() == 10005)) ||
             ((e->ErrorType() == ERR_TYPE_ODBC) && (e->ErrorNum() == 10054)) )
            m_bCanBePooled = FALSE;

        pData->retval = e->ErrorType();
        pData->error = e->ErrorNum();
        delete e;
        return E_FAIL;
    }
    catch (...)
    {
        WriteMessageToEventLog(TEXT("Unhandled exception."));
        pData->retval = ERR_TYPE_LOGIC;
        pData->error = 0;
        m_bCanBePooled = FALSE;
        return E_FAIL;
    }
}
}
```

### tpcc\_com\_all/src/tpcc\_com\_all.def

```
; tpcc_com_all.def : Declares the module parameters.
```

# Appendix B – Database Design

---

```
LIBRARY      "tpcc_com_all.dll"

EXPORTS
    DllCanUnloadNow      @1 PRIVATE
    DllGetClassObject    @2 PRIVATE
    DllRegisterServer    @3 PRIVATE
    DllUnregisterServer  @4 PRIVATE
```

## tpcc\_com\_all/src/tpcc\_com\_all.h

```
#pragma warning( disable: 4049 ) /* more than 64k source lines */

/* this ALWAYS GENERATED file contains the definitions for the interfaces */

/* File created by MIDL compiler version 5.03.0280 */
/* at Sat Apr 08 16:40:18 2000
*/
/* Compiler settings for .\src\tpcc_com_all.idl:
    Oicf (OptLev=i2), Wl, Zp8, env=Win32 (32b run), ms_ext, c_ext
    error checks: allocation ref bounds_check enum stub_data
    VC __declspec() decoration level:
        __declspec(uuid()), __declspec(selectany), __declspec(novtable)
        DECLSPEC_UUID(), MIDL_INTERFACE()
*/
//@@MIDL_FILE_HEADING(  )

/* verify that the <rpcndr.h> version is high enough to compile this file*/
#ifdef __REQUIRED_RPCNDR_H_VERSION__
#define __REQUIRED_RPCNDR_H_VERSION__ 440
#endif

#include "rpc.h"
#include "rpcndr.h"

#ifdef __tpcc_com_all_h__
#define __tpcc_com_all_h__

/* Forward Declarations */

#ifdef __TPCC_FWD_DEFINED__
#define __TPCC_FWD_DEFINED__

#ifdef __cplusplus
typedef class TPCC TPCC;
#else
typedef struct TPCC TPCC;
#endif /* __cplusplus */

#endif /* __TPCC_FWD_DEFINED__ */

#ifdef __NewOrder_FWD_DEFINED__
#define __NewOrder_FWD_DEFINED__

#ifdef __cplusplus
typedef class NewOrder NewOrder;
#else
typedef struct NewOrder NewOrder;
#endif /* __cplusplus */

#endif /* __NewOrder_FWD_DEFINED__ */

#ifdef __OrderStatus_FWD_DEFINED__
#define __OrderStatus_FWD_DEFINED__

#ifdef __cplusplus
typedef class OrderStatus OrderStatus;
#else
typedef struct OrderStatus OrderStatus;
#endif /* __cplusplus */

#endif /* __OrderStatus_FWD_DEFINED__ */

#ifdef __Payment_FWD_DEFINED__
#define __Payment_FWD_DEFINED__

#ifdef __cplusplus
typedef class Payment Payment;
#else
typedef struct Payment Payment;
#endif /* __cplusplus */

#endif /* __Payment_FWD_DEFINED__ */
```

## Appendix B – Database Design

---

```
#ifndef __StockLevel_FWD_DEFINED__
#define __StockLevel_FWD_DEFINED__

#ifdef __cplusplus
typedef class StockLevel StockLevel;
#else
typedef struct StockLevel StockLevel;
#endif /* __cplusplus */

#endif /* __StockLevel_FWD_DEFINED__ */

/* header files for imported files */
#include "oidl.h"
#include "ocidl.h"
#include "tpcc_com_ps.h"

#ifdef __cplusplus
extern "C"{
#endif

void __RPC_FAR * __RPC_USER MIDL_user_allocate(size_t);
void __RPC_USER MIDL_user_free( void __RPC_FAR * );

/* interface __MIDL_itf_tpcc_com_all_0000 */
/* [local] */

extern RPC_IF_HANDLE __MIDL_itf_tpcc_com_all_0000_v0_0_c_ifspec;
extern RPC_IF_HANDLE __MIDL_itf_tpcc_com_all_0000_v0_0_s_ifspec;

#ifdef __TPCCLib_LIBRARY_DEFINED__
#define __TPCCLib_LIBRARY_DEFINED__

/* library TPCCLib */
/* [helpstring][version][uuid] */

EXTERN_C const IID LIBID_TPCCLib;

EXTERN_C const CLSID CLSID_TPCC;

#ifdef __cplusplus
class DECLSPEC_UUID("122A3128-2520-11D3-BA71-00C04FBFE08B")
TPCC;
#endif

EXTERN_C const CLSID CLSID_NewOrder;

#ifdef __cplusplus
class DECLSPEC_UUID("975BAABF-84A7-11D2-BA47-00C04FBFE08B")
NewOrder;
#endif

EXTERN_C const CLSID CLSID_OrderStatus;

#ifdef __cplusplus
class DECLSPEC_UUID("266836AD-A50D-11D2-BA4E-00C04FBFE08B")
OrderStatus;
#endif

EXTERN_C const CLSID CLSID_Payment;

#ifdef __cplusplus
class DECLSPEC_UUID("CD02F7EF-A4FA-11D2-BA4E-00C04FBFE08B")
Payment;
#endif

EXTERN_C const CLSID CLSID_StockLevel;

#ifdef __cplusplus
class DECLSPEC_UUID("2668369E-A50D-11D2-BA4E-00C04FBFE08B")
StockLevel;
#endif
#endif /* __TPCCLib_LIBRARY_DEFINED__ */

/* Additional Prototypes for ALL interfaces */

/* end of Additional Prototypes */
```

## Appendix B – Database Design

---

```
#ifndef __cplusplus
}
#endif
#endif
```

### tpcc\_com\_all/src/tpcc\_com\_all.idl

```
/*      FILE:          TPCC.IDL
 *
 *      Microsoft TPC-C Kit Ver. 4.20.000
 *      Copyright Microsoft, 1999
 *
 *      All Rights Reserved
 *
 *      not yet audited
 *
 *      PURPOSE:  IDL source for TPCC.dll.  This file is processed by the MIDL tool to
 *                produce the type library (TPCC.tlb) and marshalling code.
 *
 *      Change history:
 *      4.20.000 - first version
 */

interface TPCC;
interface NewOrder;
interface OrderStatus;
interface Payment;
interface StockLevel;

import "oidl.idl";
import "ocidl.idl";
import "..\tpcc_com_ps\src\tpcc_com_ps.idl";

[
    uuid(122A3117-2520-11D3-BA71-00C04FBFE08B),
    version(1.0),
    helpstring("TPC-C 1.0 Type Library")
]
library TPCCLib
{
    importlib("stdole32.tlb");
    importlib("stdole2.tlb");

    [
        uuid(122A3128-2520-11D3-BA71-00C04FBFE08B),
        helpstring("All Txns Class")
    ]
    coclass TPCC
    {
        [default] interface ITPCC;
    };

    [
        uuid(975BAABF-84A7-11D2-BA47-00C04FBFE08B),
        helpstring("NewOrder Class")
    ]
    coclass NewOrder
    {
        [default] interface ITPCC;
    };

    [
        uuid(266836AD-A50D-11D2-BA4E-00C04FBFE08B),
        helpstring("OrderStatus Class")
    ]
    coclass OrderStatus
    {
        [default] interface ITPCC;
    };

    [
        uuid(CD02F7EF-A4FA-11D2-BA4E-00C04FBFE08B),
        helpstring("Payment Class")
    ]
    coclass Payment
    {
        [default] interface ITPCC;
    };

    [
        uuid(2668369E-A50D-11D2-BA4E-00C04FBFE08B),
        helpstring("StockLevel Class")
    ]
```

## Appendix B – Database Design

---

```
    }
    coclass StockLevel
    {
        [default] interface ITPCC;
    };
};
```

### tpcc\_com\_all/src/tpcc\_com\_all.rc

```
//Microsoft Developer Studio generated resource script.
//
#include "resource.h"

#define APSTUDIO_READONLY_SYMBOLS
////////////////////////////////////
//
// Generated from the TEXTINCLUDE 2 resource.
//
#include "winres.h"

////////////////////////////////////
#undef APSTUDIO_READONLY_SYMBOLS

////////////////////////////////////
// English (U.S.) resources

#if !defined(AFX_RESOURCE_DLL) || defined(AFX_TARG_ENU)
#ifdef _WIN32
LANGUAGE LANG_ENGLISH, SUBLANG_ENGLISH_US
#pragma code_page(1252)
#endif // _WIN32

#ifdef APSTUDIO_INVOKED
////////////////////////////////////
//
// TEXTINCLUDE
//

1 TEXTINCLUDE DISCARDABLE
BEGIN
    "resource.h\0"
END

2 TEXTINCLUDE DISCARDABLE
BEGIN
    "#include \"winres.h\"\r\n"
    "\0"
END

3 TEXTINCLUDE DISCARDABLE
BEGIN
    "1 TYPELIB \"tpcc_com_all.tlb\"\r\n"
    "\0"
END

#endif // APSTUDIO_INVOKED

#ifdef _MAC
////////////////////////////////////
//
// Version
//

VS_VERSION_INFO VERSIONINFO
FILEVERSION 1,0,0,1
PRODUCTVERSION 1,0,0,1
FILEFLAGSMASK 0x3fL
#ifdef _DEBUG
FILEFLAGS 0x1L
#else
FILEFLAGS 0x0L
#endif
FILEOS 0x4L
FILETYPE 0x2L
FILESUBTYPE 0x0L
BEGIN
    BLOCK "StringFileInfo"
    BEGIN
        BLOCK "040904B0"
        BEGIN
            VALUE "CompanyName", "\0"
            VALUE "FileDescription", "tpcc_com_all Module\0"
            VALUE "FileVersion", "1, 0, 0, 1\0"
            VALUE "InternalName", "TPCCNEWORDER\0"
            VALUE "LegalCopyright", "Copyright 1997\0"
            VALUE "OriginalFilename", "tpcc_com_all.DLL\0"
            VALUE "ProductName", "tpcc_com_all Module\0"
        END
    END
END
```



## Appendix B – Database Design

---

```
        VALUE "ProductVersion", "1, 0, 0, 1\0"  
        VALUE "OLESelfRegister", "\0"  
    END  
    END  
    BLOCK "VarFileInfo"  
    BEGIN  
        VALUE "Translation", 0x409, 1200  
    END  
END  
  
#endif // !_MAC  
  
////////////////////////////////////  
//  
// REGISTRY  
//  
IDR_TPCC           REGISTRY DISCARDABLE "tpcc_com_all.rgs"  
IDR_NEWORDER      REGISTRY DISCARDABLE "tpcc_com_no.rgs"  
IDR_ORDERSTATUS   REGISTRY DISCARDABLE "tpcc_com_os.rgs"  
IDR_PAYMENT       REGISTRY DISCARDABLE "tpcc_com_pay.rgs"  
IDR_STOCKLEVEL    REGISTRY DISCARDABLE "tpcc_com_sl.rgs"  
  
////////////////////////////////////  
//  
// String Table  
//  
STRINGTABLE DISCARDABLE  
BEGIN  
    IDS_PROJNAME          "tpcc_com_all"  
END  
  
#endif // English (U.S.) resources  
////////////////////////////////////  
  
#ifndef APSTUDIO_INVOKED  
////////////////////////////////////  
//  
// Generated from the TEXTINCLUDE 3 resource.  
//  
1 TYPELIB "tpcc_com_all.tlb"  
  
////////////////////////////////////  
#endif // not APSTUDIO_INVOKED
```

### tpcc\_com\_all/src/tpcc\_com\_all.rgs

```
HKCR  
{  
    TPCC.AllTxns.1 = s 'All Txns Class'  
    {  
        CLSID = s '{122A3128-2520-11D3-BA71-00C04FBFE08B}'  
    }  
    TPCC.AllTxns = s 'TPCC Class'  
    {  
        CurVer = s 'TPCC.AllTxns.1'  
    }  
    NoRemove CLSID  
    {  
        ForceRemove {122A3128-2520-11D3-BA71-00C04FBFE08B} = s 'TPCC Class'  
        {  
            ProgID = s 'TPCC.AllTxns.1'  
            VersionIndependentProgID = s 'TPCC.AllTxns'  
            InprocServer32 = s '%MODULE%'  
            {  
                val ThreadingModel = s 'Both'  
            }  
        }  
    }  
}
```

### tpcc\_com\_all/src/tpcc\_com\_all\_i.c

```
#pragma warning( disable: 4049 ) /* more than 64k source lines */  
/* this ALWAYS GENERATED file contains the IIDs and CLSIDs */
```

# Appendix B – Database Design

---

```
/* link this file in with the server and any clients */

/* File created by MIDL compiler version 5.03.0280 */
/* at Sat Apr 08 16:40:18 2000
*/
/* Compiler settings for .\src\tpcc_com_all.idl:
   Oicf (OptLev=i2), Wl, Zp8, env=Win32 (32b run), ms_ext, c_ext
   error checks: allocation ref bounds_check enum stub_data
   VC __declspec() decoration level:
       __declspec(uuid()), __declspec(selectany), __declspec(novtable)
   DECLSPEC_UUID(), MIDL_INTERFACE()
*/
//@@MIDL_FILE_HEADING( )

#if !defined(_M_IA64) && !defined(_M_AXP64)

#ifdef __cplusplus
extern "C"{
#endif

#include <rpc.h>
#include <rpcndr.h>

#ifdef _MIDL_USE_GUIDDEF_

#ifdef INITGUID
#define INITGUID
#include <guiddef.h>
#undef INITGUID
#else
#include <guiddef.h>
#endif

#define MIDL_DEFINE_GUID(type,name,l,w1,w2,b1,b2,b3,b4,b5,b6,b7,b8) \
    DEFINE_GUID(name,l,w1,w2,b1,b2,b3,b4,b5,b6,b7,b8)

#else // !_MIDL_USE_GUIDDEF_

#ifdef __IID_DEFINED__
#define __IID_DEFINED__

typedef struct _IID
{
    unsigned long x;
    unsigned short s1;
    unsigned short s2;
    unsigned char c[8];
} IID;

#endif // __IID_DEFINED__

#ifdef CLSID_DEFINED
#define CLSID_DEFINED
typedef IID CLSID;
#endif // CLSID_DEFINED

#define MIDL_DEFINE_GUID(type,name,l,w1,w2,b1,b2,b3,b4,b5,b6,b7,b8) \
    const type name = {l,w1,w2,{b1,b2,b3,b4,b5,b6,b7,b8}}

#endif !_MIDL_USE_GUIDDEF_

MIDL_DEFINE_GUID(IID, LIBID_TPCCLib,0x122A3117,0x2520,0x11D3,0xBA,0x71,0x00,0xC0,0x4F,0xBF,0xE0,0x8B);

MIDL_DEFINE_GUID(CLSID, CLSID_TPCC,0x122A3128,0x2520,0x11D3,0xBA,0x71,0x00,0xC0,0x4F,0xBF,0xE0,0x8B);

MIDL_DEFINE_GUID(CLSID, CLSID_NewOrder,0x975BAABF,0x84A7,0x11D2,0xBA,0x47,0x00,0xC0,0x4F,0xBF,0xE0,0x8B);

MIDL_DEFINE_GUID(CLSID, CLSID_OrderStatus,0x266836AD,0xA50D,0x11D2,0xBA,0x4E,0x00,0xC0,0x4F,0xBF,0xE0,0x8B);

MIDL_DEFINE_GUID(CLSID, CLSID_Payment,0xCD02F7EF,0xA4FA,0x11D2,0xBA,0x4E,0x00,0xC0,0x4F,0xBF,0xE0,0x8B);

MIDL_DEFINE_GUID(CLSID, CLSID_StockLevel,0x2668369E,0xA50D,0x11D2,0xBA,0x4E,0x00,0xC0,0x4F,0xBF,0xE0,0x8B);

#undef MIDL_DEFINE_GUID

#ifdef __cplusplus
}
#endif

#endif /* !defined(_M_IA64) && !defined(_M_AXP64)*/

#pragma warning( disable: 4049 ) /* more than 64k source lines */
```

# Appendix B – Database Design

---

```
/* this ALWAYS GENERATED file contains the IIDs and CLSIDs */
/* link this file in with the server and any clients */

/* File created by MIDL compiler version 5.03.0280 */
/* at Sat Apr 08 16:40:18 2000
*/
/* Compiler settings for .\src\tpcc_com_all.idl:
   Oicf (OptLev=i2), Wl, Zp8, env=Win64 (32b run,appending), ms_ext, c_ext, robust
   error checks: allocation ref bounds_check enum stub_data
   VC __declspec() decoration level:
       __declspec(uuid()), __declspec(selectany), __declspec(novtable)
   DECLSPEC_UUID(), MIDL_INTERFACE()
*/
//@@MIDL_FILE_HEADING( )

#if defined(_M_IA64) || defined(_M_AXP64)

#ifdef __cplusplus
extern "C"{
#endif

#include <rpc.h>
#include <rpcndr.h>

#ifdef _MIDL_USE_GUIDDEF_

#ifndef INITGUID
#define INITGUID
#include <guiddef.h>
#undef INITGUID
#else
#include <guiddef.h>
#endif

#define MIDL_DEFINE_GUID(type,name,l,w1,w2,b1,b2,b3,b4,b5,b6,b7,b8) \
    DEFINE_GUID(name,l,w1,w2,b1,b2,b3,b4,b5,b6,b7,b8)

#else // !_MIDL_USE_GUIDDEF_

#ifndef __IID_DEFINED__
#define __IID_DEFINED__

typedef struct _IID
{
    unsigned long x;
    unsigned short s1;
    unsigned short s2;
    unsigned char c[8];
} IID;

#endif // __IID_DEFINED__

#ifndef CLSID_DEFINED
#define CLSID_DEFINED
typedef IID CLSID;
#endif // CLSID_DEFINED

#define MIDL_DEFINE_GUID(type,name,l,w1,w2,b1,b2,b3,b4,b5,b6,b7,b8) \
    const type name = {l,w1,w2,{b1,b2,b3,b4,b5,b6,b7,b8}}

#endif !_MIDL_USE_GUIDDEF_

MIDL_DEFINE_GUID(IID, LIBID_TPCCLib,0x122A3117,0x2520,0x11D3,0xBA,0x71,0x00,0xC0,0x4F,0xBF,0xE0,0x8B);

MIDL_DEFINE_GUID(CLSID, CLSID_TPCC,0x122A3128,0x2520,0x11D3,0xBA,0x71,0x00,0xC0,0x4F,0xBF,0xE0,0x8B);

MIDL_DEFINE_GUID(CLSID, CLSID_NewOrder,0x975BAABF,0x84A7,0x11D2,0xBA,0x47,0x00,0xC0,0x4F,0xBF,0xE0,0x8B);

MIDL_DEFINE_GUID(CLSID, CLSID_OrderStatus,0x266836AD,0xA50D,0x11D2,0xBA,0x4E,0x00,0xC0,0x4F,0xBF,0xE0,0x8B);

MIDL_DEFINE_GUID(CLSID, CLSID_Payment,0xCD02F7EF,0xA4FA,0x11D2,0xBA,0x4E,0x00,0xC0,0x4F,0xBF,0xE0,0x8B);

MIDL_DEFINE_GUID(CLSID, CLSID_StockLevel,0x2668369E,0xA50D,0x11D2,0xBA,0x4E,0x00,0xC0,0x4F,0xBF,0xE0,0x8B);

#undef MIDL_DEFINE_GUID

#ifdef __cplusplus
}
#endif

#endif /* defined(_M_IA64) || defined(_M_AXP64) */
```

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---

### tpcc\_com\_all/src/tpcc\_com\_no.rgs

```
HKCR
{
    TPCC.NewOrder.1 = s 'NewOrder Class'
    {
        CLSID = s '{975BAABF-84A7-11D2-BA47-00C04FBFE08B}'
    }
    TPCC.NewOrder = s 'NewOrder Class'
    {
        CurVer = s 'TPCC.NewOrder.1'
    }
    NoRemove CLSID
    {
        ForceRemove {975BAABF-84A7-11D2-BA47-00C04FBFE08B} = s 'NewOrder Class'
        {
            ProgID = s 'TPCC.NewOrder.1'
            VersionIndependentProgID = s 'TPCC.NewOrder'
            InprocServer32 = s '%MODULE%'
            {
                val ThreadingModel = s 'Both'
            }
        }
    }
}
```

### tpcc\_com\_all/src/tpcc\_com\_os.rgs

```
HKCR
{
    TPCC.OrderStatus.1 = s 'OrderStatus Class'
    {
        CLSID = s '{266836AD-A50D-11D2-BA4E-00C04FBFE08B}'
    }
    TPCC.OrderStatus = s 'OrderStatus Class'
    {
        CurVer = s 'TPCC.OrderStatus.1'
    }
    NoRemove CLSID
    {
        ForceRemove {266836AD-A50D-11D2-BA4E-00C04FBFE08B} = s 'OrderStatus Class'
        {
            ProgID = s 'TPCC.OrderStatus.1'
            VersionIndependentProgID = s 'TPCC.OrderStatus'
            InprocServer32 = s '%MODULE%'
            {
                val ThreadingModel = s 'Both'
            }
        }
    }
}
```

### tpcc\_com\_all/src/tpcc\_com\_pay.rgs

```
HKCR
{
    TPCC.Payment.1 = s 'Payment Class'
    {
        CLSID = s '{CD02F7EF-A4FA-11D2-BA4E-00C04FBFE08B}'
    }
    TPCC.Payment = s 'Payment Class'
    {
        CurVer = s 'TPCC.Payment.1'
    }
    NoRemove CLSID
    {
        ForceRemove {CD02F7EF-A4FA-11D2-BA4E-00C04FBFE08B} = s 'Payment Class'
        {
            ProgID = s 'TPCC.Payment.1'
            VersionIndependentProgID = s 'TPCC.Payment'
            InprocServer32 = s '%MODULE%'
            {
                val ThreadingModel = s 'Both'
            }
        }
    }
}
```

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---

## tpcc\_com\_all/src/tpcc\_com\_ps.h

```
#pragma warning( disable: 4049 ) /* more than 64k source lines */

/* this ALWAYS GENERATED file contains the definitions for the interfaces */

/* File created by MIDL compiler version 5.03.0280 */
/* at Sat Apr 08 16:40:10 2000
*/
/* Compiler settings for .\src\tpcc_com_ps.idl:
   Oicf (OptLev=i2), Wl, Zp8, env=Win32 (32b run), ms_ext, c_ext
   error checks: allocation ref bounds_check enum stub_data
   VC __declspec() decoration level:
       __declspec(uuid()), __declspec(selectany), __declspec(novtable)
       DECLSPEC_UUID(), MIDL_INTERFACE()
*/
//@@MIDL_FILE_HEADING(  )

/* verify that the <rpcndr.h> version is high enough to compile this file*/
#ifndef __REQUIRED_RPCNDR_H_VERSION__
#define __REQUIRED_RPCNDR_H_VERSION__ 440
#endif

#include "rpc.h"
#include "rpcndr.h"

#ifndef __RPCNDR_H_VERSION__
#error this stub requires an updated version of <rpcndr.h>
#endif // __RPCNDR_H_VERSION__

#ifndef COM_NO_WINDOWS_H
#include "windows.h"
#include "ole2.h"
#endif /*COM_NO_WINDOWS_H*/

#ifndef __tpcc_com_ps_h__
#define __tpcc_com_ps_h__

/* Forward Declarations */

#ifndef __ITPCC_FWD_DEFINED__
#define __ITPCC_FWD_DEFINED__
typedef interface ITPCC ITPCC;
#endif /* __ITPCC_FWD_DEFINED__ */

/* header files for imported files */
#include "oaidl.h"
#include "ocidl.h"

#ifdef __cplusplus
extern "C"{
#endif

void __RPC_FAR * __RPC_USER MIDL_user_allocate(size_t);
void __RPC_USER MIDL_user_free( void __RPC_FAR * );

/* interface __MIDL_itf_tpcc_com_ps_0000 */
/* [local] */

extern RPC_IF_HANDLE __MIDL_itf_tpcc_com_ps_0000_v0_0_c_ifspec;
extern RPC_IF_HANDLE __MIDL_itf_tpcc_com_ps_0000_v0_0_s_ifspec;

#ifndef __ITPCC_INTERFACE_DEFINED__
#define __ITPCC_INTERFACE_DEFINED__

/* interface ITPCC */
/* [unique][helpstring][uuid][oleautomation][object] */

EXTERN_C const IID IID_ITPCC;

#if defined(__cplusplus) && !defined(CINTERFACE)

    MIDL_INTERFACE("FEE6AA2-84B1-11d2-BA47-00C04FBFE08B")
    ITPCC : public IUnknown
    {
    public:
        virtual HRESULT __stdcall NewOrder(
            /* [in] */ VARIANT txn_in,
            /* [out] */ VARIANT __RPC_FAR *txn_out) = 0;

        virtual HRESULT __stdcall Payment(

```

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---

```
        /* [in] */ VARIANT txn_in,
        /* [out] */ VARIANT __RPC_FAR *txn_out) = 0;

virtual HRESULT __stdcall Delivery(
    /* [in] */ VARIANT txn_in,
    /* [out] */ VARIANT __RPC_FAR *txn_out) = 0;

virtual HRESULT __stdcall StockLevel(
    /* [in] */ VARIANT txn_in,
    /* [out] */ VARIANT __RPC_FAR *txn_out) = 0;

virtual HRESULT __stdcall OrderStatus(
    /* [in] */ VARIANT txn_in,
    /* [out] */ VARIANT __RPC_FAR *txn_out) = 0;

virtual HRESULT __stdcall CallSetComplete( void) = 0;
};

#else    /* C style interface */

typedef struct ITPCCVtbl
{
    BEGIN_INTERFACE

    HRESULT ( STDMETHODCALLTYPE __RPC_FAR *QueryInterface )(
        ITPCC __RPC_FAR * This,
        /* [in] */ REFIID riid,
        /* [iid_is][out] */ void __RPC_FAR *__RPC_FAR *ppvObject);

    ULONG ( STDMETHODCALLTYPE __RPC_FAR *AddRef )(
        ITPCC __RPC_FAR * This);

    ULONG ( STDMETHODCALLTYPE __RPC_FAR *Release )(
        ITPCC __RPC_FAR * This);

    HRESULT ( STDMETHODCALLTYPE __RPC_FAR *NewOrder )(
        ITPCC __RPC_FAR * This,
        /* [in] */ VARIANT txn_in,
        /* [out] */ VARIANT __RPC_FAR *txn_out);

    HRESULT ( STDMETHODCALLTYPE __RPC_FAR *Payment )(
        ITPCC __RPC_FAR * This,
        /* [in] */ VARIANT txn_in,
        /* [out] */ VARIANT __RPC_FAR *txn_out);

    HRESULT ( STDMETHODCALLTYPE __RPC_FAR *Delivery )(
        ITPCC __RPC_FAR * This,
        /* [in] */ VARIANT txn_in,
        /* [out] */ VARIANT __RPC_FAR *txn_out);

    HRESULT ( STDMETHODCALLTYPE __RPC_FAR *StockLevel )(
        ITPCC __RPC_FAR * This,
        /* [in] */ VARIANT txn_in,
        /* [out] */ VARIANT __RPC_FAR *txn_out);

    HRESULT ( STDMETHODCALLTYPE __RPC_FAR *OrderStatus )(
        ITPCC __RPC_FAR * This,
        /* [in] */ VARIANT txn_in,
        /* [out] */ VARIANT __RPC_FAR *txn_out);

    HRESULT ( STDMETHODCALLTYPE __RPC_FAR *CallSetComplete )(
        ITPCC __RPC_FAR * This);

    END_INTERFACE
} ITPCCVtbl;

interface ITPCC
{
    CONST_VTBL struct ITPCCVtbl __RPC_FAR *lpVtbl;
};

#ifndef COBJMACROS

#define ITPCC_QueryInterface(This,riid,ppvObject) \
    (This)->lpVtbl -> QueryInterface(This,riid,ppvObject)

#define ITPCC_AddRef(This) \
    (This)->lpVtbl -> AddRef(This)

#define ITPCC_Release(This) \
    (This)->lpVtbl -> Release(This)

#define ITPCC_NewOrder(This,txn_in,txn_out) \
    (This)->lpVtbl -> NewOrder(This,txn_in,txn_out)

#define ITPCC_Payment(This,txn_in,txn_out) \
    (This)->lpVtbl -> Payment(This,txn_in,txn_out)
```

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---

```
#define ITPCC_Delivery(This,txn_in,txn_out)    \
    (This)->lpVtbl -> Delivery(This,txn_in,txn_out)

#define ITPCC_StockLevel(This,txn_in,txn_out) \
    (This)->lpVtbl -> StockLevel(This,txn_in,txn_out)

#define ITPCC_OrderStatus(This,txn_in,txn_out) \
    (This)->lpVtbl -> OrderStatus(This,txn_in,txn_out)

#define ITPCC_CallSetComplete(This)        \
    (This)->lpVtbl -> CallSetComplete(This)

#endif /* COBJMACROS */

#endif /* C style interface */

HRESULT __stdcall ITPCC_NewOrder_Proxy(
    ITPCC __RPC_FAR * This,
    /* [in] */ VARIANT txn_in,
    /* [out] */ VARIANT __RPC_FAR *txn_out);

void __RPC_STUB ITPCC_NewOrder_Stub(
    IRpcStubBuffer *This,
    IRpcChannelBuffer *_pRpcChannelBuffer,
    PRPC_MESSAGE _pRpcMessage,
    DWORD *_pdwStubPhase);

HRESULT __stdcall ITPCC_Payment_Proxy(
    ITPCC __RPC_FAR * This,
    /* [in] */ VARIANT txn_in,
    /* [out] */ VARIANT __RPC_FAR *txn_out);

void __RPC_STUB ITPCC_Payment_Stub(
    IRpcStubBuffer *This,
    IRpcChannelBuffer *_pRpcChannelBuffer,
    PRPC_MESSAGE _pRpcMessage,
    DWORD *_pdwStubPhase);

HRESULT __stdcall ITPCC_Delivery_Proxy(
    ITPCC __RPC_FAR * This,
    /* [in] */ VARIANT txn_in,
    /* [out] */ VARIANT __RPC_FAR *txn_out);

void __RPC_STUB ITPCC_Delivery_Stub(
    IRpcStubBuffer *This,
    IRpcChannelBuffer *_pRpcChannelBuffer,
    PRPC_MESSAGE _pRpcMessage,
    DWORD *_pdwStubPhase);

HRESULT __stdcall ITPCC_StockLevel_Proxy(
    ITPCC __RPC_FAR * This,
    /* [in] */ VARIANT txn_in,
    /* [out] */ VARIANT __RPC_FAR *txn_out);

void __RPC_STUB ITPCC_StockLevel_Stub(
    IRpcStubBuffer *This,
    IRpcChannelBuffer *_pRpcChannelBuffer,
    PRPC_MESSAGE _pRpcMessage,
    DWORD *_pdwStubPhase);

HRESULT __stdcall ITPCC_OrderStatus_Proxy(
    ITPCC __RPC_FAR * This,
    /* [in] */ VARIANT txn_in,
    /* [out] */ VARIANT __RPC_FAR *txn_out);

void __RPC_STUB ITPCC_OrderStatus_Stub(
    IRpcStubBuffer *This,
    IRpcChannelBuffer *_pRpcChannelBuffer,
    PRPC_MESSAGE _pRpcMessage,
    DWORD *_pdwStubPhase);

HRESULT __stdcall ITPCC_CallSetComplete_Proxy(
    ITPCC __RPC_FAR * This);

void __RPC_STUB ITPCC_CallSetComplete_Stub(
    IRpcStubBuffer *This,
    IRpcChannelBuffer *_pRpcChannelBuffer,
    PRPC_MESSAGE _pRpcMessage,
    DWORD *_pdwStubPhase);
```

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```
#endif /* __ITPCC_INTERFACE_DEFINED__ */

/* Additional Prototypes for ALL interfaces */

unsigned long          __RPC_USER  VARIANT_UserSize(      unsigned long __RPC_FAR *, unsigned long          ,
VARIANT __RPC_FAR * );
unsigned char __RPC_FAR * __RPC_USER  VARIANT_UserMarshal(  unsigned long __RPC_FAR *, unsigned char __RPC_FAR *,
VARIANT __RPC_FAR * );
unsigned char __RPC_FAR * __RPC_USER  VARIANT_UserUnmarshal(unsigned long __RPC_FAR *, unsigned char __RPC_FAR *,
VARIANT __RPC_FAR * );
void                  __RPC_USER  VARIANT_UserFree(      unsigned long __RPC_FAR *, VARIANT __RPC_FAR * );

/* end of Additional Prototypes */

#ifdef __cplusplus
}
#endif

#endif
```

### tpcc\_com\_all/src/tpcc\_com\_sl.rgs

```
HKCR
{
    TPCC.StockLevel.1 = s 'StockLevel Class'
    {
        CLSID = s '{2668369E-A50D-11D2-BA4E-00C04FBFE08B}'
    }
    TPCC.StockLevel = s 'StockLevel Class'
    {
        CurVer = s 'TPCC.StockLevel.1'
    }
    NoRemove CLSID
    {
        ForceRemove {2668369E-A50D-11D2-BA4E-00C04FBFE08B} = s 'StockLevel Class'
        {
            ProgID = s 'TPCC.StockLevel.1'
            VersionIndependentProgID = s 'TPCC.StockLevel'
            InprocServer32 = s '%MODULE%'
            {
                val ThreadingModel = s 'Both'
            }
        }
    }
}
}
```

### tpcc\_com\_ps/src/dlldata.c

```
/******
DllData file -- generated by MIDL compiler

DO NOT ALTER THIS FILE

This file is regenerated by MIDL on every IDL file compile.

To completely reconstruct this file, delete it and rerun MIDL
on all the IDL files in this DLL, specifying this file for the
/dlldata command line option
*****/

#include <rpcproxy.h>

#ifdef __cplusplus
extern "C" {
#endif

EXTERN_PROXY_FILE( tpcc_com_ps )

PROXYFILE_LIST_START
/* Start of list */
REFERENCE_PROXY_FILE( tpcc_com_ps ),
/* End of list */
PROXYFILE_LIST_END
```



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---

```
DLldata_ROUTINES( aProxyFileList, GET_DLL_CLSID )

#ifdef __cplusplus
} /*extern "C" */
#endif

/* end of generated dlldata file */
```

### tpcc\_com\_ps/src/tpcc\_com\_ps.def

```
LIBRARY      "tpcc_com_ps"

DESCRIPTION  'Proxy/Stub DLL'

EXPORTS
    DllGetClassObject      @1    PRIVATE
    DllCanUnloadNow       @2    PRIVATE
    GetProxyDllInfo       @3    PRIVATE
    DllRegisterServer     @4    PRIVATE
    DllUnregisterServer   @5    PRIVATE
```

### tpcc\_com\_ps/src/tpcc\_com\_ps.h

```
#pragma warning( disable: 4049 ) /* more than 64k source lines */

/* this ALWAYS GENERATED file contains the definitions for the interfaces */

/* File created by MIDL compiler version 5.03.0280 */
/* at Sat Apr 08 16:40:10 2000 */
/*
/* Compiler settings for .\src\tpcc_com_ps.idl:
    Oicf (OptLev=i2), Wl, Zp8, env=Win32 (32b run), ms_ext, c_ext
    error checks: allocation ref bounds_check enum stub_data
    VC __declspec() decoration level:
        __declspec(uuid()), __declspec(selectany), __declspec(novtable)
    DECLSPEC_UUID(), MIDL_INTERFACE()
*/
//@@MIDL_FILE_HEADING(  )

/* verify that the <rpcndr.h> version is high enough to compile this file*/
#ifdef __REQUIRED_RPCNDR_H_VERSION__
#define __REQUIRED_RPCNDR_H_VERSION__ 440
#endif

#include "rpc.h"
#include "rpcndr.h"

#ifdef __RPCNDR_H_VERSION__
#error this stub requires an updated version of <rpcndr.h>
#endif // __RPCNDR_H_VERSION__

#ifdef COM_NO_WINDOWS_H
#include "windows.h"
#include "ole2.h"
#endif /*COM_NO_WINDOWS_H*/

#ifdef __tpcc_com_ps_h__
#define __tpcc_com_ps_h__

/* Forward Declarations */

#ifdef __ITPCC_FWD_DEFINED__
#define __ITPCC_FWD_DEFINED__
typedef interface ITPCC ITPCC;
#endif /* __ITPCC_FWD_DEFINED__ */

/* header files for imported files */
#include "oaidl.h"
#include "ocidl.h"

#ifdef __cplusplus
extern "C"{
#endif

void __RPC_FAR * __RPC_USER MIDL_user_allocate(size_t);
void __RPC_USER MIDL_user_free( void __RPC_FAR * );

/* interface __MIDL_itf_tpcc_com_ps_0000 */
```

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---

```
/* [local] */

extern RPC_IF_HANDLE __MIDL_itf_tpcc_com_ps_0000_v0_0_c_ifspec;
extern RPC_IF_HANDLE __MIDL_itf_tpcc_com_ps_0000_v0_0_s_ifspec;

#ifdef __ITPCC_INTERFACE_DEFINED__
#define __ITPCC_INTERFACE_DEFINED__

/* interface ITPCC */
/* [unique][helpstring][uuid][oleautomation][object] */

EXTERN_C const IID IID_ITPCC;

#ifdef __cplusplus && !defined(CINTERFACE)

MIDL_INTERFACE("FEEE6AA2-84B1-11d2-BA47-00C04FBFE08B")
ITPCC : public IUnknown
{
public:
    virtual HRESULT __stdcall NewOrder(
        /* [in] */ VARIANT txn_in,
        /* [out] */ VARIANT __RPC_FAR *txn_out) = 0;

    virtual HRESULT __stdcall Payment(
        /* [in] */ VARIANT txn_in,
        /* [out] */ VARIANT __RPC_FAR *txn_out) = 0;

    virtual HRESULT __stdcall Delivery(
        /* [in] */ VARIANT txn_in,
        /* [out] */ VARIANT __RPC_FAR *txn_out) = 0;

    virtual HRESULT __stdcall StockLevel(
        /* [in] */ VARIANT txn_in,
        /* [out] */ VARIANT __RPC_FAR *txn_out) = 0;

    virtual HRESULT __stdcall OrderStatus(
        /* [in] */ VARIANT txn_in,
        /* [out] */ VARIANT __RPC_FAR *txn_out) = 0;

    virtual HRESULT __stdcall CallSetComplete( void) = 0;

};

#else /* C style interface */

typedef struct ITPCCVtbl
{
    BEGIN_INTERFACE

    HRESULT ( STDMETHODCALLTYPE __RPC_FAR *QueryInterface )(
        ITPCC __RPC_FAR * This,
        /* [in] */ REFIID riid,
        /* [iid_is][out] */ void __RPC_FAR *__RPC_FAR *ppvObject);

    ULONG ( STDMETHODCALLTYPE __RPC_FAR *AddRef )(
        ITPCC __RPC_FAR * This);

    ULONG ( STDMETHODCALLTYPE __RPC_FAR *Release )(
        ITPCC __RPC_FAR * This);

    HRESULT ( STDMETHODCALLTYPE __RPC_FAR *NewOrder )(
        ITPCC __RPC_FAR * This,
        /* [in] */ VARIANT txn_in,
        /* [out] */ VARIANT __RPC_FAR *txn_out);

    HRESULT ( STDMETHODCALLTYPE __RPC_FAR *Payment )(
        ITPCC __RPC_FAR * This,
        /* [in] */ VARIANT txn_in,
        /* [out] */ VARIANT __RPC_FAR *txn_out);

    HRESULT ( STDMETHODCALLTYPE __RPC_FAR *Delivery )(
        ITPCC __RPC_FAR * This,
        /* [in] */ VARIANT txn_in,
        /* [out] */ VARIANT __RPC_FAR *txn_out);

    HRESULT ( STDMETHODCALLTYPE __RPC_FAR *StockLevel )(
        ITPCC __RPC_FAR * This,
        /* [in] */ VARIANT txn_in,
        /* [out] */ VARIANT __RPC_FAR *txn_out);

    HRESULT ( STDMETHODCALLTYPE __RPC_FAR *OrderStatus )(
        ITPCC __RPC_FAR * This,
        /* [in] */ VARIANT txn_in,
        /* [out] */ VARIANT __RPC_FAR *txn_out);

    HRESULT ( STDMETHODCALLTYPE __RPC_FAR *CallSetComplete )(
        ITPCC __RPC_FAR * This);

    END_INTERFACE
};

#endif

#endif
```

## Appendix B – Database Design

---

```
    } ITPCCVtbl;

    interface ITPCC
    {
        CONST_VTBL struct ITPCCVtbl __RPC_FAR *lpVtbl;
    };

#ifdef COBJMACROS

#define ITPCC_QueryInterface(This,riid,ppvObject) \
    (This)->lpVtbl -> QueryInterface(This,riid,ppvObject)

#define ITPCC_AddRef(This) \
    (This)->lpVtbl -> AddRef(This)

#define ITPCC_Release(This) \
    (This)->lpVtbl -> Release(This)

#define ITPCC_NewOrder(This,txn_in,txn_out) \
    (This)->lpVtbl -> NewOrder(This,txn_in,txn_out)

#define ITPCC_Payment(This,txn_in,txn_out) \
    (This)->lpVtbl -> Payment(This,txn_in,txn_out)

#define ITPCC_Delivery(This,txn_in,txn_out) \
    (This)->lpVtbl -> Delivery(This,txn_in,txn_out)

#define ITPCC_StockLevel(This,txn_in,txn_out) \
    (This)->lpVtbl -> StockLevel(This,txn_in,txn_out)

#define ITPCC_OrderStatus(This,txn_in,txn_out) \
    (This)->lpVtbl -> OrderStatus(This,txn_in,txn_out)

#define ITPCC_CallSetComplete(This) \
    (This)->lpVtbl -> CallSetComplete(This)

#endif /* COBJMACROS */

#endif /* C style interface */

HRESULT __stdcall ITPCC_NewOrder_Proxy(
    ITPCC __RPC_FAR * This,
    /* [in] */ VARIANT txn_in,
    /* [out] */ VARIANT __RPC_FAR *txn_out);

void __RPC_STUB ITPCC_NewOrder_Stub(
    IRpcStubBuffer *This,
    IRpcChannelBuffer *_pRpcChannelBuffer,
    PRPC_MESSAGE _pRpcMessage,
    DWORD *_pdwStubPhase);

HRESULT __stdcall ITPCC_Payment_Proxy(
    ITPCC __RPC_FAR * This,
    /* [in] */ VARIANT txn_in,
    /* [out] */ VARIANT __RPC_FAR *txn_out);

void __RPC_STUB ITPCC_Payment_Stub(
    IRpcStubBuffer *This,
    IRpcChannelBuffer *_pRpcChannelBuffer,
    PRPC_MESSAGE _pRpcMessage,
    DWORD *_pdwStubPhase);

HRESULT __stdcall ITPCC_Delivery_Proxy(
    ITPCC __RPC_FAR * This,
    /* [in] */ VARIANT txn_in,
    /* [out] */ VARIANT __RPC_FAR *txn_out);

void __RPC_STUB ITPCC_Delivery_Stub(
    IRpcStubBuffer *This,
    IRpcChannelBuffer *_pRpcChannelBuffer,
    PRPC_MESSAGE _pRpcMessage,
    DWORD *_pdwStubPhase);

HRESULT __stdcall ITPCC_StockLevel_Proxy(
    ITPCC __RPC_FAR * This,
    /* [in] */ VARIANT txn_in,
    /* [out] */ VARIANT __RPC_FAR *txn_out);

void __RPC_STUB ITPCC_StockLevel_Stub(
```

## Appendix B – Database Design

---

```
IRpcStubBuffer *This,
IRpcChannelBuffer *_pRpcChannelBuffer,
PRPC_MESSAGE _pRpcMessage,
DWORD *_pdwStubPhase);

HRESULT __stdcall ITPCC_OrderStatus_Proxy(
ITPCC __RPC_FAR * This,
/* [in] */ VARIANT txn_in,
/* [out] */ VARIANT __RPC_FAR *txn_out);

void __RPC_STUB ITPCC_OrderStatus_Stub(
IRpcStubBuffer *This,
IRpcChannelBuffer *_pRpcChannelBuffer,
PRPC_MESSAGE _pRpcMessage,
DWORD *_pdwStubPhase);

HRESULT __stdcall ITPCC_CallSetComplete_Proxy(
ITPCC __RPC_FAR * This);

void __RPC_STUB ITPCC_CallSetComplete_Stub(
IRpcStubBuffer *This,
IRpcChannelBuffer *_pRpcChannelBuffer,
PRPC_MESSAGE _pRpcMessage,
DWORD *_pdwStubPhase);

#endif /* __ITPCC_INTERFACE_DEFINED__ */

/* Additional Prototypes for ALL interfaces */

unsigned long          __RPC_USER  VARIANT_UserSize(      unsigned long __RPC_FAR *, unsigned long          ,
VARIANT __RPC_FAR * );
unsigned char __RPC_FAR * __RPC_USER  VARIANT_UserMarshal(  unsigned long __RPC_FAR *, unsigned char __RPC_FAR *,
VARIANT __RPC_FAR * );
unsigned char __RPC_FAR * __RPC_USER  VARIANT_UserUnmarshal(unsigned long __RPC_FAR *, unsigned char __RPC_FAR *,
VARIANT __RPC_FAR * );
void                __RPC_USER  VARIANT_UserFree(      unsigned long __RPC_FAR *, VARIANT __RPC_FAR * );

/* end of Additional Prototypes */

#ifdef __cplusplus
}
#endif
#endif

#endif
```

### tpcc\_com\_ps/src/tpcc\_com\_ps.idl

```
/*      FILE:          ITPCC.IDL
 *
 *      Microsoft TPC-C Kit Ver. 4.20.000
 *      Copyright Microsoft, 1999
 *
 *      All Rights Reserved
 *
 *      not yet audited
 *
 *      PURPOSE:  Defines the interface used by TPC-C. This interface can be implemented by C++ components.
 *
 *      Change history:
 *      4.20.000 - first version
 */

// Forward declare all types defined
interface ITPCC;
import "oidl.idl";
import "ocidl.idl";

[
    object,
    oleautomation,
    uuid(FEEE6AA2-84B1-11d2-BA47-00C04FBFE08B),
    helpstring("ITPCC Interface"),
    pointer_default(unique)
]
interface ITPCC : IUnknown
{
    HRESULT __stdcall NewOrder

    (
        [in] VARIANT txn_in
```

## Appendix B – Database Design

---

```
[out] VARIANT *txn_out
);

HRESULT _stdcall Payment
(
[in] VARIANT txn_in,
[out] VARIANT *txn_out
);

HRESULT _stdcall Delivery
(
[in] VARIANT txn_in,
[out] VARIANT *txn_out
);

HRESULT _stdcall StockLevel
(
[in] VARIANT txn_in,
[out] VARIANT *txn_out
);

HRESULT _stdcall OrderStatus
(
[in] VARIANT txn_in,
[out] VARIANT *txn_out
);

HRESULT _stdcall CallSetComplete
(
);

}; // interface ITPCC
```

### tpcc\_com\_ps/src/tpcc\_com\_ps\_i.c

```
#pragma warning( disable: 4049 ) /* more than 64k source lines */

/* this ALWAYS GENERATED file contains the IIDs and CLSIDs */

/* link this file in with the server and any clients */

/* File created by MIDL compiler version 5.03.0280 */
/* at Sat Apr 08 16:40:10 2000
*/
/* Compiler settings for .\src\tpcc_com_ps.idl:
Oicf (OptLev=i2), Wl, Zp8, env=Win32 (32b run), ms_ext, c_ext
error checks: allocation ref bounds_check enum stub_data
VC __declspec() decoration level:
__declspec(uuid()), __declspec(selectany), __declspec(novtable)
DECLSPEC_UUID(), MIDL_INTERFACE()
*/
//@@MIDL_FILE_HEADING( )

#if !defined(_M_IA64) && !defined(_M_AXP64)

#ifdef __cplusplus
extern "C"{
#endif

#include <rpc.h>
#include <rpcndr.h>

#ifdef _MIDL_USE_GUIDDEF_

#ifndef INITGUID
#define INITGUID
#include <guiddef.h>
#undef INITGUID
#else
#include <guiddef.h>
#endif

#define MIDL_DEFINE_GUID(type,name,l,w1,w2,b1,b2,b3,b4,b5,b6,b7,b8) \
DEFINE_GUID(name,l,w1,w2,b1,b2,b3,b4,b5,b6,b7,b8)

#else // !_MIDL_USE_GUIDDEF_

#ifdef __IID_DEFINED__
#define __IID_DEFINED__
typedef struct _IID
{
```

## Appendix B – Database Design

---

```
    unsigned long x;
    unsigned short s1;
    unsigned short s2;
    unsigned char c[8];
} IID;

#endif // __IID_DEFINED__

#ifndef CLSID_DEFINED
#define CLSID_DEFINED
typedef IID CLSID;
#endif // CLSID_DEFINED

#define MIDL_DEFINE_GUID(type,name,l,w1,w2,b1,b2,b3,b4,b5,b6,b7,b8) \
    const type name = {l,w1,w2,{b1,b2,b3,b4,b5,b6,b7,b8}}

#endif !_MIDL_USE_GUIDDEF_

MIDL_DEFINE_GUID(IID, IID_ITPCC,0xFEE6AA2,0x84B1,0x11d2,0xBA,0x47,0x00,0xC0,0x4F,0xBF,0xE0,0x8B);

#undef MIDL_DEFINE_GUID

#ifdef __cplusplus
}
#endif

#endif /* !defined(_M_IA64) && !defined(_M_AXP64)*/

#pragma warning( disable: 4049 ) /* more than 64k source lines */

/* this ALWAYS GENERATED file contains the IIDs and CLSIDs */

/* link this file in with the server and any clients */

/* File created by MIDL compiler version 5.03.0280 */
/* at Sat Apr 08 16:40:10 2000 */
/*
/* Compiler settings for .\src\tpcc_com_ps.idl:
    Oicf (OptLev=i2), Wl, Zp8, env=Win64 (32b run,appending), ms_ext, c_ext, robust
    error checks: allocation ref bounds_check enum stub_data
    VC __declspec() decoration level:
        __declspec(uuid()), __declspec(selectany), __declspec(novtable)
        DECLSPEC_UUID(), MIDL_INTERFACE()
*/
//@@MIDL_FILE_HEADING(  )

#if defined(_M_IA64) || defined(_M_AXP64)

#ifdef __cplusplus
extern "C"{
#endif

#include <rpc.h>
#include <rpcndr.h>

#ifdef _MIDL_USE_GUIDDEF_

#ifndef INITGUID
#define INITGUID
#include <guiddef.h>
#undef INITGUID
#else
#include <guiddef.h>
#endif

#define MIDL_DEFINE_GUID(type,name,l,w1,w2,b1,b2,b3,b4,b5,b6,b7,b8) \
    DEFINE_GUID(name,l,w1,w2,b1,b2,b3,b4,b5,b6,b7,b8)

#else // !_MIDL_USE_GUIDDEF_

#ifndef __IID_DEFINED__
#define __IID_DEFINED__

typedef struct _IID
{
    unsigned long x;
    unsigned short s1;
    unsigned short s2;
    unsigned char c[8];
} IID;

#endif // __IID_DEFINED__

#ifndef CLSID_DEFINED
#define CLSID_DEFINED
typedef IID CLSID;
#endif // CLSID_DEFINED
```

# Appendix B – Database Design

---

```
#define MIDL_DEFINE_GUID(type,name,l,w1,w2,b1,b2,b3,b4,b5,b6,b7,b8) \  
    const type name = {l,w1,w2,{b1,b2,b3,b4,b5,b6,b7,b8}}  
  
#endif !_MIDL_USE_GUIDDEF_  
  
MIDL_DEFINE_GUID(IID, IID_ITPCC,0xFEE6AA2,0x84B1,0x11d2,0xBA,0x47,0x00,0xC0,0x4F,0xBF,0xE0,0x8B);  
  
#undef MIDL_DEFINE_GUID  
  
#ifdef __cplusplus  
}  
#endif  
  
#endif /* defined(_M_IA64) || defined(_M_AXP64)*/
```

## tpcc\_com\_ps/src/tpcc\_com\_ps\_p.c

```
#pragma warning( disable: 4049 ) /* more than 64k source lines */  
  
/* this ALWAYS GENERATED file contains the proxy stub code */  
  
/* File created by MIDL compiler version 5.03.0280 */  
/* at Sat Apr 08 16:40:10 2000 */  
/*  
/* Compiler settings for .\src\tpcc_com_ps.idl:  
    Oicf (OptLev=i2), Wl, Zp8, env=Win32 (32b run), ms_ext, c_ext  
    error checks: allocation ref bounds_check enum stub_data  
    VC __declspec() decoration level:  
        __declspec(uuid()), __declspec(selectany), __declspec(novtable)  
    DECLSPEC_UUID(), MIDL_INTERFACE()  
*/  
//@@MIDL_FILE_HEADING( )  
  
#if !defined(_M_IA64) && !defined(_M_AXP64)  
#define USE_STUBLESS_PROXY  
  
/* verify that the <rpcproxy.h> version is high enough to compile this file*/  
#ifndef __REDQ_RPCPROXY_H_VERSION__  
#define __REQUIRED_RPCPROXY_H_VERSION__ 440  
#endif  
  
#include "rpcproxy.h"  
#ifndef __RPCPROXY_H_VERSION__  
#error this stub requires an updated version of <rpcproxy.h>  
#endif // __RPCPROXY_H_VERSION__  
  
#include "tpcc_com_ps.h"  
  
#define TYPE_FORMAT_STRING_SIZE 997  
#define PROC_FORMAT_STRING_SIZE 193  
#define TRANSMIT_AS_TABLE_SIZE 0  
#define WIRE_MARSHAL_TABLE_SIZE 1  
  
typedef struct _MIDL_TYPE_FORMAT_STRING  
{  
    short Pad;  
    unsigned char Format[ TYPE_FORMAT_STRING_SIZE ];  
} MIDL_TYPE_FORMAT_STRING;  
  
typedef struct _MIDL_PROC_FORMAT_STRING  
{  
    short Pad;  
    unsigned char Format[ PROC_FORMAT_STRING_SIZE ];  
} MIDL_PROC_FORMAT_STRING;  
  
extern const MIDL_TYPE_FORMAT_STRING __MIDL_TypeFormatString;  
extern const MIDL_PROC_FORMAT_STRING __MIDL_ProcFormatString;  
  
/* Standard interface: __MIDL_itf_tpcc_com_ps_0000, ver. 0.0,  
    GUID={0x00000000,0x0000,0x0000,{0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00}} */  
  
/* Object interface: IUnknown, ver. 0.0,  
    GUID={0x00000000,0x0000,0x0000,{0xc0,0x00,0x00,0x00,0x00,0x00,0x00,0x46}} */  
  
/* Object interface: ITPCC, ver. 0.0,  
    GUID={0x8BEE6AA2,0x84B1,0x11d2,{0xBA,0x47,0x00,0xC0,0x4F,0xBF,0xE0,0x8B}} */
```

## Appendix B – Database Design

---

```
extern const MIDL_STUB_DESC Object_StubDesc;

extern const MIDL_SERVER_INFO ITPCC_ServerInfo;

#pragma code_seg(".orpc")
static const unsigned short ITPCC_FormatStringOffsetTable[] =
{
    0,
    34,
    68,
    102,
    136,
    170
};

static const MIDL_SERVER_INFO ITPCC_ServerInfo =
{
    &Object_StubDesc,
    0,
    __MIDL_ProcFormatString.Format,
    &ITPCC_FormatStringOffsetTable[-3],
    0,
    0,
    0,
    0
};

static const MIDL_STUBLESS_PROXY_INFO ITPCC_ProxyInfo =
{
    &Object_StubDesc,
    __MIDL_ProcFormatString.Format,
    &ITPCC_FormatStringOffsetTable[-3],
    0,
    0,
    0
};

CINTERFACE_PROXY_VTABLE(9) _ITPCCProxyVtbl =
{
    &ITPCC_ProxyInfo,
    &IID_ITPCC,
    IUnknown_QueryInterface_Proxy,
    IUnknown_AddRef_Proxy,
    IUnknown_Release_Proxy ,
    (void *)-1 /* ITPCC::NewOrder */ ,
    (void *)-1 /* ITPCC::Payment */ ,
    (void *)-1 /* ITPCC::Delivery */ ,
    (void *)-1 /* ITPCC::StockLevel */ ,
    (void *)-1 /* ITPCC::OrderStatus */ ,
    (void *)-1 /* ITPCC::CallSetComplete */
};

const CInterfaceStubVtbl _ITPCCStubVtbl =
{
    &IID_ITPCC,
    &ITPCC_ServerInfo,
    9,
    0, /* pure interpreted */
    CStdStubBuffer_METHODS
};

extern const USER_MARSHAL_ROUTINE_QUADRUPLE UserMarshalRoutines[ WIRE_MARSHAL_TABLE_SIZE ];

static const MIDL_STUB_DESC Object_StubDesc =
{
    0,
    NdrOleAllocate,
    NdrOleFree,
    0,
    0,
    0,
    0,
    0,
    0,
    __MIDL_TypeFormatString.Format,
    1, /* -error bounds_check flag */
    0x20000, /* Ndr library version */
    0,
    0x5030118, /* MIDL Version 5.4.280 */
    0,
    UserMarshalRoutines,
    0, /* notify & notify_flag routine table */
    0x1, /* MIDL flag */
    0, /* Reserved3 */
    0, /* Reserved4 */
    0 /* Reserved5 */
};

#pragma data_seg(".rdata")

static const USER_MARSHAL_ROUTINE_QUADRUPLE UserMarshalRoutines[ WIRE_MARSHAL_TABLE_SIZE ] =
```



# Appendix B – Database Design

---

```
{
    {
        VARIANT_UserSize
        ,VARIANT_UserMarshal
        ,VARIANT_UserUnmarshal
        ,VARIANT_UserFree
    }
};

#if !defined(__RPC_WIN32__)
#error Invalid build platform for this stub.
#endif

#if !(TARGET_IS_NT40_OR_LATER)
#error You need a Windows NT 4.0 or later to run this stub because it uses these features:
#error -Oif or -Oicf, [wire_marshal] or [user_marshal] attribute.
#error However, your C/C++ compilation flags indicate you intend to run this app on earlier systems.
#error This app will die there with the RPC_X_WRONG_STUB_VERSION error.
#endif

static const MIDL_PROC_FORMAT_STRING __MIDL_ProcFormatString =
{
    0,
    {
        /* Procedure NewOrder */

        0x33,          /* FC_AUTO_HANDLE */
        0x6c,          /* Old Flags: object, Oi2 */
        /* 2 */ NdrFcLong( 0x0 ), /* 0 */
        /* 6 */ NdrFcShort( 0x3 ), /* 3 */
#ifdef _ALPHA_
#ifdef _PPC_
#if !defined(_MIPS_)
/* 8 */ NdrFcShort( 0x1c ), /* x86 Stack size/offset = 28 */
#else
NdrFcShort( 0x20 ), /* MIPS Stack size/offset = 32 */
#endif
#else
NdrFcShort( 0x20 ), /* PPC Stack size/offset = 32 */
#endif
#else
NdrFcShort( 0x28 ), /* Alpha Stack size/offset = 40 */
#endif
/* 10 */ NdrFcShort( 0x0 ), /* 0 */
/* 12 */ NdrFcShort( 0x8 ), /* 8 */
/* 14 */ 0x7, /* Oi2 Flags: srv must size, clt must size, has return, */
        0x3,          /* 3 */

        /* Parameter txn_in */

        /* 16 */ NdrFcShort( 0x8b ), /* Flags: must size, must free, in, by val, */
#ifdef _ALPHA_
#ifdef _PPC_
#if !defined(_MIPS_)
/* 18 */ NdrFcShort( 0x4 ), /* x86 Stack size/offset = 4 */
#else
NdrFcShort( 0x8 ), /* MIPS Stack size/offset = 8 */
#endif
#else
NdrFcShort( 0x8 ), /* PPC Stack size/offset = 8 */
#endif
#else
NdrFcShort( 0x8 ), /* Alpha Stack size/offset = 8 */
#endif
/* 20 */ NdrFcShort( 0x3c8 ), /* Type Offset=968 */

        /* Parameter txn_out */

        /* 22 */ NdrFcShort( 0x4113 ), /* Flags: must size, must free, out, simple ref, srv alloc size=16 */
#ifdef _ALPHA_
#ifdef _PPC_
#if !defined(_MIPS_)
/* 24 */ NdrFcShort( 0x14 ), /* x86 Stack size/offset = 20 */
#else
NdrFcShort( 0x18 ), /* MIPS Stack size/offset = 24 */
#endif
#else
NdrFcShort( 0x18 ), /* PPC Stack size/offset = 24 */
#endif
#else
NdrFcShort( 0x18 ), /* Alpha Stack size/offset = 24 */
#endif
/* 26 */ NdrFcShort( 0x3da ), /* Type Offset=986 */

        /* Return value */

        /* 28 */ NdrFcShort( 0x70 ), /* Flags: out, return, base type, */
#ifdef _ALPHA_

```

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---

```
#ifndef _PPC_
#if !defined(_MIPS_)
/* 30 */ NdrFcShort( 0x18 ), /* x86 Stack size/offset = 24 */
#else
NdrFcShort( 0x1c ), /* MIPS Stack size/offset = 28 */
#endif
#else
NdrFcShort( 0x1c ), /* PPC Stack size/offset = 28 */
#endif
#else
NdrFcShort( 0x20 ), /* Alpha Stack size/offset = 32 */
#endif
/* 32 */ 0x8, /* FC_LONG */
0x0, /* 0 */

/* Procedure Payment */

/* 34 */ 0x33, /* FC_AUTO_HANDLE */
0x6c, /* Old Flags: object, Oi2 */
/* 36 */ NdrFcLong( 0x0 ), /* 0 */
/* 40 */ NdrFcShort( 0x4 ), /* 4 */
#ifdef _ALPHA_
#ifdef _PPC_
#if !defined(_MIPS_)
/* 42 */ NdrFcShort( 0x1c ), /* x86 Stack size/offset = 28 */
#else
NdrFcShort( 0x20 ), /* MIPS Stack size/offset = 32 */
#endif
#else
NdrFcShort( 0x20 ), /* PPC Stack size/offset = 32 */
#endif
#else
NdrFcShort( 0x28 ), /* Alpha Stack size/offset = 40 */
#endif
/* 44 */ NdrFcShort( 0x0 ), /* 0 */
/* 46 */ NdrFcShort( 0x8 ), /* 8 */
/* 48 */ 0x7, /* Oi2 Flags: srv must size, clt must size, has return, */
0x3, /* 3 */

/* Parameter txn_in */

/* 50 */ NdrFcShort( 0x8b ), /* Flags: must size, must free, in, by val, */
#ifdef _ALPHA_
#ifdef _PPC_
#if !defined(_MIPS_)
/* 52 */ NdrFcShort( 0x4 ), /* x86 Stack size/offset = 4 */
#else
NdrFcShort( 0x8 ), /* MIPS Stack size/offset = 8 */
#endif
#else
NdrFcShort( 0x8 ), /* PPC Stack size/offset = 8 */
#endif
#else
NdrFcShort( 0x8 ), /* Alpha Stack size/offset = 8 */
#endif
/* 54 */ NdrFcShort( 0x3c8 ), /* Type Offset=968 */

/* Parameter txn_out */

/* 56 */ NdrFcShort( 0x4113 ), /* Flags: must size, must free, out, simple ref, srv alloc size=16 */
#ifdef _ALPHA_
#ifdef _PPC_
#if !defined(_MIPS_)
/* 58 */ NdrFcShort( 0x14 ), /* x86 Stack size/offset = 20 */
#else
NdrFcShort( 0x18 ), /* MIPS Stack size/offset = 24 */
#endif
#else
NdrFcShort( 0x18 ), /* PPC Stack size/offset = 24 */
#endif
#else
NdrFcShort( 0x18 ), /* Alpha Stack size/offset = 24 */
#endif
/* 60 */ NdrFcShort( 0x3da ), /* Type Offset=986 */

/* Return value */

/* 62 */ NdrFcShort( 0x70 ), /* Flags: out, return, base type, */
#ifdef _ALPHA_
#ifdef _PPC_
#if !defined(_MIPS_)
/* 64 */ NdrFcShort( 0x18 ), /* x86 Stack size/offset = 24 */
#else
NdrFcShort( 0x1c ), /* MIPS Stack size/offset = 28 */
#endif
#else
NdrFcShort( 0x1c ), /* PPC Stack size/offset = 28 */
#endif
#else
NdrFcShort( 0x20 ), /* Alpha Stack size/offset = 32 */
#endif
/* 66 */ 0x8, /* FC_LONG */
0x0, /* 0 */
```

# Appendix B – Database Design

---

```
        /* Procedure Delivery */

/* 68 */ 0x33,          /* FC_AUTO_HANDLE */
          0x6c,          /* Old Flags: object, Oi2 */
/* 70 */ NdrFcLong( 0x0 ), /* 0 */
/* 74 */ NdrFcShort( 0x5 ), /* 5 */
#ifdef _ALPHA_
#ifdef _PPC_
#if !defined(_MIPS_)
/* 76 */ NdrFcShort( 0x1c ), /* x86 Stack size/offset = 28 */
#else
                                NdrFcShort( 0x20 ), /* MIPS Stack size/offset = 32 */
#endif
#endif
#else
                                NdrFcShort( 0x20 ), /* PPC Stack size/offset = 32 */
#endif
#else
                                NdrFcShort( 0x28 ), /* Alpha Stack size/offset = 40 */
#endif
/* 78 */ NdrFcShort( 0x0 ), /* 0 */
/* 80 */ NdrFcShort( 0x8 ), /* 8 */
/* 82 */ 0x7,          /* Oi2 Flags: srv must size, clt must size, has return, */
          0x3,          /* 3 */

        /* Parameter txn_in */

/* 84 */ NdrFcShort( 0x8b ), /* Flags: must size, must free, in, by val, */
#ifdef _ALPHA_
#ifdef _PPC_
#if !defined(_MIPS_)
/* 86 */ NdrFcShort( 0x4 ), /* x86 Stack size/offset = 4 */
#else
                                NdrFcShort( 0x8 ), /* MIPS Stack size/offset = 8 */
#endif
#endif
#else
                                NdrFcShort( 0x8 ), /* PPC Stack size/offset = 8 */
#endif
#else
                                NdrFcShort( 0x8 ), /* Alpha Stack size/offset = 8 */
#endif
/* 88 */ NdrFcShort( 0x3c8 ), /* Type Offset=968 */

        /* Parameter txn_out */

/* 90 */ NdrFcShort( 0x4113 ), /* Flags: must size, must free, out, simple ref, srv alloc size=16 */
#ifdef _ALPHA_
#ifdef _PPC_
#if !defined(_MIPS_)
/* 92 */ NdrFcShort( 0x14 ), /* x86 Stack size/offset = 20 */
#else
                                NdrFcShort( 0x18 ), /* MIPS Stack size/offset = 24 */
#endif
#endif
#else
                                NdrFcShort( 0x18 ), /* PPC Stack size/offset = 24 */
#endif
#else
                                NdrFcShort( 0x18 ), /* Alpha Stack size/offset = 24 */
#endif
/* 94 */ NdrFcShort( 0x3da ), /* Type Offset=986 */

        /* Return value */

/* 96 */ NdrFcShort( 0x70 ), /* Flags: out, return, base type, */
#ifdef _ALPHA_
#ifdef _PPC_
#if !defined(_MIPS_)
/* 98 */ NdrFcShort( 0x18 ), /* x86 Stack size/offset = 24 */
#else
                                NdrFcShort( 0x1c ), /* MIPS Stack size/offset = 28 */
#endif
#endif
#else
                                NdrFcShort( 0x1c ), /* PPC Stack size/offset = 28 */
#endif
#else
                                NdrFcShort( 0x20 ), /* Alpha Stack size/offset = 32 */
#endif
/* 100 */ 0x8,          /* FC_LONG */
          0x0,          /* 0 */

        /* Procedure StockLevel */

/* 102 */ 0x33,          /* FC_AUTO_HANDLE */
          0x6c,          /* Old Flags: object, Oi2 */
/* 104 */ NdrFcLong( 0x0 ), /* 0 */
/* 108 */ NdrFcShort( 0x6 ), /* 6 */
#ifdef _ALPHA_
#ifdef _PPC_
#if !defined(_MIPS_)
/* 110 */ NdrFcShort( 0x1c ), /* x86 Stack size/offset = 28 */
#else
                                NdrFcShort( 0x20 ), /* MIPS Stack size/offset = 32 */
#endif
#endif
#endif
#endif
```

# Appendix B – Database Design

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```
#else
                                NdrFcShort( 0x20 ), /* PPC Stack size/offset = 32 */
#endif
#else
                                NdrFcShort( 0x28 ), /* Alpha Stack size/offset = 40 */
#endif
/* 112 */ NdrFcShort( 0x0 ), /* 0 */
/* 114 */ NdrFcShort( 0x8 ), /* 8 */
/* 116 */ 0x7, /* Oi2 Flags: srv must size, clt must size, has return, */
                                0x3, /* 3 */

/* Parameter txn_in */

/* 118 */ NdrFcShort( 0x8b ), /* Flags: must size, must free, in, by val, */
#ifdef _ALPHA_
#ifdef _PPC_
#if !defined(_MIPS_)
/* 120 */ NdrFcShort( 0x4 ), /* x86 Stack size/offset = 4 */
#else
                                NdrFcShort( 0x8 ), /* MIPS Stack size/offset = 8 */
#endif
#endif
#else
                                NdrFcShort( 0x8 ), /* PPC Stack size/offset = 8 */
#endif
#else
                                NdrFcShort( 0x8 ), /* Alpha Stack size/offset = 8 */
#endif
/* 122 */ NdrFcShort( 0x3c8 ), /* Type Offset=968 */

/* Parameter txn_out */

/* 124 */ NdrFcShort( 0x4113 ), /* Flags: must size, must free, out, simple ref, srv alloc size=16 */
#ifdef _ALPHA_
#ifdef _PPC_
#if !defined(_MIPS_)
/* 126 */ NdrFcShort( 0x14 ), /* x86 Stack size/offset = 20 */
#else
                                NdrFcShort( 0x18 ), /* MIPS Stack size/offset = 24 */
#endif
#endif
#else
                                NdrFcShort( 0x18 ), /* PPC Stack size/offset = 24 */
#endif
#else
                                NdrFcShort( 0x18 ), /* Alpha Stack size/offset = 24 */
#endif
/* 128 */ NdrFcShort( 0x3da ), /* Type Offset=986 */

/* Return value */

/* 130 */ NdrFcShort( 0x70 ), /* Flags: out, return, base type, */
#ifdef _ALPHA_
#ifdef _PPC_
#if !defined(_MIPS_)
/* 132 */ NdrFcShort( 0x18 ), /* x86 Stack size/offset = 24 */
#else
                                NdrFcShort( 0x1c ), /* MIPS Stack size/offset = 28 */
#endif
#endif
#else
                                NdrFcShort( 0x1c ), /* PPC Stack size/offset = 28 */
#endif
#else
                                NdrFcShort( 0x20 ), /* Alpha Stack size/offset = 32 */
#endif
/* 134 */ 0x8, /* FC_LONG */
                                0x0, /* 0 */

/* Procedure OrderStatus */

/* 136 */ 0x33, /* FC_AUTO_HANDLE */
                                0x6c, /* Old Flags: object, Oi2 */
/* 138 */ NdrFcLong( 0x0 ), /* 0 */
/* 142 */ NdrFcShort( 0x7 ), /* 7 */
#ifdef _ALPHA_
#ifdef _PPC_
#if !defined(_MIPS_)
/* 144 */ NdrFcShort( 0x1c ), /* x86 Stack size/offset = 28 */
#else
                                NdrFcShort( 0x20 ), /* MIPS Stack size/offset = 32 */
#endif
#endif
#else
                                NdrFcShort( 0x20 ), /* PPC Stack size/offset = 32 */
#endif
#else
                                NdrFcShort( 0x28 ), /* Alpha Stack size/offset = 40 */
#endif
/* 146 */ NdrFcShort( 0x0 ), /* 0 */
/* 148 */ NdrFcShort( 0x8 ), /* 8 */
/* 150 */ 0x7, /* Oi2 Flags: srv must size, clt must size, has return, */
                                0x3, /* 3 */

/* Parameter txn_in */

/* 152 */ NdrFcShort( 0x8b ), /* Flags: must size, must free, in, by val, */
```

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---

```
#ifndef _ALPHA_
#ifndef _PPC_
#if !defined(_MIPS_)
/* 154 */ NdrFcShort( 0x4 ), /* x86 Stack size/offset = 4 */
#else
NdrFcShort( 0x8 ), /* MIPS Stack size/offset = 8 */
#endif
#else
NdrFcShort( 0x8 ), /* PPC Stack size/offset = 8 */
#endif
#else
NdrFcShort( 0x8 ), /* Alpha Stack size/offset = 8 */
#endif
/* 156 */ NdrFcShort( 0x3c8 ), /* Type Offset=968 */

/* Parameter txn_out */

/* 158 */ NdrFcShort( 0x4113 ), /* Flags: must size, must free, out, simple ref, srv alloc size=16 */
#ifndef _ALPHA_
#ifndef _PPC_
#if !defined(_MIPS_)
/* 160 */ NdrFcShort( 0x14 ), /* x86 Stack size/offset = 20 */
#else
NdrFcShort( 0x18 ), /* MIPS Stack size/offset = 24 */
#endif
#else
NdrFcShort( 0x18 ), /* PPC Stack size/offset = 24 */
#endif
#else
NdrFcShort( 0x18 ), /* Alpha Stack size/offset = 24 */
#endif
/* 162 */ NdrFcShort( 0x3da ), /* Type Offset=986 */

/* Return value */

/* 164 */ NdrFcShort( 0x70 ), /* Flags: out, return, base type, */
#ifndef _ALPHA_
#ifndef _PPC_
#if !defined(_MIPS_)
/* 166 */ NdrFcShort( 0x18 ), /* x86 Stack size/offset = 24 */
#else
NdrFcShort( 0x1c ), /* MIPS Stack size/offset = 28 */
#endif
#else
NdrFcShort( 0x1c ), /* PPC Stack size/offset = 28 */
#endif
#else
NdrFcShort( 0x20 ), /* Alpha Stack size/offset = 32 */
#endif
/* 168 */ 0x8, /* FC_LONG */
0x0, /* 0 */

/* Procedure CallSetComplete */

/* 170 */ 0x33, /* FC_AUTO_HANDLE */
0x6c, /* Old Flags: object, Oi2 */
/* 172 */ NdrFcLong( 0x0 ), /* 0 */
/* 176 */ NdrFcShort( 0x8 ), /* 8 */
#ifndef _ALPHA_
/* 178 */ NdrFcShort( 0x8 ), /* x86, MIPS, PPC Stack size/offset = 8 */
#else
NdrFcShort( 0x10 ), /* Alpha Stack size/offset = 16 */
#endif
/* 180 */ NdrFcShort( 0x0 ), /* 0 */
/* 182 */ NdrFcShort( 0x8 ), /* 8 */
/* 184 */ 0x4, /* Oi2 Flags: has return, */
0x1, /* 1 */

/* Return value */

/* 186 */ NdrFcShort( 0x70 ), /* Flags: out, return, base type, */
#ifndef _ALPHA_
/* 188 */ NdrFcShort( 0x4 ), /* x86, MIPS, PPC Stack size/offset = 4 */
#else
NdrFcShort( 0x8 ), /* Alpha Stack size/offset = 8 */
#endif
/* 190 */ 0x8, /* FC_LONG */
0x0, /* 0 */

0x0
}
};

static const MIDL_TYPE_FORMAT_STRING __MIDL_TypeFormatString =
{
0,
{
NdrFcShort( 0x0 ), /* 0 */
/* 2 */
0x12, 0x0, /* FC_UP */
/* 4 */ NdrFcShort( 0x3b0 ), /* Offset= 944 (948) */
/* 6 */
0x2b, /* FC_NON_ENCAPSULATED UNION */

```

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```
/* 8 */ 0x7, 0x9, /* FC_ULONG */
/* 10 */ NdrFcShort( 0xffff8 ), /* -8 */
/* 12 */ NdrFcShort( 0x2 ), /* Offset= 2 (14) */
/* 14 */ NdrFcShort( 0x10 ), /* 16 */
/* 16 */ NdrFcShort( 0x2b ), /* 43 */
/* 18 */ NdrFcLong( 0x3 ), /* 3 */
/* 22 */ NdrFcShort( 0x8008 ), /* Simple arm type: FC_LONG */
/* 24 */ NdrFcLong( 0x11 ), /* 17 */
/* 28 */ NdrFcShort( 0x8001 ), /* Simple arm type: FC_BYTE */
/* 30 */ NdrFcLong( 0x2 ), /* 2 */
/* 34 */ NdrFcShort( 0x8006 ), /* Simple arm type: FC_SHORT */
/* 36 */ NdrFcLong( 0x4 ), /* 4 */
/* 40 */ NdrFcShort( 0x800a ), /* Simple arm type: FC_FLOAT */
/* 42 */ NdrFcLong( 0x5 ), /* 5 */
/* 46 */ NdrFcShort( 0x800c ), /* Simple arm type: FC_DOUBLE */
/* 48 */ NdrFcLong( 0xb ), /* 11 */
/* 52 */ NdrFcShort( 0x8006 ), /* Simple arm type: FC_SHORT */
/* 54 */ NdrFcLong( 0xa ), /* 10 */
/* 58 */ NdrFcShort( 0x8008 ), /* Simple arm type: FC_LONG */
/* 60 */ NdrFcLong( 0x6 ), /* 6 */
/* 64 */ NdrFcShort( 0xd6 ), /* Offset= 214 (278) */
/* 66 */ NdrFcLong( 0x7 ), /* 7 */
/* 70 */ NdrFcShort( 0x800c ), /* Simple arm type: FC_DOUBLE */
/* 72 */ NdrFcLong( 0x8 ), /* 8 */
/* 76 */ NdrFcShort( 0xd0 ), /* Offset= 208 (284) */
/* 78 */ NdrFcLong( 0xd ), /* 13 */
/* 82 */ NdrFcShort( 0xe2 ), /* Offset= 226 (308) */
/* 84 */ NdrFcLong( 0x9 ), /* 9 */
/* 88 */ NdrFcShort( 0xee ), /* Offset= 238 (326) */
/* 90 */ NdrFcLong( 0x2000 ), /* 8192 */
/* 94 */ NdrFcShort( 0xfa ), /* Offset= 250 (344) */
/* 96 */ NdrFcLong( 0x24 ), /* 36 */
/* 100 */ NdrFcShort( 0x308 ), /* Offset= 776 (876) */
/* 102 */ NdrFcLong( 0x4024 ), /* 16420 */
/* 106 */ NdrFcShort( 0x302 ), /* Offset= 770 (876) */
/* 108 */ NdrFcLong( 0x4011 ), /* 16401 */
/* 112 */ NdrFcShort( 0x300 ), /* Offset= 768 (880) */
/* 114 */ NdrFcLong( 0x4002 ), /* 16386 */
/* 118 */ NdrFcShort( 0x2fe ), /* Offset= 766 (884) */
/* 120 */ NdrFcLong( 0x4003 ), /* 16387 */
/* 124 */ NdrFcShort( 0x2fc ), /* Offset= 764 (888) */
/* 126 */ NdrFcLong( 0x4004 ), /* 16388 */
/* 130 */ NdrFcShort( 0x2fa ), /* Offset= 762 (892) */
/* 132 */ NdrFcLong( 0x4005 ), /* 16389 */
/* 136 */ NdrFcShort( 0x2f8 ), /* Offset= 760 (896) */
/* 138 */ NdrFcLong( 0x400b ), /* 16395 */
/* 142 */ NdrFcShort( 0x2e6 ), /* Offset= 742 (884) */
/* 144 */ NdrFcLong( 0x400a ), /* 16394 */
/* 148 */ NdrFcShort( 0x2e4 ), /* Offset= 740 (888) */
/* 150 */ NdrFcLong( 0x4006 ), /* 16390 */
/* 154 */ NdrFcShort( 0x2ea ), /* Offset= 746 (900) */
/* 156 */ NdrFcLong( 0x4007 ), /* 16391 */
/* 160 */ NdrFcShort( 0x2e0 ), /* Offset= 736 (896) */
/* 162 */ NdrFcLong( 0x4008 ), /* 16392 */
/* 166 */ NdrFcShort( 0x2e2 ), /* Offset= 738 (904) */
/* 168 */ NdrFcLong( 0x400d ), /* 16397 */
/* 172 */ NdrFcShort( 0x2e0 ), /* Offset= 736 (908) */
/* 174 */ NdrFcLong( 0x4009 ), /* 16393 */
/* 178 */ NdrFcShort( 0x2de ), /* Offset= 734 (912) */
/* 180 */ NdrFcLong( 0x6000 ), /* 24576 */
/* 184 */ NdrFcShort( 0x2dc ), /* Offset= 732 (916) */
/* 186 */ NdrFcLong( 0x400c ), /* 16396 */
/* 190 */ NdrFcShort( 0x2da ), /* Offset= 730 (920) */
/* 192 */ NdrFcLong( 0x10 ), /* 16 */
/* 196 */ NdrFcShort( 0x8002 ), /* Simple arm type: FC_CHAR */
/* 198 */ NdrFcLong( 0x12 ), /* 18 */
/* 202 */ NdrFcShort( 0x8006 ), /* Simple arm type: FC_SHORT */
/* 204 */ NdrFcLong( 0x13 ), /* 19 */
/* 208 */ NdrFcShort( 0x8008 ), /* Simple arm type: FC_LONG */
/* 210 */ NdrFcLong( 0x16 ), /* 22 */
/* 214 */ NdrFcShort( 0x8008 ), /* Simple arm type: FC_LONG */
/* 216 */ NdrFcLong( 0x17 ), /* 23 */
/* 220 */ NdrFcShort( 0x8008 ), /* Simple arm type: FC_LONG */
/* 222 */ NdrFcLong( 0xe ), /* 14 */
/* 226 */ NdrFcShort( 0x2be ), /* Offset= 702 (928) */
/* 228 */ NdrFcLong( 0x400e ), /* 16398 */
/* 232 */ NdrFcShort( 0x2c4 ), /* Offset= 708 (940) */
/* 234 */ NdrFcLong( 0x4010 ), /* 16400 */
/* 238 */ NdrFcShort( 0x2c2 ), /* Offset= 706 (944) */
/* 240 */ NdrFcLong( 0x4012 ), /* 16402 */
/* 244 */ NdrFcShort( 0x280 ), /* Offset= 640 (884) */
/* 246 */ NdrFcLong( 0x4013 ), /* 16403 */
/* 250 */ NdrFcShort( 0x27e ), /* Offset= 638 (888) */
/* 252 */ NdrFcLong( 0x4016 ), /* 16406 */
/* 256 */ NdrFcShort( 0x278 ), /* Offset= 632 (888) */
/* 258 */ NdrFcLong( 0x4017 ), /* 16407 */
/* 262 */ NdrFcShort( 0x272 ), /* Offset= 626 (888) */
/* 264 */ NdrFcLong( 0x0 ), /* 0 */
/* 268 */ NdrFcShort( 0x0 ), /* Offset= 0 (268) */
/* 270 */ NdrFcLong( 0x1 ), /* 1 */
/* 274 */ NdrFcShort( 0x0 ), /* Offset= 0 (274) */
```

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```
/* 276 */ NdrFcShort( 0xffffffff ), /* Offset= -1 (275) */
/* 278 */
                                0x15, /* FC_STRUCT */
                                0x7, /* 7 */
/* 280 */ NdrFcShort( 0x8 ), /* 8 */
/* 282 */ 0xb, /* FC_HYPER */
                                0x5b, /* FC_END */
/* 284 */
                                0x12, 0x0, /* FC_UP */
/* 286 */ NdrFcShort( 0xc ), /* Offset= 12 (298) */
/* 288 */
                                0x1b, /* FC_CARRAY */
                                0x1, /* 1 */
/* 290 */ NdrFcShort( 0x2 ), /* 2 */
/* 292 */ 0x9, /* Corr desc: FC_ULONG */
                                0x0, /* */
/* 294 */ NdrFcShort( 0xfffc ), /* -4 */
/* 296 */ 0x6, /* FC_SHORT */
                                0x5b, /* FC_END */
/* 298 */
                                0x17, /* FC_CSTRUCT */
                                0x3, /* 3 */
/* 300 */ NdrFcShort( 0x8 ), /* 8 */
/* 302 */ NdrFcShort( 0xffffffff2 ), /* Offset= -14 (288) */
/* 304 */ 0x8, /* FC_LONG */
                                0x8, /* FC_LONG */
/* 306 */ 0x5c, /* FC_PAD */
                                0x5b, /* FC_END */
/* 308 */
                                0x2f, /* FC_IP */
                                0x5a, /* FC_CONSTANT_IID */
/* 310 */ NdrFcLong( 0x0 ), /* 0 */
/* 314 */ NdrFcShort( 0x0 ), /* 0 */
/* 316 */ NdrFcShort( 0x0 ), /* 0 */
/* 318 */ 0xc0, /* 192 */
                                0x0, /* 0 */
/* 320 */ 0x0, /* 0 */
                                0x0, /* 0 */
/* 322 */ 0x0, /* 0 */
                                0x0, /* 0 */
/* 324 */ 0x0, /* 0 */
                                0x46, /* 70 */
/* 326 */
                                0x2f, /* FC_IP */
                                0x5a, /* FC_CONSTANT_IID */
/* 328 */ NdrFcLong( 0x20400 ), /* 132096 */
/* 332 */ NdrFcShort( 0x0 ), /* 0 */
/* 334 */ NdrFcShort( 0x0 ), /* 0 */
/* 336 */ 0xc0, /* 192 */
                                0x0, /* 0 */
/* 338 */ 0x0, /* 0 */
                                0x0, /* 0 */
/* 340 */ 0x0, /* 0 */
                                0x0, /* 0 */
/* 342 */ 0x0, /* 0 */
                                0x46, /* 70 */
/* 344 */
                                0x12, 0x10, /* FC_UP [pointer_deref] */
/* 346 */ NdrFcShort( 0x2 ), /* Offset= 2 (348) */
/* 348 */
                                0x12, 0x0, /* FC_UP */
/* 350 */ NdrFcShort( 0x1fc ), /* Offset= 508 (858) */
/* 352 */
                                0x2a, /* FC_ENCAPSULATED_UNION */
                                0x49, /* 73 */
/* 354 */ NdrFcShort( 0x18 ), /* 24 */
/* 356 */ NdrFcShort( 0xa ), /* 10 */
/* 358 */ NdrFcLong( 0x8 ), /* 8 */
/* 362 */ NdrFcShort( 0x58 ), /* Offset= 88 (450) */
/* 364 */ NdrFcLong( 0xd ), /* 13 */
/* 368 */ NdrFcShort( 0x78 ), /* Offset= 120 (488) */
/* 370 */ NdrFcLong( 0x9 ), /* 9 */
/* 374 */ NdrFcShort( 0x94 ), /* Offset= 148 (522) */
/* 376 */ NdrFcLong( 0xc ), /* 12 */
/* 380 */ NdrFcShort( 0xbc ), /* Offset= 188 (568) */
/* 382 */ NdrFcLong( 0x24 ), /* 36 */
/* 386 */ NdrFcShort( 0x114 ), /* Offset= 276 (662) */
/* 388 */ NdrFcLong( 0x800d ), /* 32781 */
/* 392 */ NdrFcShort( 0x130 ), /* Offset= 304 (696) */
/* 394 */ NdrFcLong( 0x10 ), /* 16 */
/* 398 */ NdrFcShort( 0x148 ), /* Offset= 328 (726) */
/* 400 */ NdrFcLong( 0x2 ), /* 2 */
/* 404 */ NdrFcShort( 0x160 ), /* Offset= 352 (756) */
/* 406 */ NdrFcLong( 0x3 ), /* 3 */
/* 410 */ NdrFcShort( 0x178 ), /* Offset= 376 (786) */
/* 412 */ NdrFcLong( 0x14 ), /* 20 */
/* 416 */ NdrFcShort( 0x190 ), /* Offset= 400 (816) */
/* 418 */ NdrFcShort( 0xffffffff ), /* Offset= -1 (417) */
/* 420 */
                                0x1b, /* FC_CARRAY */
                                0x3, /* 3 */
/* 422 */ NdrFcShort( 0x4 ), /* 4 */
/* 424 */ 0x19, /* Corr desc: field pointer, FC_ULONG */
```

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```
/* 426 */ NdrFcShort( 0x0 ), /* 0 */
/* 428 */
                                0x4b, /* FC_PP */
                                0x5c, /* FC_PAD */
/* 430 */
                                0x48, /* FC_VARIABLE_REPEAT */
                                0x49, /* FC_FIXED_OFFSET */
/* 432 */ NdrFcShort( 0x4 ), /* 4 */
/* 434 */ NdrFcShort( 0x0 ), /* 0 */
/* 436 */ NdrFcShort( 0x1 ), /* 1 */
/* 438 */ NdrFcShort( 0x0 ), /* 0 */
/* 440 */ NdrFcShort( 0x0 ), /* 0 */
/* 442 */ 0x12, 0x0, /* FC_UP */
/* 444 */ NdrFcShort( 0xffffffff6e ), /* Offset= -146 (298) */
/* 446 */
                                0x5b, /* FC_END */
                                0x8, /* FC_LONG */
/* 448 */ 0x5c, /* FC_PAD */
                                0x5b, /* FC_END */
/* 450 */
                                0x16, /* FC_PSTRUCT */
                                0x3, /* 3 */
/* 452 */ NdrFcShort( 0x8 ), /* 8 */
/* 454 */
                                0x4b, /* FC_PP */
                                0x5c, /* FC_PAD */
/* 456 */
                                0x46, /* FC_NO_REPEAT */
                                0x5c, /* FC_PAD */
/* 458 */ NdrFcShort( 0x4 ), /* 4 */
/* 460 */ NdrFcShort( 0x4 ), /* 4 */
/* 462 */ 0x11, 0x0, /* FC_RP */
/* 464 */ NdrFcShort( 0xffffffffd4 ), /* Offset= -44 (420) */
/* 466 */
                                0x5b, /* FC_END */
                                0x8, /* FC_LONG */
/* 468 */ 0x8, /* FC_LONG */
                                0x5b, /* FC_END */
/* 470 */
                                0x21, /* FC_BOGUS_ARRAY */
                                0x3, /* 3 */
/* 472 */ NdrFcShort( 0x0 ), /* 0 */
/* 474 */ 0x19, /* Corr desc: field pointer, FC_ULONG */
                                0x0, /* */
/* 476 */ NdrFcShort( 0x0 ), /* 0 */
/* 478 */ NdrFcLong( 0xffffffff ), /* -1 */
/* 482 */ 0x4c, /* FC_EMBEDDED_COMPLEX */
                                0x0, /* 0 */
/* 484 */ NdrFcShort( 0xffffffff50 ), /* Offset= -176 (308) */
/* 486 */ 0x5c, /* FC_PAD */
                                0x5b, /* FC_END */
/* 488 */
                                0x1a, /* FC_BOGUS_STRUCT */
                                0x3, /* 3 */
/* 490 */ NdrFcShort( 0x8 ), /* 8 */
/* 492 */ NdrFcShort( 0x0 ), /* 0 */
/* 494 */ NdrFcShort( 0x6 ), /* Offset= 6 (500) */
/* 496 */ 0x8, /* FC_LONG */
                                0x36, /* FC_POINTER */
/* 498 */ 0x5c, /* FC_PAD */
                                0x5b, /* FC_END */
/* 500 */
                                0x11, 0x0, /* FC_RP */
/* 502 */ NdrFcShort( 0xffffffffe0 ), /* Offset= -32 (470) */
/* 504 */
                                0x21, /* FC_BOGUS_ARRAY */
                                0x3, /* 3 */
/* 506 */ NdrFcShort( 0x0 ), /* 0 */
/* 508 */ 0x19, /* Corr desc: field pointer, FC_ULONG */
                                0x0, /* */
/* 510 */ NdrFcShort( 0x0 ), /* 0 */
/* 512 */ NdrFcLong( 0xffffffff ), /* -1 */
/* 516 */ 0x4c, /* FC_EMBEDDED_COMPLEX */
                                0x0, /* 0 */
/* 518 */ NdrFcShort( 0xffffffff40 ), /* Offset= -192 (326) */
/* 520 */ 0x5c, /* FC_PAD */
                                0x5b, /* FC_END */
/* 522 */
                                0x1a, /* FC_BOGUS_STRUCT */
                                0x3, /* 3 */
/* 524 */ NdrFcShort( 0x8 ), /* 8 */
/* 526 */ NdrFcShort( 0x0 ), /* 0 */
/* 528 */ NdrFcShort( 0x6 ), /* Offset= 6 (534) */
/* 530 */ 0x8, /* FC_LONG */
                                0x36, /* FC_POINTER */
/* 532 */ 0x5c, /* FC_PAD */
                                0x5b, /* FC_END */
/* 534 */
                                0x11, 0x0, /* FC_RP */
/* 536 */ NdrFcShort( 0xffffffffe0 ), /* Offset= -32 (504) */
```



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```
/* 538 */
                                0x1b,          /* FC_CARRAY */
                                0x3,          /* 3 */
/* 540 */ NdrFcShort( 0x4 ), /* 4 */
/* 542 */ 0x19,             /* Corr desc: field pointer, FC_ULONG */
                                0x0,          /* */
/* 544 */ NdrFcShort( 0x0 ), /* 0 */
/* 546 */
                                0x4b,          /* FC_PP */
                                0x5c,          /* FC_PAD */
/* 548 */
                                0x48,          /* FC_VARIABLE_REPEAT */
                                0x49,          /* FC_FIXED_OFFSET */
/* 550 */ NdrFcShort( 0x4 ), /* 4 */
/* 552 */ NdrFcShort( 0x0 ), /* 0 */
/* 554 */ NdrFcShort( 0x1 ), /* 1 */
/* 556 */ NdrFcShort( 0x0 ), /* 0 */
/* 558 */ NdrFcShort( 0x0 ), /* 0 */
/* 560 */ 0x12, 0x0,        /* FC_UP */
/* 562 */ NdrFcShort( 0x182 ), /* Offset= 386 (948) */
/* 564 */
                                0x5b,          /* FC_END */
                                0x8,          /* FC_LONG */
/* 566 */ 0x5c,             /* FC_PAD */
                                0x5b,          /* FC_END */
/* 568 */
                                0x1a,          /* FC_BOGUS_STRUCT */
                                0x3,          /* 3 */
/* 570 */ NdrFcShort( 0x8 ), /* 8 */
/* 572 */ NdrFcShort( 0x0 ), /* 0 */
/* 574 */ NdrFcShort( 0x6 ), /* Offset= 6 (580) */
/* 576 */ 0x8,             /* FC_LONG */
                                0x36,          /* FC_POINTER */
/* 578 */ 0x5c,             /* FC_PAD */
                                0x5b,          /* FC_END */
/* 580 */
                                0x11, 0x0,        /* FC_RP */
/* 582 */ NdrFcShort( 0xfffffd4 ), /* Offset= -44 (538) */
/* 584 */
                                0x2f,          /* FC_IP */
                                0x5a,          /* FC_CONSTANT_IID */
/* 586 */ NdrFcLong( 0x2f ), /* 47 */
/* 590 */ NdrFcShort( 0x0 ), /* 0 */
/* 592 */ NdrFcShort( 0x0 ), /* 0 */
/* 594 */ 0xc0,            /* 192 */
                                0x0,          /* 0 */
/* 596 */ 0x0,             /* 0 */
                                0x0,          /* 0 */
/* 598 */ 0x0,             /* 0 */
                                0x0,          /* 0 */
/* 600 */ 0x0,             /* 0 */
                                0x46,          /* 70 */
/* 602 */
                                0x1b,          /* FC_CARRAY */
                                0x0,          /* 0 */
/* 604 */ NdrFcShort( 0x1 ), /* 1 */
/* 606 */ 0x19,             /* Corr desc: field pointer, FC_ULONG */
                                0x0,          /* */
/* 608 */ NdrFcShort( 0x4 ), /* 4 */
/* 610 */ 0x1,             /* FC_BYTE */
                                0x5b,          /* FC_END */
/* 612 */
                                0x1a,          /* FC_BOGUS_STRUCT */
                                0x3,          /* 3 */
/* 614 */ NdrFcShort( 0x10 ), /* 16 */
/* 616 */ NdrFcShort( 0x0 ), /* 0 */
/* 618 */ NdrFcShort( 0xa ), /* Offset= 10 (628) */
/* 620 */ 0x8,             /* FC_LONG */
                                0x8,          /* FC_LONG */
/* 622 */ 0x4c,            /* FC_EMBEDDED_COMPLEX */
                                0x0,          /* 0 */
/* 624 */ NdrFcShort( 0xfffffd8 ), /* Offset= -40 (584) */
/* 626 */ 0x36,            /* FC_POINTER */
                                0x5b,          /* FC_END */
/* 628 */
                                0x12, 0x0,        /* FC_UP */
/* 630 */ NdrFcShort( 0xfffffe4 ), /* Offset= -28 (602) */
/* 632 */
                                0x1b,          /* FC_CARRAY */
                                0x3,          /* 3 */
/* 634 */ NdrFcShort( 0x4 ), /* 4 */
/* 636 */ 0x19,             /* Corr desc: field pointer, FC_ULONG */
                                0x0,          /* */
/* 638 */ NdrFcShort( 0x0 ), /* 0 */
/* 640 */
                                0x4b,          /* FC_PP */
                                0x5c,          /* FC_PAD */
/* 642 */
                                0x48,          /* FC_VARIABLE_REPEAT */
                                0x49,          /* FC_FIXED_OFFSET */
/* 644 */ NdrFcShort( 0x4 ), /* 4 */
/* 646 */ NdrFcShort( 0x0 ), /* 0 */
```

## Appendix B – Database Design

---

```
/* 648 */ NdrFcShort( 0x1 ), /* 1 */
/* 650 */ NdrFcShort( 0x0 ), /* 0 */
/* 652 */ NdrFcShort( 0x0 ), /* 0 */
/* 654 */ 0x12, 0x0, /* FC_UP */
/* 656 */ NdrFcShort( 0xffffffffd4 ), /* Offset= -44 (612) */
/* 658 */
                                0x5b, /* FC_END */

                                0x8, /* FC_LONG */
/* 660 */ 0x5c, /* FC_PAD */
                                0x5b, /* FC_END */
/* 662 */
                                0x1a, /* FC_BOGUS_STRUCT */
                                0x3, /* 3 */
/* 664 */ NdrFcShort( 0x8 ), /* 8 */
/* 666 */ NdrFcShort( 0x0 ), /* 0 */
/* 668 */ NdrFcShort( 0x6 ), /* Offset= 6 (674) */
/* 670 */ 0x8, /* FC_LONG */
                                0x36, /* FC_POINTER */
/* 672 */ 0x5c, /* FC_PAD */
                                0x5b, /* FC_END */
/* 674 */
                                0x11, 0x0, /* FC_RP */
/* 676 */ NdrFcShort( 0xffffffffd4 ), /* Offset= -44 (632) */
/* 678 */
                                0x1d, /* FC_SMFARRAY */
                                0x0, /* 0 */
/* 680 */ NdrFcShort( 0x8 ), /* 8 */
/* 682 */ 0x2, /* FC_CHAR */
                                0x5b, /* FC_END */
/* 684 */
                                0x15, /* FC_STRUCT */
                                0x3, /* 3 */
/* 686 */ NdrFcShort( 0x10 ), /* 16 */
/* 688 */ 0x8, /* FC_LONG */
                                0x6, /* FC_SHORT */
/* 690 */ 0x6, /* FC_SHORT */
                                0x4c, /* FC_EMBEDDED_COMPLEX */
/* 692 */ 0x0, /* 0 */
                                NdrFcShort( 0xfffffffff1 ), /* Offset= -15 (678) */
                                0x5b, /* FC_END */
/* 696 */
                                0x1a, /* FC_BOGUS_STRUCT */
                                0x3, /* 3 */
/* 698 */ NdrFcShort( 0x18 ), /* 24 */
/* 700 */ NdrFcShort( 0x0 ), /* 0 */
/* 702 */ NdrFcShort( 0xa ), /* Offset= 10 (712) */
/* 704 */ 0x8, /* FC_LONG */
                                0x36, /* FC_POINTER */
/* 706 */ 0x4c, /* FC_EMBEDDED_COMPLEX */
                                0x0, /* 0 */
/* 708 */ NdrFcShort( 0xffffffffe8 ), /* Offset= -24 (684) */
/* 710 */ 0x5c, /* FC_PAD */
                                0x5b, /* FC_END */
/* 712 */
                                0x11, 0x0, /* FC_RP */
/* 714 */ NdrFcShort( 0xfffffffff0c ), /* Offset= -244 (470) */
/* 716 */
                                0x1b, /* FC_CARRAY */
                                0x0, /* 0 */
/* 718 */ NdrFcShort( 0x1 ), /* 1 */
/* 720 */ 0x19, /* Corr desc: field pointer, FC_ULONG */
                                0x0, /* */
/* 722 */ NdrFcShort( 0x0 ), /* 0 */
/* 724 */ 0x1, /* FC_BYTE */
                                0x5b, /* FC_END */
/* 726 */
                                0x16, /* FC_PSTRUCT */
                                0x3, /* 3 */
/* 728 */ NdrFcShort( 0x8 ), /* 8 */
/* 730 */
                                0x4b, /* FC_PP */
                                0x5c, /* FC_PAD */
/* 732 */
                                0x46, /* FC_NO_REPEAT */
                                0x5c, /* FC_PAD */
/* 734 */ NdrFcShort( 0x4 ), /* 4 */
/* 736 */ NdrFcShort( 0x4 ), /* 4 */
/* 738 */ 0x12, 0x0, /* FC_UP */
/* 740 */ NdrFcShort( 0xffffffffe8 ), /* Offset= -24 (716) */
/* 742 */
                                0x5b, /* FC_END */

                                0x8, /* FC_LONG */
/* 744 */ 0x8, /* FC_LONG */
                                0x5b, /* FC_END */
/* 746 */
                                0x1b, /* FC_CARRAY */
                                0x1, /* 1 */
/* 748 */ NdrFcShort( 0x2 ), /* 2 */
/* 750 */ 0x19, /* Corr desc: field pointer, FC_ULONG */
                                0x0, /* */
/* 752 */ NdrFcShort( 0x0 ), /* 0 */
```

## Appendix B – Database Design

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```
/* 754 */ 0x6,          /* FC_SHORT */
/* 756 */                                0x5b,          /* FC_END */
/* 756 */                                0x16,          /* FC_PSTRUCT */
/* 756 */                                0x3,           /* 3 */
/* 758 */ NdrFcShort( 0x8 ), /* 8 */
/* 760 */                                0x4b,          /* FC_PP */
/* 760 */                                0x5c,          /* FC_PAD */
/* 762 */                                0x46,          /* FC_NO_REPEAT */
/* 762 */                                0x5c,          /* FC_PAD */
/* 764 */ NdrFcShort( 0x4 ), /* 4 */
/* 766 */ NdrFcShort( 0x4 ), /* 4 */
/* 768 */ 0x12, 0x0,       /* FC_UP */
/* 770 */ NdrFcShort( 0xffffffe8 ), /* Offset= -24 (746) */
/* 772 */                                0x5b,          /* FC_END */
/* 772 */                                0x8,           /* FC_LONG */
/* 774 */ 0x8,           /* FC_LONG */
/* 774 */                                0x5b,          /* FC_END */
/* 776 */                                0x1b,          /* FC_CARRAY */
/* 776 */                                0x3,           /* 3 */
/* 778 */ NdrFcShort( 0x4 ), /* 4 */
/* 780 */ 0x19,          /* Corr desc: field pointer, FC_ULONG */
/* 780 */                                0x0,           /* */
/* 782 */ NdrFcShort( 0x0 ), /* 0 */
/* 784 */ 0x8,           /* FC_LONG */
/* 784 */                                0x5b,          /* FC_END */
/* 786 */                                0x16,          /* FC_PSTRUCT */
/* 786 */                                0x3,           /* 3 */
/* 788 */ NdrFcShort( 0x8 ), /* 8 */
/* 790 */                                0x4b,          /* FC_PP */
/* 790 */                                0x5c,          /* FC_PAD */
/* 792 */                                0x46,          /* FC_NO_REPEAT */
/* 792 */                                0x5c,          /* FC_PAD */
/* 794 */ NdrFcShort( 0x4 ), /* 4 */
/* 796 */ NdrFcShort( 0x4 ), /* 4 */
/* 798 */ 0x12, 0x0,       /* FC_UP */
/* 800 */ NdrFcShort( 0xffffffe8 ), /* Offset= -24 (776) */
/* 802 */                                0x5b,          /* FC_END */
/* 802 */                                0x8,           /* FC_LONG */
/* 804 */ 0x8,           /* FC_LONG */
/* 804 */                                0x5b,          /* FC_END */
/* 806 */                                0x1b,          /* FC_CARRAY */
/* 806 */                                0x7,           /* 7 */
/* 808 */ NdrFcShort( 0x8 ), /* 8 */
/* 810 */ 0x19,          /* Corr desc: field pointer, FC_ULONG */
/* 810 */                                0x0,           /* */
/* 812 */ NdrFcShort( 0x0 ), /* 0 */
/* 814 */ 0xb,           /* FC_HYPER */
/* 814 */                                0x5b,          /* FC_END */
/* 816 */                                0x16,          /* FC_PSTRUCT */
/* 816 */                                0x3,           /* 3 */
/* 818 */ NdrFcShort( 0x8 ), /* 8 */
/* 820 */                                0x4b,          /* FC_PP */
/* 820 */                                0x5c,          /* FC_PAD */
/* 822 */                                0x46,          /* FC_NO_REPEAT */
/* 822 */                                0x5c,          /* FC_PAD */
/* 824 */ NdrFcShort( 0x4 ), /* 4 */
/* 826 */ NdrFcShort( 0x4 ), /* 4 */
/* 828 */ 0x12, 0x0,       /* FC_UP */
/* 830 */ NdrFcShort( 0xffffffe8 ), /* Offset= -24 (806) */
/* 832 */                                0x5b,          /* FC_END */
/* 832 */                                0x8,           /* FC_LONG */
/* 834 */ 0x8,           /* FC_LONG */
/* 834 */                                0x5b,          /* FC_END */
/* 836 */                                0x15,          /* FC_STRUCT */
/* 836 */                                0x3,           /* 3 */
/* 838 */ NdrFcShort( 0x8 ), /* 8 */
/* 840 */ 0x8,           /* FC_LONG */
/* 840 */                                0x8,           /* FC_LONG */
/* 842 */ 0x5c,          /* FC_PAD */
/* 842 */                                0x5b,          /* FC_END */
/* 844 */                                0x1b,          /* FC_CARRAY */
/* 844 */                                0x3,           /* 3 */
/* 846 */ NdrFcShort( 0x8 ), /* 8 */
/* 848 */ 0x7,           /* Corr desc: FC USHORT */
```

## Appendix B – Database Design

---

```
/* 850 */ NdrFcShort( 0xffd8 ), /* -40 */ /* */
/* 852 */ 0x4c, /* FC_EMBEDDED_COMPLEX */
/* 854 */ NdrFcShort( 0xfffffee ), /* Offset= -18 (836) */ /* 0 */
/* 856 */ 0x5c, /* FC_PAD */
/* 858 */ 0x5b, /* FC_END */

/* 860 */ NdrFcShort( 0x28 ), /* 40 */ /* FC_BOGUS_STRUCT */
/* 862 */ NdrFcShort( 0xfffffee ), /* Offset= -18 (844) */ /* 3 */
/* 864 */ NdrFcShort( 0x0 ), /* Offset= 0 (864) */
/* 866 */ 0x6, /* FC_SHORT */
/* 868 */ 0x38, /* FC_SHORT */
/* 870 */ 0x8, /* FC_ALIGNM4 */
/* 872 */ 0x0, /* FC_LONG */
/* 874 */ 0x4c, /* FC_EMBEDDED_COMPLEX */
/* 876 */ NdrFcShort( 0xffffdf7 ), /* Offset= -521 (352) */
/* 878 */ 0x12, 0x0, /* FC_UP */
/* 880 */ NdrFcShort( 0xffffef6 ), /* Offset= -266 (612) */
/* 882 */ 0x1, 0x12, 0x8, /* FC_UP [simple_pointer] */
/* 884 */ 0x5c, /* FC_BYTE */
/* 886 */ 0x6, 0x12, 0x8, /* FC_UP [simple_pointer] */
/* 888 */ 0x5c, /* FC_SHORT */
/* 890 */ 0x8, 0x12, 0x8, /* FC_UP [simple_pointer] */
/* 892 */ 0x5c, /* FC_LONG */
/* 894 */ 0xa, 0x12, 0x8, /* FC_UP [simple_pointer] */
/* 896 */ 0x5c, /* FC_FLOAT */
/* 898 */ 0xc, 0x12, 0x8, /* FC_UP [simple_pointer] */
/* 900 */ 0x5c, /* FC_DOUBLE */
/* 902 */ NdrFcShort( 0xffffd90 ), /* Offset= -624 (278) */
/* 904 */ 0x12, 0x10, /* FC_UP [pointer_deref] */
/* 906 */ NdrFcShort( 0xffffd92 ), /* Offset= -622 (284) */
/* 908 */ 0x12, 0x10, /* FC_UP [pointer_deref] */
/* 910 */ NdrFcShort( 0xffffda6 ), /* Offset= -602 (308) */
/* 912 */ 0x12, 0x10, /* FC_UP [pointer_deref] */
/* 914 */ NdrFcShort( 0xffffdb4 ), /* Offset= -588 (326) */
/* 916 */ 0x12, 0x10, /* FC_UP [pointer_deref] */
/* 918 */ NdrFcShort( 0xffffdc2 ), /* Offset= -574 (344) */
/* 920 */ 0x12, 0x10, /* FC_UP [pointer_deref] */
/* 922 */ NdrFcShort( 0x2 ), /* Offset= 2 (924) */
/* 924 */ 0x12, 0x0, /* FC_UP */
/* 926 */ NdrFcShort( 0x16 ), /* Offset= 22 (948) */
/* 928 */ 0x15, /* FC_STRUCT */
/* 930 */ NdrFcShort( 0x10 ), /* 16 */ /* 7 */
/* 932 */ 0x6, /* FC_SHORT */
/* 934 */ 0x1, /* FC_BYTE */
/* 936 */ 0x8, /* FC_BYTE */
/* 938 */ 0xb, /* FC_ALIGNM4 */
/* 940 */ 0x5b, /* FC_LONG */
/* 942 */ NdrFcShort( 0xffffff2 ), /* Offset= -14 (928) */
/* 944 */ 0x12, 0x8, /* FC_ALIGNM8 */
/* 946 */ 0x2, /* FC_HYPER */
/* 948 */ 0x5c, /* FC_END */
/* 950 */ 0x1a, /* FC_BOGUS_STRUCT */
/* 952 */ NdrFcShort( 0x20 ), /* 32 */ /* 7 */
/* 954 */ NdrFcShort( 0x0 ), /* 0 */
/* 956 */ NdrFcShort( 0x0 ), /* Offset= 0 (954) */
/* 958 */ 0x8, /* FC_LONG */
/* 960 */ 0x8, /* FC_LONG */
```

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---

```
/* 958 */ 0x6, /* FC_SHORT */
/* 960 */ 0x6, /* FC_SHORT */
/* 962 */ 0x4c, /* FC_SHORT */
/* 964 */ NdrFcShort( 0xfffffc42 ), /* Offset= -958 (6) */
/* 966 */ 0x5c, /* FC_PAD */
/* 968 */ 0xb4, /* FC_USER_MARSHAL */
/* 970 */ NdrFcShort( 0x0 ), /* 0 */
/* 972 */ NdrFcShort( 0x10 ), /* 16 */
/* 974 */ NdrFcShort( 0x0 ), /* 0 */
/* 976 */ NdrFcShort( 0xfffffc32 ), /* Offset= -974 (2) */
/* 978 */
/* 980 */ NdrFcShort( 0x6 ), /* Offset= 6 (986) */
/* 982 */
/* 984 */ NdrFcShort( 0xfffffcdc ), /* Offset= -36 (948) */
/* 986 */ 0xb4, /* FC_USER_MARSHAL */
/* 988 */ NdrFcShort( 0x0 ), /* 0 */
/* 990 */ NdrFcShort( 0x10 ), /* 16 */
/* 992 */ NdrFcShort( 0x0 ), /* 0 */
/* 994 */ NdrFcShort( 0xfffffff4 ), /* Offset= -12 (982) */

0x0
};

const CInterfaceProxyVtbl * _tpcc_com_ps_ProxyVtblList[] =
{
    ( CInterfaceProxyVtbl *) &ITPCCProxyVtbl,
    0
};

const CInterfaceStubVtbl * _tpcc_com_ps_StubVtblList[] =
{
    ( CInterfaceStubVtbl *) &ITPCCStubVtbl,
    0
};

PCInterfaceName const _tpcc_com_ps_InterfaceNamesList[] =
{
    "ITPCC",
    0
};

#define _tpcc_com_ps_CHECK_IID(n) IID_GENERIC_CHECK_IID( _tpcc_com_ps, pIID, n)

int __stdcall _tpcc_com_ps_IID_Lookup( const IID * pIID, int * pIndex )
{
    if(!_tpcc_com_ps_CHECK_IID(0))
    {
        *pIndex = 0;
        return 1;
    }

    return 0;
}

const ExtendedProxyFileInfo tpcc_com_ps_ProxyFileInfo =
{
    (PCInterfaceProxyVtblList *) &_tpcc_com_ps_ProxyVtblList,
    (PCInterfaceStubVtblList *) &_tpcc_com_ps_StubVtblList,
    (const PCInterfaceName *) &_tpcc_com_ps_InterfaceNamesList,
    0, // no delegation
    &_tpcc_com_ps_IID_Lookup,
    1,
    2,
    0, /* table of [async_uid] interfaces */
    0, /* Filler1 */
    0, /* Filler2 */
    0 /* Filler3 */
};

#endif /* !defined(_M_IA64) && !defined(_M_IX86) */

#pragma warning( disable: 4049 ) /* more than 64k source lines */

/* this ALWAYS GENERATED file contains the proxy stub code */

/* File created by MIDL compiler version 5.03.0280 */
/* at Sat Apr 08 16:40:10 2000
*/
/* Compiler settings for .\src\tpcc_com_ps.idl:
```

# Appendix B – Database Design

---

```
Oicf (OptLev=i2), Wl, Zp8, env=Win64 (32b run,appending), ms_ext, c_ext, robust
error checks: allocation ref bounds_check enum stub_data
VC __declspec() decoration level:
    __declspec(uuid()), __declspec(selectany), __declspec(novtable)
    DECLSPEC_UUID(), MIDL_INTERFACE()
*/
/**@MIDL_FILE_HEADING( )

#if defined(_M_IA64) || defined(_M_AXP64)
#define USE_STUBLESS_PROXY

/* verify that the <rpcproxy.h> version is high enough to compile this file*/
#ifndef __REDQ_RPCPROXY_H_VERSION__
#define __REQUIRED_RPCPROXY_H_VERSION__ 475
#endif

#include "rpcproxy.h"
#ifndef __RPCPROXY_H_VERSION__
#error this stub requires an updated version of <rpcproxy.h>
#endif // __RPCPROXY_H_VERSION__

#include "tpcc_com_ps.h"

#define TYPE_FORMAT_STRING_SIZE 979
#define PROC_FORMAT_STRING_SIZE 253
#define TRANSMIT_AS_TABLE_SIZE 0
#define WIRE_MARSHAL_TABLE_SIZE 1

typedef struct _MIDL_TYPE_FORMAT_STRING
{
    short          Pad;
    unsigned char  Format[ TYPE_FORMAT_STRING_SIZE ];
} MIDL_TYPE_FORMAT_STRING;

typedef struct _MIDL_PROC_FORMAT_STRING
{
    short          Pad;
    unsigned char  Format[ PROC_FORMAT_STRING_SIZE ];
} MIDL_PROC_FORMAT_STRING;

extern const MIDL_TYPE_FORMAT_STRING __MIDL_TypeFormatString;
extern const MIDL_PROC_FORMAT_STRING __MIDL_ProcFormatString;

/* Standard interface: __MIDL_itf_tpcc_com_ps_0000, ver. 0.0,
   GUID={0x00000000,0x0000,0x0000,{0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00}} */

/* Object interface: IUnknown, ver. 0.0,
   GUID={0x00000000,0x0000,0x0000,{0xC0,0x00,0x00,0x00,0x00,0x00,0x00,0x46}} */

/* Object interface: ITPCC, ver. 0.0,
   GUID={0xFEE6AA2,0x84B1,0x11d2,{0xBA,0x47,0x00,0xC0,0x4F,0xBF,0xE0,0x8B}} */

extern const MIDL_STUB_DESC Object_StubDesc;

extern const MIDL_SERVER_INFO ITPCC_ServerInfo;

#pragma code_seg(".orpc")
static const unsigned short ITPCC_FormatStringOffsetTable[] =
{
    0,
    44,
    88,
    132,
    176,
    220
};

static const MIDL_SERVER_INFO ITPCC_ServerInfo =
{
    &Object_StubDesc,
    0,
    __MIDL_ProcFormatString.Format,
    &ITPCC_FormatStringOffsetTable[-3],
    0,
    0,
    0,
    0
};

static const MIDL_STUBLESS_PROXY_INFO ITPCC_ProxyInfo =
{
    &Object_StubDesc,
    __MIDL_ProcFormatString.Format,
    &ITPCC_FormatStringOffsetTable[-3],
```

## Appendix B – Database Design

---

```
0,
0,
0
};

CINTERFACE_PROXY_VTABLE(9) _ITPCCProxyVtbl =
{
    &ITPCC_ProxyInfo,
    &IID_ITPCC,
    IUnknown_QueryInterface_Proxy,
    IUnknown_AddRef_Proxy,
    IUnknown_Release_Proxy,
    (void *)-1 /* ITPCC::NewOrder */ ,
    (void *)-1 /* ITPCC::Payment */ ,
    (void *)-1 /* ITPCC::Delivery */ ,
    (void *)-1 /* ITPCC::StockLevel */ ,
    (void *)-1 /* ITPCC::OrderStatus */ ,
    (void *)-1 /* ITPCC::CallSetComplete */
};

const CInterfaceStubVtbl _ITPCCStubVtbl =
{
    &IID_ITPCC,
    &ITPCC_ServerInfo,
    9,
    0, /* pure interpreted */
    CStdStubBuffer_METHODS
};

extern const USER_MARSHAL_ROUTINE_QUADRUPLE UserMarshalRoutines[ WIRE_MARSHAL_TABLE_SIZE ];

static const MIDL_STUB_DESC Object_StubDesc =
{
    0,
    NdrOleAllocate,
    NdrOleFree,
    0,
    0,
    0,
    0,
    0,
    0,
    __MIDL_TypeFormatString.Format,
    1, /* -error bounds_check flag */
    0x50002, /* Ndr library version */
    0,
    0x5030118, /* MIDL Version 5.4.280 */
    0,
    UserMarshalRoutines,
    0, /* notify & notify_flag routine table */
    0x1, /* MIDL flag */
    0, /* Reserved3 */
    0, /* Reserved4 */
    0 /* Reserved5 */
};

#pragma data_seg(".rdata")

static const USER_MARSHAL_ROUTINE_QUADRUPLE UserMarshalRoutines[ WIRE_MARSHAL_TABLE_SIZE ] =
{
    {
        VARIANT_UserSize
        ,VARIANT_UserMarshal
        ,VARIANT_UserUnmarshal
        ,VARIANT_UserFree
    }
};

#if !defined(__RPC_WIN64__)
#error Invalid build platform for this stub.
#endif

static const MIDL_PROC_FORMAT_STRING __MIDL_ProcFormatString =
{
    0,
    {
        /* Procedure NewOrder */

                                0x33,          /* FC_AUTO_HANDLE */
                                0x6c,          /* Old Flags: object, Oi2 */
/* 2 */ NdrFcLong( 0x0 ), /* 0 */
/* 6 */ NdrFcShort( 0x3 ), /* 3 */
#ifdef _ALPHA_
/* 8 */ NdrFcShort( 0x38 ), /* ia64 Stack size/offset = 56 */
#else
                                NdrFcShort( 0x30 ), /* axp64 Stack size/offset = 48 */
#endif
/* 10 */ NdrFcShort( 0x0 ), /* 0 */
/* 12 */ NdrFcShort( 0x8 ), /* 8 */
/* 14 */ 0x47, /* Oi2 Flags: srv must size, clt must size, has return, has ext, */

```

## Appendix B – Database Design

---

```
/* 16 */ 0xa,                0x3,                /* 3 */
/* 18 */ NdrFcShort( 0x20 ), /* 10 */
/* 20 */ NdrFcShort( 0x20 ), /* 7,                /* Ext Flags: new corr desc, clt corr check, srv corr check, */
/* 22 */ NdrFcShort( 0x0 ),  /* 32 */
/* 24 */ NdrFcShort( 0x0 ),  /* 32 */
/* 0 */

/* Parameter txn_in */

/* 26 */ NdrFcShort( 0x8b ), /* Flags: must size, must free, in, by val, */
#ifdef _ALPHA_
/* 28 */ NdrFcShort( 0x10 ), /* ia64 Stack size/offset = 16 */
#else
NdrFcShort( 0x8 ), /* axp64 Stack size/offset = 8 */
#endif
/* 30 */ NdrFcShort( 0x3b6 ), /* Type Offset=950 */

/* Parameter txn_out */

/* 32 */ NdrFcShort( 0x6113 ), /* Flags: must size, must free, out, simple ref, srv alloc size=24 */
#ifdef _ALPHA_
/* 34 */ NdrFcShort( 0x28 ), /* ia64 Stack size/offset = 40 */
#else
NdrFcShort( 0x20 ), /* axp64 Stack size/offset = 32 */
#endif
/* 36 */ NdrFcShort( 0x3c8 ), /* Type Offset=968 */

/* Return value */

/* 38 */ NdrFcShort( 0x70 ), /* Flags: out, return, base type, */
#ifdef _ALPHA_
/* 40 */ NdrFcShort( 0x30 ), /* ia64 Stack size/offset = 48 */
#else
NdrFcShort( 0x28 ), /* axp64 Stack size/offset = 40 */
#endif
/* 42 */ 0x8,                /* FC_LONG */
/* 0 */

/* Procedure Payment */

/* 44 */ 0x33,                /* FC_AUTO_HANDLE */
/* 0x6c,                /* Old Flags: object, Oi2 */
/* 46 */ NdrFcLong( 0x0 ),    /* 0 */
/* 50 */ NdrFcShort( 0x4 ),   /* 4 */
#ifdef _ALPHA_
/* 52 */ NdrFcShort( 0x38 ), /* ia64 Stack size/offset = 56 */
#else
NdrFcShort( 0x30 ), /* axp64 Stack size/offset = 48 */
#endif
/* 54 */ NdrFcShort( 0x0 ),   /* 0 */
/* 56 */ NdrFcShort( 0x8 ),   /* 8 */
/* 58 */ 0x47,                /* Oi2 Flags: srv must size, clt must size, has return, has ext, */
/* 0x3,                /* 3 */
/* 60 */ 0xa,                /* 10 */
/* 0x7,                /* Ext Flags: new corr desc, clt corr check, srv corr check, */
/* 62 */ NdrFcShort( 0x20 ), /* 32 */
/* 64 */ NdrFcShort( 0x20 ), /* 32 */
/* 66 */ NdrFcShort( 0x0 ),  /* 0 */
/* 68 */ NdrFcShort( 0x0 ),  /* 0 */
/* 0 */

/* Parameter txn_in */

/* 70 */ NdrFcShort( 0x8b ), /* Flags: must size, must free, in, by val, */
#ifdef _ALPHA_
/* 72 */ NdrFcShort( 0x10 ), /* ia64 Stack size/offset = 16 */
#else
NdrFcShort( 0x8 ), /* axp64 Stack size/offset = 8 */
#endif
/* 74 */ NdrFcShort( 0x3b6 ), /* Type Offset=950 */

/* Parameter txn_out */

/* 76 */ NdrFcShort( 0x6113 ), /* Flags: must size, must free, out, simple ref, srv alloc size=24 */
#ifdef _ALPHA_
/* 78 */ NdrFcShort( 0x28 ), /* ia64 Stack size/offset = 40 */
#else
NdrFcShort( 0x20 ), /* axp64 Stack size/offset = 32 */
#endif
/* 80 */ NdrFcShort( 0x3c8 ), /* Type Offset=968 */

/* Return value */

/* 82 */ NdrFcShort( 0x70 ), /* Flags: out, return, base type, */
#ifdef _ALPHA_
/* 84 */ NdrFcShort( 0x30 ), /* ia64 Stack size/offset = 48 */
#else
NdrFcShort( 0x28 ), /* axp64 Stack size/offset = 40 */
#endif
/* 86 */ 0x8,                /* FC_LONG */
/* 0 */

/* Procedure Delivery */
```



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```
/* 88 */ 0x33,          /* FC_AUTO_HANDLE */
                                0x6c,          /* Old Flags: object, Oi2 */
/* 90 */ NdrFcLong( 0x0 ), /* 0 */
/* 94 */ NdrFcShort( 0x5 ), /* 5 */
#ifdef _ALPHA_
/* 96 */ NdrFcShort( 0x38 ), /* ia64 Stack size/offset = 56 */
#else
                                NdrFcShort( 0x30 ), /* axp64 Stack size/offset = 48 */
#endif
/* 98 */ NdrFcShort( 0x0 ), /* 0 */
/* 100 */ NdrFcShort( 0x8 ), /* 8 */
/* 102 */ 0x47,          /* Oi2 Flags: srv must size, clt must size, has return, has ext, */
                                0x3,          /* 3 */
/* 104 */ 0xa,          /* 10 */
                                0x7,          /* Ext Flags: new corr desc, clt corr check, srv corr check, */
/* 106 */ NdrFcShort( 0x20 ), /* 32 */
/* 108 */ NdrFcShort( 0x20 ), /* 32 */
/* 110 */ NdrFcShort( 0x0 ), /* 0 */
/* 112 */ NdrFcShort( 0x0 ), /* 0 */

    /* Parameter txn_in */

/* 114 */ NdrFcShort( 0x8b ), /* Flags: must size, must free, in, by val, */
#ifdef _ALPHA_
/* 116 */ NdrFcShort( 0x10 ), /* ia64 Stack size/offset = 16 */
#else
                                NdrFcShort( 0x8 ), /* axp64 Stack size/offset = 8 */
#endif
/* 118 */ NdrFcShort( 0x3b6 ), /* Type Offset=950 */

    /* Parameter txn_out */

/* 120 */ NdrFcShort( 0x6113 ), /* Flags: must size, must free, out, simple ref, srv alloc size=24 */
#ifdef _ALPHA_
/* 122 */ NdrFcShort( 0x28 ), /* ia64 Stack size/offset = 40 */
#else
                                NdrFcShort( 0x20 ), /* axp64 Stack size/offset = 32 */
#endif
/* 124 */ NdrFcShort( 0x3c8 ), /* Type Offset=968 */

    /* Return value */

/* 126 */ NdrFcShort( 0x70 ), /* Flags: out, return, base type, */
#ifdef _ALPHA_
/* 128 */ NdrFcShort( 0x30 ), /* ia64 Stack size/offset = 48 */
#else
                                NdrFcShort( 0x28 ), /* axp64 Stack size/offset = 40 */
#endif
/* 130 */ 0x8,          /* FC_LONG */
                                0x0,          /* 0 */

    /* Procedure StockLevel */

/* 132 */ 0x33,          /* FC_AUTO_HANDLE */
                                0x6c,          /* Old Flags: object, Oi2 */
/* 134 */ NdrFcLong( 0x0 ), /* 0 */
/* 138 */ NdrFcShort( 0x6 ), /* 6 */
#ifdef _ALPHA_
/* 140 */ NdrFcShort( 0x38 ), /* ia64 Stack size/offset = 56 */
#else
                                NdrFcShort( 0x30 ), /* axp64 Stack size/offset = 48 */
#endif
/* 142 */ NdrFcShort( 0x0 ), /* 0 */
/* 144 */ NdrFcShort( 0x8 ), /* 8 */
/* 146 */ 0x47,          /* Oi2 Flags: srv must size, clt must size, has return, has ext, */
                                0x3,          /* 3 */
/* 148 */ 0xa,          /* 10 */
                                0x7,          /* Ext Flags: new corr desc, clt corr check, srv corr check, */
/* 150 */ NdrFcShort( 0x20 ), /* 32 */
/* 152 */ NdrFcShort( 0x20 ), /* 32 */
/* 154 */ NdrFcShort( 0x0 ), /* 0 */
/* 156 */ NdrFcShort( 0x0 ), /* 0 */

    /* Parameter txn_in */

/* 158 */ NdrFcShort( 0x8b ), /* Flags: must size, must free, in, by val, */
#ifdef _ALPHA_
/* 160 */ NdrFcShort( 0x10 ), /* ia64 Stack size/offset = 16 */
#else
                                NdrFcShort( 0x8 ), /* axp64 Stack size/offset = 8 */
#endif
/* 162 */ NdrFcShort( 0x3b6 ), /* Type Offset=950 */

    /* Parameter txn_out */

/* 164 */ NdrFcShort( 0x6113 ), /* Flags: must size, must free, out, simple ref, srv alloc size=24 */
#ifdef _ALPHA_
/* 166 */ NdrFcShort( 0x28 ), /* ia64 Stack size/offset = 40 */
#else
                                NdrFcShort( 0x20 ), /* axp64 Stack size/offset = 32 */
#endif
/* 168 */ NdrFcShort( 0x3c8 ), /* Type Offset=968 */
```

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```
        /* Return value */

/* 170 */ NdrFcShort( 0x70 ), /* Flags: out, return, base type, */
#ifdef _ALPHA_
/* 172 */ NdrFcShort( 0x30 ), /* ia64 Stack size/offset = 48 */
#else
        NdrFcShort( 0x28 ), /* axp64 Stack size/offset = 40 */
#endif
/* 174 */ 0x8,          /* FC_LONG */
                0x0,          /* 0 */

        /* Procedure OrderStatus */

/* 176 */ 0x33,          /* FC_AUTO_HANDLE */
                0x6c,          /* Old Flags: object, Oi2 */
/* 178 */ NdrFcLong( 0x0 ), /* 0 */
/* 182 */ NdrFcShort( 0x7 ), /* 7 */
#ifdef _ALPHA_
/* 184 */ NdrFcShort( 0x38 ), /* ia64 Stack size/offset = 56 */
#else
        NdrFcShort( 0x30 ), /* axp64 Stack size/offset = 48 */
#endif
/* 186 */ NdrFcShort( 0x0 ), /* 0 */
/* 188 */ NdrFcShort( 0x8 ), /* 8 */
/* 190 */ 0x47,          /* Oi2 Flags: srv must size, clt must size, has return, has ext, */
                0x3,          /* 3 */
/* 192 */ 0xa,          /* 10 */
                0x7,          /* Ext Flags: new corr desc, clt corr check, srv corr check, */
/* 194 */ NdrFcShort( 0x20 ), /* 32 */
/* 196 */ NdrFcShort( 0x20 ), /* 32 */
/* 198 */ NdrFcShort( 0x0 ), /* 0 */
/* 200 */ NdrFcShort( 0x0 ), /* 0 */

        /* Parameter txn_in */

/* 202 */ NdrFcShort( 0x8b ), /* Flags: must size, must free, in, by val, */
#ifdef _ALPHA_
/* 204 */ NdrFcShort( 0x10 ), /* ia64 Stack size/offset = 16 */
#else
        NdrFcShort( 0x8 ), /* axp64 Stack size/offset = 8 */
#endif
/* 206 */ NdrFcShort( 0x3b6 ), /* Type Offset=950 */

        /* Parameter txn_out */

/* 208 */ NdrFcShort( 0x6113 ), /* Flags: must size, must free, out, simple ref, srv alloc size=24 */
#ifdef _ALPHA_
/* 210 */ NdrFcShort( 0x28 ), /* ia64 Stack size/offset = 40 */
#else
        NdrFcShort( 0x20 ), /* axp64 Stack size/offset = 32 */
#endif
/* 212 */ NdrFcShort( 0x3c8 ), /* Type Offset=968 */

        /* Return value */

/* 214 */ NdrFcShort( 0x70 ), /* Flags: out, return, base type, */
#ifdef _ALPHA_
/* 216 */ NdrFcShort( 0x30 ), /* ia64 Stack size/offset = 48 */
#else
        NdrFcShort( 0x28 ), /* axp64 Stack size/offset = 40 */
#endif
/* 218 */ 0x8,          /* FC_LONG */
                0x0,          /* 0 */

        /* Procedure CallSetComplete */

/* 220 */ 0x33,          /* FC_AUTO_HANDLE */
                0x6c,          /* Old Flags: object, Oi2 */
/* 222 */ NdrFcLong( 0x0 ), /* 0 */
/* 226 */ NdrFcShort( 0x8 ), /* 8 */
/* 228 */ NdrFcShort( 0x10 ), /* ia64, axp64 Stack size/offset = 16 */
/* 230 */ NdrFcShort( 0x0 ), /* 0 */
/* 232 */ NdrFcShort( 0x8 ), /* 8 */
/* 234 */ 0x44,          /* Oi2 Flags: has return, has ext, */
                0x1,          /* 1 */
/* 236 */ 0xa,          /* 10 */
                0x1,          /* Ext Flags: new corr desc, */
/* 238 */ NdrFcShort( 0x0 ), /* 0 */
/* 240 */ NdrFcShort( 0x0 ), /* 0 */
/* 242 */ NdrFcShort( 0x0 ), /* 0 */
/* 244 */ NdrFcShort( 0x0 ), /* 0 */

        /* Return value */

/* 246 */ NdrFcShort( 0x70 ), /* Flags: out, return, base type, */
/* 248 */ NdrFcShort( 0x8 ), /* ia64, axp64 Stack size/offset = 8 */
/* 250 */ 0x8,          /* FC_LONG */
                0x0,          /* 0 */

        0x0
    }
};
```

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```
static const MIDL_TYPE_FORMAT_STRING __MIDL_TypeFormatString =
{
    0,
    {
        NdrFcShort( 0x0 ), /* 0 */
/* 2 */
        0x12, 0x0, /* FC_UP */
/* 4 */ NdrFcShort( 0x39e ), /* Offset= 926 (930) */
/* 6 */
        0x2b, /* FC_NON_ENCAPSULATED_UNION */
        0x9, /* FC_ULONG */
/* 8 */ 0x7, /* Corr desc: FC_USHORT */
        0x0, /* */
/* 10 */ NdrFcShort( 0xffff8 ), /* -8 */
/* 12 */ NdrFcShort( 0x1 ), /* Corr flags: early, */
/* 14 */ NdrFcShort( 0x2 ), /* Offset= 2 (16) */
/* 16 */ NdrFcShort( 0x10 ), /* 16 */
/* 18 */ NdrFcShort( 0x2b ), /* 43 */
/* 20 */ NdrFcLong( 0x3 ), /* 3 */
/* 24 */ NdrFcShort( 0x8008 ), /* Simple arm type: FC_LONG */
/* 26 */ NdrFcLong( 0x11 ), /* 17 */
/* 30 */ NdrFcShort( 0x8001 ), /* Simple arm type: FC_BYTE */
/* 32 */ NdrFcLong( 0x2 ), /* 2 */
/* 36 */ NdrFcShort( 0x8006 ), /* Simple arm type: FC_SHORT */
/* 38 */ NdrFcLong( 0x4 ), /* 4 */
/* 42 */ NdrFcShort( 0x800a ), /* Simple arm type: FC_FLOAT */
/* 44 */ NdrFcLong( 0x5 ), /* 5 */
/* 48 */ NdrFcShort( 0x800c ), /* Simple arm type: FC_DOUBLE */
/* 50 */ NdrFcLong( 0xb ), /* 11 */
/* 54 */ NdrFcShort( 0x8006 ), /* Simple arm type: FC_SHORT */
/* 56 */ NdrFcLong( 0xa ), /* 10 */
/* 60 */ NdrFcShort( 0x8008 ), /* Simple arm type: FC_LONG */
/* 62 */ NdrFcLong( 0x6 ), /* 6 */
/* 66 */ NdrFcShort( 0xd6 ), /* Offset= 214 (280) */
/* 68 */ NdrFcLong( 0x7 ), /* 7 */
/* 72 */ NdrFcShort( 0x800c ), /* Simple arm type: FC_DOUBLE */
/* 74 */ NdrFcLong( 0x8 ), /* 8 */
/* 78 */ NdrFcShort( 0xd0 ), /* Offset= 208 (286) */
/* 80 */ NdrFcLong( 0xd ), /* 13 */
/* 84 */ NdrFcShort( 0xe4 ), /* Offset= 228 (312) */
/* 86 */ NdrFcLong( 0x9 ), /* 9 */
/* 90 */ NdrFcShort( 0xf0 ), /* Offset= 240 (330) */
/* 92 */ NdrFcLong( 0x2000 ), /* 8192 */
/* 96 */ NdrFcShort( 0xfc ), /* Offset= 252 (348) */
/* 98 */ NdrFcLong( 0x24 ), /* 36 */
/* 102 */ NdrFcShort( 0x2f4 ), /* Offset= 756 (858) */
/* 104 */ NdrFcLong( 0x4024 ), /* 16420 */
/* 108 */ NdrFcShort( 0x2ee ), /* Offset= 750 (858) */
/* 110 */ NdrFcLong( 0x4011 ), /* 16401 */
/* 114 */ NdrFcShort( 0x2ec ), /* Offset= 748 (862) */
/* 116 */ NdrFcLong( 0x4002 ), /* 16386 */
/* 120 */ NdrFcShort( 0x2ea ), /* Offset= 746 (866) */
/* 122 */ NdrFcLong( 0x4003 ), /* 16387 */
/* 126 */ NdrFcShort( 0x2e8 ), /* Offset= 744 (870) */
/* 128 */ NdrFcLong( 0x4004 ), /* 16388 */
/* 132 */ NdrFcShort( 0x2e6 ), /* Offset= 742 (874) */
/* 134 */ NdrFcLong( 0x4005 ), /* 16389 */
/* 138 */ NdrFcShort( 0x2e4 ), /* Offset= 740 (878) */
/* 140 */ NdrFcLong( 0x400b ), /* 16395 */
/* 144 */ NdrFcShort( 0x2d2 ), /* Offset= 722 (866) */
/* 146 */ NdrFcLong( 0x400a ), /* 16394 */
/* 150 */ NdrFcShort( 0x2d0 ), /* Offset= 720 (870) */
/* 152 */ NdrFcLong( 0x4006 ), /* 16390 */
/* 156 */ NdrFcShort( 0x2d6 ), /* Offset= 726 (882) */
/* 158 */ NdrFcLong( 0x4007 ), /* 16391 */
/* 162 */ NdrFcShort( 0x2cc ), /* Offset= 716 (878) */
/* 164 */ NdrFcLong( 0x4008 ), /* 16392 */
/* 168 */ NdrFcShort( 0x2ce ), /* Offset= 718 (886) */
/* 170 */ NdrFcLong( 0x400d ), /* 16397 */
/* 174 */ NdrFcShort( 0x2cc ), /* Offset= 716 (890) */
/* 176 */ NdrFcLong( 0x4009 ), /* 16393 */
/* 180 */ NdrFcShort( 0x2ca ), /* Offset= 714 (894) */
/* 182 */ NdrFcLong( 0x6000 ), /* 24576 */
/* 186 */ NdrFcShort( 0x2c8 ), /* Offset= 712 (898) */
/* 188 */ NdrFcLong( 0x400c ), /* 16396 */
/* 192 */ NdrFcShort( 0x2c6 ), /* Offset= 710 (902) */
/* 194 */ NdrFcLong( 0x10 ), /* 16 */
/* 198 */ NdrFcShort( 0x8002 ), /* Simple arm type: FC_CHAR */
/* 200 */ NdrFcLong( 0x12 ), /* 18 */
/* 204 */ NdrFcShort( 0x8006 ), /* Simple arm type: FC_SHORT */
/* 206 */ NdrFcLong( 0x13 ), /* 19 */
/* 210 */ NdrFcShort( 0x8008 ), /* Simple arm type: FC_LONG */
/* 212 */ NdrFcLong( 0x16 ), /* 22 */
/* 216 */ NdrFcShort( 0x8008 ), /* Simple arm type: FC_LONG */
/* 218 */ NdrFcLong( 0x17 ), /* 23 */
/* 222 */ NdrFcShort( 0x8008 ), /* Simple arm type: FC_LONG */
/* 224 */ NdrFcLong( 0xe ), /* 14 */
/* 228 */ NdrFcShort( 0x2aa ), /* Offset= 682 (910) */
/* 230 */ NdrFcLong( 0x400e ), /* 16398 */
/* 234 */ NdrFcShort( 0x2b0 ), /* Offset= 688 (922) */
/* 236 */ NdrFcLong( 0x4010 ), /* 16400 */
/* 240 */ NdrFcShort( 0x2ae ), /* Offset= 686 (926) */

```

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```
/* 242 */ NdrFcLong( 0x4012 ), /* 16402 */
/* 246 */ NdrFcShort( 0x26c ), /* Offset= 620 (866) */
/* 248 */ NdrFcLong( 0x4013 ), /* 16403 */
/* 252 */ NdrFcShort( 0x26a ), /* Offset= 618 (870) */
/* 254 */ NdrFcLong( 0x4016 ), /* 16406 */
/* 258 */ NdrFcShort( 0x264 ), /* Offset= 612 (870) */
/* 260 */ NdrFcLong( 0x4017 ), /* 16407 */
/* 264 */ NdrFcShort( 0x25e ), /* Offset= 606 (870) */
/* 266 */ NdrFcLong( 0x0 ), /* 0 */
/* 270 */ NdrFcShort( 0x0 ), /* Offset= 0 (270) */
/* 272 */ NdrFcLong( 0x1 ), /* 1 */
/* 276 */ NdrFcShort( 0x0 ), /* Offset= 0 (276) */
/* 278 */ NdrFcShort( 0xffffffff ), /* Offset= -1 (277) */
/* 280 */
                                0x15, /* FC_STRUCT */
                                0x7, /* 7 */
/* 282 */ NdrFcShort( 0x8 ), /* 8 */
/* 284 */ 0xb, /* FC_HYPER */
                                0x5b, /* FC_END */
/* 286 */
                                0x12, 0x0, /* FC_UP */
/* 288 */ NdrFcShort( 0xe ), /* Offset= 14 (302) */
/* 290 */
                                0x1b, /* FC_CARRAY */
                                0x1, /* 1 */
/* 292 */ NdrFcShort( 0x2 ), /* 2 */
/* 294 */ 0x9, /* Corr desc: FC_ULONG */
                                0x0, /* */
/* 296 */ NdrFcShort( 0xfffc ), /* -4 */
/* 298 */ NdrFcShort( 0x1 ), /* Corr flags: early, */
/* 300 */ 0x6, /* FC_SHORT */
                                0x5b, /* FC_END */
/* 302 */
                                0x17, /* FC_CSTRUCT */
                                0x3, /* 3 */
/* 304 */ NdrFcShort( 0x8 ), /* 8 */
/* 306 */ NdrFcShort( 0xffffffff0 ), /* Offset= -16 (290) */
/* 308 */ 0x8, /* FC_LONG */
                                0x8, /* FC_LONG */
/* 310 */ 0x5c, /* FC_PAD */
                                0x5b, /* FC_END */
/* 312 */
                                0x2f, /* FC_IP */
                                0x5a, /* FC_CONSTANT_IID */
/* 314 */ NdrFcLong( 0x0 ), /* 0 */
/* 318 */ NdrFcShort( 0x0 ), /* 0 */
/* 320 */ NdrFcShort( 0x0 ), /* 0 */
/* 322 */ 0xc0, /* 192 */
                                0x0, /* 0 */
/* 324 */ 0x0, /* 0 */
                                0x0, /* 0 */
/* 326 */ 0x0, /* 0 */
                                0x0, /* 0 */
/* 328 */ 0x0, /* 0 */
                                0x46, /* 70 */
/* 330 */
                                0x2f, /* FC_IP */
                                0x5a, /* FC_CONSTANT_IID */
/* 332 */ NdrFcLong( 0x20400 ), /* 132096 */
/* 336 */ NdrFcShort( 0x0 ), /* 0 */
/* 338 */ NdrFcShort( 0x0 ), /* 0 */
/* 340 */ 0xc0, /* 192 */
                                0x0, /* 0 */
/* 342 */ 0x0, /* 0 */
                                0x0, /* 0 */
/* 344 */ 0x0, /* 0 */
                                0x0, /* 0 */
/* 346 */ 0x0, /* 0 */
                                0x46, /* 70 */
/* 348 */
                                0x12, 0x10, /* FC_UP [pointer_deref] */
/* 350 */ NdrFcShort( 0x2 ), /* Offset= 2 (352) */
/* 352 */
                                0x12, 0x0, /* FC_UP */
/* 354 */ NdrFcShort( 0x1e6 ), /* Offset= 486 (840) */
/* 356 */
                                0x2a, /* FC_ENCAPSULATED_UNION */
                                0x89, /* 137 */
/* 358 */ NdrFcShort( 0x20 ), /* 32 */
/* 360 */ NdrFcShort( 0xa ), /* 10 */
/* 362 */ NdrFcLong( 0x8 ), /* 8 */
/* 366 */ NdrFcShort( 0x50 ), /* Offset= 80 (446) */
/* 368 */ NdrFcLong( 0xd ), /* 13 */
/* 372 */ NdrFcShort( 0x70 ), /* Offset= 112 (484) */
/* 374 */ NdrFcLong( 0x9 ), /* 9 */
/* 378 */ NdrFcShort( 0x90 ), /* Offset= 144 (522) */
/* 380 */ NdrFcLong( 0xc ), /* 12 */
/* 384 */ NdrFcShort( 0xb0 ), /* Offset= 176 (560) */
/* 386 */ NdrFcLong( 0x24 ), /* 36 */
/* 390 */ NdrFcShort( 0x104 ), /* Offset= 260 (650) */
/* 392 */ NdrFcLong( 0x800d ), /* 32781 */
/* 396 */ NdrFcShort( 0x120 ), /* Offset= 288 (684) */
/* 398 */ NdrFcLong( 0x10 ), /* 16 */
```

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```
/* 402 */ NdrFcShort( 0x13a ), /* Offset= 314 (716) */
/* 404 */ NdrFcLong( 0x2 ), /* 2 */
/* 408 */ NdrFcShort( 0x150 ), /* Offset= 336 (744) */
/* 410 */ NdrFcLong( 0x3 ), /* 3 */
/* 414 */ NdrFcShort( 0x166 ), /* Offset= 358 (772) */
/* 416 */ NdrFcLong( 0x14 ), /* 20 */
/* 420 */ NdrFcShort( 0x17c ), /* Offset= 380 (800) */
/* 422 */ NdrFcShort( 0xffffffff ), /* Offset= -1 (421) */
/* 424 */
                                0x21, /* FC_BOGUS_ARRAY */
                                0x3, /* 3 */
/* 426 */ NdrFcShort( 0x0 ), /* 0 */
/* 428 */ 0x19, /* Corr desc: field pointer, FC_ULONG */
                                0x0, /* */
/* 430 */ NdrFcShort( 0x0 ), /* 0 */
/* 432 */ NdrFcShort( 0x1 ), /* Corr flags: early, */
/* 434 */ NdrFcLong( 0xffffffff ), /* -1 */
/* 438 */ NdrFcShort( 0x0 ), /* Corr flags: */
/* 440 */
                                0x12, 0x0, /* FC_UP */
/* 442 */ NdrFcShort( 0xffffffff74 ), /* Offset= -140 (302) */
/* 444 */ 0x5c, /* FC_PAD */
                                0x5b, /* FC_END */
/* 446 */
                                0x1a, /* FC_BOGUS_STRUCT */
                                0x3, /* 3 */
/* 448 */ NdrFcShort( 0x10 ), /* 16 */
/* 450 */ NdrFcShort( 0x0 ), /* 0 */
/* 452 */ NdrFcShort( 0x6 ), /* Offset= 6 (458) */
/* 454 */ 0x8, /* FC_LONG */
                                0x39, /* FC_ALIGNM8 */
/* 456 */ 0x36, /* FC_POINTER */
                                0x5b, /* FC_END */
/* 458 */
                                0x11, 0x0, /* FC_RP */
/* 460 */ NdrFcShort( 0xfffffddc ), /* Offset= -36 (424) */
/* 462 */
                                0x21, /* FC_BOGUS_ARRAY */
                                0x3, /* 3 */
/* 464 */ NdrFcShort( 0x0 ), /* 0 */
/* 466 */ 0x19, /* Corr desc: field pointer, FC_ULONG */
                                0x0, /* */
/* 468 */ NdrFcShort( 0x0 ), /* 0 */
/* 470 */ NdrFcShort( 0x1 ), /* Corr flags: early, */
/* 472 */ NdrFcLong( 0xffffffff ), /* -1 */
/* 476 */ NdrFcShort( 0x0 ), /* Corr flags: */
/* 478 */ 0x4c, /* FC_EMBEDDED_COMPLEX */
                                0x0, /* 0 */
/* 480 */ NdrFcShort( 0xfffff58 ), /* Offset= -168 (312) */
/* 482 */ 0x5c, /* FC_PAD */
                                0x5b, /* FC_END */
/* 484 */
                                0x1a, /* FC_BOGUS_STRUCT */
                                0x3, /* 3 */
/* 486 */ NdrFcShort( 0x10 ), /* 16 */
/* 488 */ NdrFcShort( 0x0 ), /* 0 */
/* 490 */ NdrFcShort( 0x6 ), /* Offset= 6 (496) */
/* 492 */ 0x8, /* FC_LONG */
                                0x39, /* FC_ALIGNM8 */
/* 494 */ 0x36, /* FC_POINTER */
                                0x5b, /* FC_END */
/* 496 */
                                0x11, 0x0, /* FC_RP */
/* 498 */ NdrFcShort( 0xfffffddc ), /* Offset= -36 (462) */
/* 500 */
                                0x21, /* FC_BOGUS_ARRAY */
                                0x3, /* 3 */
/* 502 */ NdrFcShort( 0x0 ), /* 0 */
/* 504 */ 0x19, /* Corr desc: field pointer, FC_ULONG */
                                0x0, /* */
/* 506 */ NdrFcShort( 0x0 ), /* 0 */
/* 508 */ NdrFcShort( 0x1 ), /* Corr flags: early, */
/* 510 */ NdrFcLong( 0xffffffff ), /* -1 */
/* 514 */ NdrFcShort( 0x0 ), /* Corr flags: */
/* 516 */ 0x4c, /* FC_EMBEDDED_COMPLEX */
                                0x0, /* 0 */
/* 518 */ NdrFcShort( 0xfffff44 ), /* Offset= -188 (330) */
/* 520 */ 0x5c, /* FC_PAD */
                                0x5b, /* FC_END */
/* 522 */
                                0x1a, /* FC_BOGUS_STRUCT */
                                0x3, /* 3 */
/* 524 */ NdrFcShort( 0x10 ), /* 16 */
/* 526 */ NdrFcShort( 0x0 ), /* 0 */
/* 528 */ NdrFcShort( 0x6 ), /* Offset= 6 (534) */
/* 530 */ 0x8, /* FC_LONG */
                                0x39, /* FC_ALIGNM8 */
/* 532 */ 0x36, /* FC_POINTER */
                                0x5b, /* FC_END */
/* 534 */
                                0x11, 0x0, /* FC_RP */
/* 536 */ NdrFcShort( 0xfffffddc ), /* Offset= -36 (500) */
/* 538 */
```

## Appendix B – Database Design

---

```

                                0x21,          /* FC_BOGUS_ARRAY */
                                0x3,          /* 3 */
/* 540 */ NdrFcShort( 0x0 ), /* 0 */
/* 542 */ 0x19,             /* Corr desc: field pointer, FC_ULONG */
                                0x0,          /* */
/* 544 */ NdrFcShort( 0x0 ), /* 0 */
/* 546 */ NdrFcShort( 0x1 ), /* Corr flags: early, */
/* 548 */ NdrFcLong( 0xffffffff ), /* -1 */
/* 552 */ NdrFcShort( 0x0 ), /* Corr flags: */
/* 554 */
                                0x12, 0x0,    /* FC_UP */
/* 556 */ NdrFcShort( 0x176 ), /* Offset= 374 (930) */
/* 558 */ 0x5c,             /* FC_PAD */
                                0x5b,          /* FC_END */
/* 560 */
                                0x1a,          /* FC_BOGUS_STRUCT */
                                0x3,          /* 3 */
/* 562 */ NdrFcShort( 0x10 ), /* 16 */
/* 564 */ NdrFcShort( 0x0 ), /* 0 */
/* 566 */ NdrFcShort( 0x6 ), /* Offset= 6 (572) */
/* 568 */ 0x8,              /* FC_LONG */
                                0x39,          /* FC_ALIGNM8 */
/* 570 */ 0x36,             /* FC_POINTER */
                                0x5b,          /* FC_END */
/* 572 */
                                0x11, 0x0,    /* FC_RP */
/* 574 */ NdrFcShort( 0xfffffddc ), /* Offset= -36 (538) */
/* 576 */
                                0x2E,          /* FC_IP */
                                0x5a,          /* FC_CONSTANT_IID */
/* 578 */ NdrFcLong( 0x2f ), /* 47 */
/* 582 */ NdrFcShort( 0x0 ), /* 0 */
/* 584 */ NdrFcShort( 0x0 ), /* 0 */
/* 586 */ 0xc0,             /* 192 */
                                0x0,          /* 0 */
/* 588 */ 0x0,              /* 0 */
                                0x0,          /* 0 */
/* 590 */ 0x0,              /* 0 */
                                0x0,          /* 0 */
/* 592 */ 0x0,              /* 0 */
                                0x46,          /* 70 */
/* 594 */
                                0x1b,          /* FC_CARRAY */
                                0x0,          /* 0 */
/* 596 */ NdrFcShort( 0x1 ), /* 1 */
/* 598 */ 0x19,             /* Corr desc: field pointer, FC_ULONG */
                                0x0,          /* */
/* 600 */ NdrFcShort( 0x4 ), /* 4 */
/* 602 */ NdrFcShort( 0x1 ), /* Corr flags: early, */
/* 604 */ 0x1,              /* FC_BYTE */
                                0x5b,          /* FC_END */
/* 606 */
                                0x1a,          /* FC_BOGUS_STRUCT */
                                0x3,          /* 3 */
/* 608 */ NdrFcShort( 0x18 ), /* 24 */
/* 610 */ NdrFcShort( 0x0 ), /* 0 */
/* 612 */ NdrFcShort( 0xc ), /* Offset= 12 (624) */
/* 614 */ 0x8,              /* FC_LONG */
                                0x8,          /* FC_LONG */
/* 616 */ 0x4c,             /* FC_EMBEDDED_COMPLEX */
                                0x0,          /* 0 */
/* 618 */ NdrFcShort( 0xfffffdd6 ), /* Offset= -42 (576) */
/* 620 */ 0x39,             /* FC_ALIGNM8 */
                                0x36,          /* FC_POINTER */
/* 622 */ 0x5c,             /* FC_PAD */
                                0x5b,          /* FC_END */
/* 624 */
                                0x12, 0x0,    /* FC_UP */
/* 626 */ NdrFcShort( 0xffffffe0 ), /* Offset= -32 (594) */
/* 628 */
                                0x21,          /* FC_BOGUS_ARRAY */
                                0x3,          /* 3 */
/* 630 */ NdrFcShort( 0x0 ), /* 0 */
/* 632 */ 0x19,             /* Corr desc: field pointer, FC_ULONG */
                                0x0,          /* */
/* 634 */ NdrFcShort( 0x0 ), /* 0 */
/* 636 */ NdrFcShort( 0x1 ), /* Corr flags: early, */
/* 638 */ NdrFcLong( 0xffffffff ), /* -1 */
/* 642 */ NdrFcShort( 0x0 ), /* Corr flags: */
/* 644 */
                                0x12, 0x0,    /* FC_UP */
/* 646 */ NdrFcShort( 0xfffffdd8 ), /* Offset= -40 (606) */
/* 648 */ 0x5c,             /* FC_PAD */
                                0x5b,          /* FC_END */
/* 650 */
                                0x1a,          /* FC_BOGUS_STRUCT */
                                0x3,          /* 3 */
/* 652 */ NdrFcShort( 0x10 ), /* 16 */
/* 654 */ NdrFcShort( 0x0 ), /* 0 */
/* 656 */ NdrFcShort( 0x6 ), /* Offset= 6 (662) */
/* 658 */ 0x8,              /* FC_LONG */
                                0x39,          /* FC_ALIGNM8 */
/* 660 */ 0x36,             /* FC_POINTER */
```

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---

```

                                0x5b,          /* FC_END */
/* 662 */
                                0x11, 0x0,      /* FC_RP */
/* 664 */ NdrFcShort( 0xfffffd0c ), /* Offset= -36 (628) */
/* 666 */
                                0x1d,          /* FC_SMFARRAY */
                                0x0,          /* 0 */
/* 668 */ NdrFcShort( 0x8 ), /* 8 */
/* 670 */ 0x2, /* FC_CHAR */
                                0x5b,          /* FC_END */
/* 672 */
                                0x15,          /* FC_STRUCT */
                                0x3,          /* 3 */
/* 674 */ NdrFcShort( 0x10 ), /* 16 */
/* 676 */ 0x8, /* FC_LONG */
                                0x6,          /* FC_SHORT */
/* 678 */ 0x6, /* FC_SHORT */
                                0x4c,        /* FC_EMBEDDED_COMPLEX */
/* 680 */ 0x0, /* 0 */
                                NdrFcShort( 0xfffffff1 ), /* Offset= -15 (666) */
                                0x5b,          /* FC_END */
/* 684 */
                                0x1a,          /* FC_BOGUS_STRUCT */
                                0x3,          /* 3 */
/* 686 */ NdrFcShort( 0x20 ), /* 32 */
/* 688 */ NdrFcShort( 0x0 ), /* 0 */
/* 690 */ NdrFcShort( 0xa ), /* Offset= 10 (700) */
/* 692 */ 0x8, /* FC_LONG */
                                0x39,        /* FC_ALIGNM8 */
/* 694 */ 0x36, /* FC_POINTER */
                                0x4c,        /* FC_EMBEDDED_COMPLEX */
/* 696 */ 0x0, /* 0 */
                                NdrFcShort( 0xffffffe7 ), /* Offset= -25 (672) */
                                0x5b,          /* FC_END */
/* 700 */
                                0x11, 0x0,      /* FC_RP */
/* 702 */ NdrFcShort( 0xfffff10 ), /* Offset= -240 (462) */
/* 704 */
                                0x1b,          /* FC_CARRAY */
                                0x0,          /* 0 */
/* 706 */ NdrFcShort( 0x1 ), /* 1 */
/* 708 */ 0x19, /* Corr desc: field pointer, FC_ULONG */
                                0x0,          /* */
/* 710 */ NdrFcShort( 0x0 ), /* 0 */
/* 712 */ NdrFcShort( 0x1 ), /* Corr flags: early, */
/* 714 */ 0x1, /* FC_BYTE */
                                0x5b,          /* FC_END */
/* 716 */
                                0x1a,          /* FC_BOGUS_STRUCT */
                                0x3,          /* 3 */
/* 718 */ NdrFcShort( 0x10 ), /* 16 */
/* 720 */ NdrFcShort( 0x0 ), /* 0 */
/* 722 */ NdrFcShort( 0x6 ), /* Offset= 6 (728) */
/* 724 */ 0x8, /* FC_LONG */
                                0x39,        /* FC_ALIGNM8 */
/* 726 */ 0x36, /* FC_POINTER */
                                0x5b,          /* FC_END */
/* 728 */
                                0x12, 0x0,      /* FC_UP */
/* 730 */ NdrFcShort( 0xffffffe6 ), /* Offset= -26 (704) */
/* 732 */
                                0x1b,          /* FC_CARRAY */
                                0x1,          /* 1 */
/* 734 */ NdrFcShort( 0x2 ), /* 2 */
/* 736 */ 0x19, /* Corr desc: field pointer, FC_ULONG */
                                0x0,          /* */
/* 738 */ NdrFcShort( 0x0 ), /* 0 */
/* 740 */ NdrFcShort( 0x1 ), /* Corr flags: early, */
/* 742 */ 0x6, /* FC_SHORT */
                                0x5b,          /* FC_END */
/* 744 */
                                0x1a,          /* FC_BOGUS_STRUCT */
                                0x3,          /* 3 */
/* 746 */ NdrFcShort( 0x10 ), /* 16 */
/* 748 */ NdrFcShort( 0x0 ), /* 0 */
/* 750 */ NdrFcShort( 0x6 ), /* Offset= 6 (756) */
/* 752 */ 0x8, /* FC_LONG */
                                0x39,        /* FC_ALIGNM8 */
/* 754 */ 0x36, /* FC_POINTER */
                                0x5b,          /* FC_END */
/* 756 */
                                0x12, 0x0,      /* FC_UP */
/* 758 */ NdrFcShort( 0xffffffe6 ), /* Offset= -26 (732) */
/* 760 */
                                0x1b,          /* FC_CARRAY */
                                0x3,          /* 3 */
/* 762 */ NdrFcShort( 0x4 ), /* 4 */
/* 764 */ 0x19, /* Corr desc: field pointer, FC_ULONG */
                                0x0,          /* */
/* 766 */ NdrFcShort( 0x0 ), /* 0 */
/* 768 */ NdrFcShort( 0x1 ), /* Corr flags: early, */
/* 770 */ 0x8, /* FC_LONG */
                                0x5b,          /* FC_END */

```

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---

```
/* 772 */
                                0x1a,          /* FC_BOGUS_STRUCT */
                                0x3,          /* 3 */
/* 774 */ NdrFcShort( 0x10 ), /* 16 */
/* 776 */ NdrFcShort( 0x0 ), /* 0 */
/* 778 */ NdrFcShort( 0x6 ), /* Offset= 6 (784) */
/* 780 */ 0x8,                /* FC_LONG */
                                0x39,          /* FC_ALIGNM8 */
/* 782 */ 0x36,                /* FC_POINTER */
                                0x5b,          /* FC_END */
/* 784 */
                                0x12, 0x0,      /* FC_UP */
/* 786 */ NdrFcShort( 0xfffffe6 ), /* Offset= -26 (760) */
/* 788 */
                                0x1b,          /* FC_CARRAY */
                                0x7,          /* 7 */
/* 790 */ NdrFcShort( 0x8 ), /* 8 */
/* 792 */ 0x19,                /* Corr desc: field pointer, FC_ULONG */
                                0x0,          /* */
/* 794 */ NdrFcShort( 0x0 ), /* 0 */
/* 796 */ NdrFcShort( 0x1 ), /* Corr flags: early, */
/* 798 */ 0xb,                 /* FC_HYPER */
                                0x5b,          /* FC_END */
/* 800 */
                                0x1a,          /* FC_BOGUS_STRUCT */
                                0x3,          /* 3 */
/* 802 */ NdrFcShort( 0x10 ), /* 16 */
/* 804 */ NdrFcShort( 0x0 ), /* 0 */
/* 806 */ NdrFcShort( 0x6 ), /* Offset= 6 (812) */
/* 808 */ 0x8,                /* FC_LONG */
                                0x39,          /* FC_ALIGNM8 */
/* 810 */ 0x36,                /* FC_POINTER */
                                0x5b,          /* FC_END */
/* 812 */
                                0x12, 0x0,      /* FC_UP */
/* 814 */ NdrFcShort( 0xfffffe6 ), /* Offset= -26 (788) */
/* 816 */
                                0x15,          /* FC_STRUCT */
                                0x3,          /* 3 */
/* 818 */ NdrFcShort( 0x8 ), /* 8 */
/* 820 */ 0x8,                /* FC_LONG */
                                0x8,          /* FC_LONG */
/* 822 */ 0x5c,                /* FC_PAD */
                                0x5b,          /* FC_END */
/* 824 */
                                0x1b,          /* FC_CARRAY */
                                0x3,          /* 3 */
/* 826 */ NdrFcShort( 0x8 ), /* 8 */
/* 828 */ 0x7,                /* Corr desc: FC_USHORT */
                                0x0,          /* */
/* 830 */ NdrFcShort( 0xffc8 ), /* -56 */
/* 832 */ NdrFcShort( 0x1 ), /* Corr flags: early, */
/* 834 */ 0x4c,                /* FC_EMBEDDED_COMPLEX */
                                0x0,          /* 0 */
/* 836 */ NdrFcShort( 0xfffffec ), /* Offset= -20 (816) */
/* 838 */ 0x5c,                /* FC_PAD */
                                0x5b,          /* FC_END */
/* 840 */
                                0x1a,          /* FC_BOGUS_STRUCT */
                                0x3,          /* 3 */
/* 842 */ NdrFcShort( 0x38 ), /* 56 */
/* 844 */ NdrFcShort( 0xfffffec ), /* Offset= -20 (824) */
/* 846 */ NdrFcShort( 0x0 ), /* Offset= 0 (846) */
/* 848 */ 0x6,                /* FC_SHORT */
                                0x6,          /* FC_SHORT */
/* 850 */ 0x38,                /* FC_ALIGNM4 */
                                0x8,          /* FC_LONG */
/* 852 */ 0x8,                /* FC_LONG */
                                0x4c,          /* FC_EMBEDDED_COMPLEX */
/* 854 */ 0x4,                /* 4 */
                                NdrFcShort( 0xfffffe0d ), /* Offset= -499 (356) */
                                0x5b,          /* FC_END */
/* 858 */
                                0x12, 0x0,      /* FC_UP */
/* 860 */ NdrFcShort( 0xfffff02 ), /* Offset= -254 (606) */
/* 862 */
                                0x12, 0x8,      /* FC_UP [simple_pointer] */
/* 864 */ 0x1,                /* FC_BYTE */
                                0x5c,          /* FC_PAD */
/* 866 */
                                0x12, 0x8,      /* FC_UP [simple_pointer] */
/* 868 */ 0x6,                /* FC_SHORT */
                                0x5c,          /* FC_PAD */
/* 870 */
                                0x12, 0x8,      /* FC_UP [simple_pointer] */
/* 872 */ 0x8,                /* FC_LONG */
                                0x5c,          /* FC_PAD */
/* 874 */
                                0x12, 0x8,      /* FC_UP [simple_pointer] */
/* 876 */ 0xa,                /* FC_FLOAT */
                                0x5c,          /* FC_PAD */
/* 878 */
                                0x12, 0x8,      /* FC_UP [simple_pointer] */
```



## Appendix B – Database Design

```
/* 880 */ 0xc, /* FC_DOUBLE */
/* 882 */ 0x5c, /* FC_PAD */
/* 884 */ NdrFcShort( 0xfffffda4 ), /* FC_UP */
/* 886 */ 0x12, 0x0, /* FC_UP [pointer_deref] */
/* 888 */ NdrFcShort( 0xfffffda6 ), /* Offset= -602 (286) */
/* 890 */ 0x12, 0x10, /* FC_UP [pointer_deref] */
/* 892 */ NdrFcShort( 0xfffffdb0 ), /* Offset= -580 (312) */
/* 894 */ 0x12, 0x10, /* FC_UP [pointer_deref] */
/* 896 */ NdrFcShort( 0xfffffdca ), /* Offset= -566 (330) */
/* 898 */ 0x12, 0x10, /* FC_UP [pointer_deref] */
/* 900 */ NdrFcShort( 0xfffffdd8 ), /* Offset= -552 (348) */
/* 902 */ 0x12, 0x10, /* FC_UP [pointer_deref] */
/* 904 */ NdrFcShort( 0x2 ), /* Offset= 2 (906) */
/* 906 */ 0x12, 0x0, /* FC_UP */
/* 908 */ NdrFcShort( 0x16 ), /* Offset= 22 (930) */
/* 910 */ 0x15, /* FC_STRUCT */
/* 912 */ NdrFcShort( 0x10 ), /* 7 */
/* 914 */ 0x6, /* FC_SHORT */
/* 916 */ 0x1, /* FC_BYTE */
/* 918 */ 0x8, /* FC_ALIGNM4 */
/* 920 */ 0xb, /* FC_ALIGNM8 */
/* 922 */ 0x5b, /* FC_END */
/* 924 */ NdrFcShort( 0xfffffff2 ), /* FC_UP */
/* 926 */ 0x12, 0x8, /* FC_UP [simple_pointer] */
/* 928 */ 0x2, /* FC_CHAR */
/* 930 */ 0x5c, /* FC_PAD */
/* 932 */ 0x1a, /* FC_BOGUS_STRUCT */
/* 934 */ NdrFcShort( 0x20 ), /* 7 */
/* 936 */ NdrFcShort( 0x0 ), /* 32 */
/* 938 */ NdrFcShort( 0x0 ), /* 0 */
/* 940 */ 0x8, /* Offset= 0 (936) */
/* 942 */ 0x6, /* FC_LONG */
/* 944 */ 0x6, /* FC_SHORT */
/* 946 */ 0x4c, /* FC_SHORT */
/* 948 */ NdrFcShort( 0xfffffc54 ), /* FC_EMBEDDED_COMPLEX */
/* 950 */ 0x5c, /* 0 */
/* 952 */ 0x5b, /* Offset= -940 (6) */
/* 954 */ 0xb4, /* FC_PAD */
/* 956 */ 0x83, /* FC_END */
/* 958 */ NdrFcShort( 0x0 ), /* FC_USER_MARSHAL */
/* 960 */ 0x83, /* 131 */
/* 962 */ NdrFcShort( 0x0 ), /* 0 */
/* 964 */ NdrFcShort( 0x18 ), /* 24 */
/* 966 */ NdrFcShort( 0x0 ), /* 0 */
/* 968 */ NdrFcShort( 0xfffffc44 ), /* Offset= -956 (2) */
/* 970 */ 0x11, 0x4, /* FC_RP [allocated_on_stack] */
/* 972 */ NdrFcShort( 0x6 ), /* Offset= 6 (968) */
/* 974 */ 0x13, 0x0, /* FC_OP */
/* 976 */ NdrFcShort( 0xfffffddc ), /* Offset= -36 (930) */
/* 978 */ 0xb4, /* FC_USER_MARSHAL */
/* 980 */ 0x83, /* 131 */
/* 982 */ NdrFcShort( 0x0 ), /* 0 */
/* 984 */ NdrFcShort( 0x18 ), /* 24 */
/* 986 */ NdrFcShort( 0x0 ), /* 0 */
/* 988 */ NdrFcShort( 0xfffffff4 ), /* Offset= -12 (964) */
/* 990 */ 0x0
}
};

const CInterfaceProxyVtbl * _tpcc_com_ps_ProxyVtblList[] =
{
    ( CInterfaceProxyVtbl *) &ITPCCProxyVtbl,
    0
};

const CInterfaceStubVtbl * _tpcc_com_ps_StubVtblList[] =
{
    ( CInterfaceStubVtbl *) &ITPCCStubVtbl,
    0
};
```

## Appendix B – Database Design

---

```
PCInterfaceName const _tpcc_com_ps_InterfaceNamesList[] =
{
    "ITPCC",
    0
};

#define _tpcc_com_ps_CHECK_IID(n) IID_GENERIC_CHECK_IID( _tpcc_com_ps, pIID, n)

int __stdcall _tpcc_com_ps_IID_Lookup( const IID * pIID, int * pIndex )
{
    if(!_tpcc_com_ps_CHECK_IID(0))
    {
        *pIndex = 0;
        return 1;
    }

    return 0;
}

const ExtendedProxyFileInfo tpcc_com_ps_ProxyFileInfo =
{
    (PCInterfaceProxyVtblList *) & _tpcc_com_ps_ProxyVtblList,
    (PCInterfaceStubVtblList *) & _tpcc_com_ps_StubVtblList,
    (const PCInterfaceName * ) & _tpcc_com_ps_InterfaceNamesList,
    0, // no delegation
    & _tpcc_com_ps_IID_Lookup,
    1,
    2,
    0, /* table of [async_uuid] interfaces */
    0, /* Filler1 */
    0, /* Filler2 */
    0 /* Filler3 */
};

#endif /* defined(_M_IA64) || defined(_M_AXP64)*/
```

### common/txnlog/include/rtetime.h

```
/* FILE: rtetime.h : header file
 * Copyright 1997 Microsoft Corp., All rights reserved.
 *
 * Authors: Charles Levine, Philip Durr
 *          Microsoft Corp.
 */

#define MAX_JULIAN_TIME 0x7FFFFFFFFFFFFFFF
#define JULIAN_TIME __int64
#define TC_TIME DWORD
extern "C"
{
    BOOL InitJulianTime(LPSYSTEMTIME lpInitTime);
    JULIAN_TIME GetJulianTime(void);
    DWORD MyTickCount(void);
    void GetJulianAndTC(JULIAN_TIME *pJulian, DWORD *pTC);
    JULIAN_TIME ConvertTo(x64)Time(int iYear, int iMonth, int iDay, int iHour, int iMinute, int iSecond);
    JULIAN_TIME Get(x64)Time(LPSYSTEMTIME lpInitTime);
    int JulianDay( int yr, int mm, int dd );
    void JulianToTime(JULIAN_TIME julianTS, int* yr, int* mm, int* dd, int *hh, int *mi, int *ss );
    void JulianToCalendar( int day, int* yr, int* mm, int* dd );
}

```

### common/txnlog/include/spinlock.h

```
/* FILE: SPINLOCK.H
 *
 * Copyright 1997 Microsoft Corp., All rights reserved.
 *
 * Authors: Mike Parkes, Charles Levine, Philip Durr
 *          Microsoft Corp.
 */

#ifdef _INC_Spinlock
```

## Appendix B – Database Design

---

```
const LONG LockClosed      = 1;
const LONG LockOpen       = 0;

/*****
 *
 * Spinlock and Semaphore locking.
 *
 * This class provides a very conservative locking scheme.
 * The assumption behind the code is that locks will be
 * held for a very short time. When a lock is taken a memory
 * location is exchanged. All other threads that want this
 * lock wait by spinning and sometimes sleeping on a semaphore
 * until it becomes free again. The only other choice is not
 * to wait at all and move on to do something else. This
 * module should normally be used in conjunction with cache
 * aligned memory in minimize cache line misses.
 *
 *****/

class Spinlock
{
    // Private data.
    HANDLE Semaphore;
    volatile LONG m_Spinlock;
    volatile LONG Waiting;

#ifdef _DEBUG
    // Counters for debugging builds.
    volatile LONG TotalLocks;
    volatile LONG TotalSleeps;
    volatile LONG TotalSpins;
    volatile LONG TotalWaits;
#endif

public:
    // Public functions.

    Spinlock( void );

    inline BOOL ClaimLock( BOOL Wait = TRUE );
    inline void ReleaseLock( void );
    ~Spinlock( void );
    // Disabled operations.
    Spinlock( const Spinlock & Copy );
    void operator=( const Spinlock & Copy );

private:
    // Private functions.
    inline BOOL ClaimSpinlock( volatile LONG *sl );
    void WaitForLock( void );
    void WakeAllSleepers( void );
};

/*****
 *
 * A guaranteed atomic exchange.
 *
 * An attempt is made to claim the Spinlock. This action is
 * guaranteed to be atomic.
 *
 *****/

inline BOOL Spinlock::ClaimSpinlock( volatile LONG *Spinlock )
{
#ifdef _DEBUG
    InterlockedIncrement( (LPLONG) & TotalLocks );
#endif
    return ( (*Spinlock) == LockOpen ) && ( InterlockedExchange( (LPLONG)Spinlock, LockClosed ) ==
LockOpen ) );
}

/*****
 *
 * Claim the Spinlock.
 *
 * Claim the lock if available else wait or exit.
 *
 *****/

inline BOOL Spinlock::ClaimLock( BOOL Wait )
{
    if ( ! ClaimSpinlock( (volatile LONG*) & m_Spinlock ) )
    {
        if ( Wait )
            WaitForLock();
        return Wait;
    }
    return TRUE;
}

/*****
 *
 * Release the Spinlock.
 *****/
```

## Appendix B – Database Design

---

```
*
*   Release the lock and if needed wakeup any sleepers.
*
* *****/
inline void Spinlock::ReleaseLock( void )
{
    m_Spinlock = LockOpen;
    if ( Waiting > 0 )
        WakeAllSleepers();
}

#define _INC_Spinlock

#endif
```

### common/txnlog/include/txnlog.h

```
/*      FILE:          TXNLOG.H
*
*      Microsoft TPC-C Kit Ver. 4.10.000
*
*      NOTE: this file is RTE specific and should not be included
*      in Full Disclosure Reports.
*
*      Copyright Microsoft, 1999
*
*      PURPOSE:  Structure definitions for logging delivery txn completion stats.
*      Contact:  Charles Levine (clevine@microsoft.com)
*/

typedef struct _TXN_NEWORDER
{
    BYTE    OL_Count;          //range 0 to 31
    BYTE    OL_Remote_Count;  //range 0 to 31
    WORD    c_id;
    int     o_id;
} TXN_NEWORDER;

typedef struct _TXN_PAYMENT
{
    BYTE    CustByName;
    BYTE    IsRemote;
} TXN_PAYMENT;

typedef struct _TXN_ORDERSTATUS
{
    BYTE    CustByName;
} TXN_ORDERSTATUS;

typedef union _TXN_DETAILS
{
    TXN_NEWORDER    NewOrder;
    TXN_PAYMENT     Payment;
    TXN_ORDERSTATUS OrderStatus;
} TXN_DETAILS;

// Common header for all records in txn log. The TxnType field is
// a switch which identifies the particular variant.
#define TXN_REC_TYPE_CONTROL    1
#define TXN_REC_TYPE_TPCC      2 // replaces TRANSACTION_TYPE_TPCC
#define TXN_REC_TYPE_TPCC_DELIV_DEF 3

typedef struct _TXN_RECORD_HEADER
{
    JULIAN_TIME    TxnStartT0;          // start of txn
    BYTE    TxnType;                    // one of TXN_REC_TYPE_*
    BYTE    TxnSubType;                 // depends on TxnType
} TXN_RECORD_HEADER, *PTXN_RECORD_HEADER;

typedef struct _TXN_RECORD_CONTROL
{
    // common header; must exactly match TXN_RECORD_HEADER
    JULIAN_TIME    TxnStartT0;          // start of txn
    BYTE    TxnType;                    // = TXN_REC_TYPE_CONTROL
    BYTE    TxnSubType;                 // depends on TxnType
    // end of common header

    DWORD    Len;                       // number of bytes after this field
} TXN_RECORD_CONTROL, *PTXN_RECORD_CONTROL;
```

## Appendix B – Database Design

```
// TPC-C Txn Record Layout:
//
// 'TxnStartT0' is a Julian timestamp corresponding to the moment the
// txn is sent to the SUT, i.e., beginning of response time. Deltas
// are in milliseconds. Note that if RTDelay > 0, then the txn was
// delayed by this amount. The delay occurs at the beginning of the
// response time. So if RTDelay > 0, then the txn was actually sent
// at TxnStartT0 + RTDelay.
//
// Graphically:
//
// time -->
//
// |--- Menu ---|--- Keying ---|--- Response ---|--- Think ---|
// <- DeltaT1 -> <- DeltaT2 -> <- DeltaT4 -> <- DeltaT3 ->
//
//                               ^
//                               ^ TxnStartT0
//
// RTDelay is the amount of response time delay included in DeltaT4.
// RTDelay is recorded per txn because this value can be changed on
// the fly, and so may vary from txn to txn.
//
// TxnStatus is the txn completion code. It is used to indicate errors.
// For example, in the New Order txn, 1% of txns abort. TxnStatus will
// reflect this.

typedef struct _TXN_RECORD_TPCC
{
    // common header; must exactly match TXN_RECORD_HEADER
    JULIAN_TIME TxnStartT0; // start of txn
    BYTE TxnType; // = TXN_REC_TYPE_TPCC
    BYTE TxnSubType; // depends on TxnType
    // end of common header

    int DeltaT1; // menu time (ms)
    int DeltaT2; // keying time (ms)
    int DeltaT3; // think time (ms)
    int DeltaT4; // response time (ms)
    int RTDelay; // response time delay (ms)
    int TxnError; // error code providing more detail for TxnStatus
    WORD w_id; // warehouse ID
    BYTE d_id; // assigned district ID for this thread
    BYTE d_id_ThisTxn; // district ID chosen for this particular
    BYTE TxnStatus; // completion status for txn to indicate errors
    BYTE reserved; // for word alignment
    TXN_DETAILS TxnDetails; //
} TXN_RECORD_TPCC, *PTXN_RECORD_TPCC;

// TPC-C Deferred Delivery Txn Record Layout:
//
// Incorporating delivery transaction information into the above
// structure would increase the size of TXN_DETAILS from 8 to 42 bytes.
// Hence, we store delivery transaction details in a separate structure.
//
typedef struct _TXN_RECORD_TPCC_DELIV_DEF
{
    // common header; must exactly match TXN_RECORD_HEADER
    JULIAN_TIME TxnStartT0; // start of txn
    BYTE TxnType; // = TXN_REC_TYPE_TPCC_DELIV_DEF
    BYTE TxnSubType; // = 0
    // end of common header

    int DeltaT4; // response time (ms)
    int DeltaTxnExec; // execution time (ms)
    WORD w_id; // warehouse ID
    BYTE TxnStatus; // completion status for txn to indicate errors
    BYTE reserved; // for word alignment
    short o_carrier_id; // carrier id
    long o_id[10]; // returned delivery transaction ids
} TXN_RECORD_TPCC_DELIV_DEF, *PTXN_RECORD_TPCC_DELIV_DEF;

#define TXN_LOG_VERSION 1
#define TXN_DATA_START 4096 // offset in log file where log records start
#define TXN_LOG_EYE_CATCHER "BC" // signature bytes at the start of log file

//
// The transaction log has a header as the first 4K block.
//
typedef struct _TXN_LOG_HEADER
{
    char EyeCatcher[2]; // signature bytes; should always be "BC"
    int LogVersion; // set to TXN_LOG_VERSION
    JULIAN_TIME BeginTxnTS; // timestamp of first (lowest) txn
start
    JULIAN_TIME EndTxnTS; // timestamp of last (highest) txn completion
time
    int iRecCount; // number of records in log
file
    BOOL bLogSorted;
    int iFileSize; // file size in bytes
}
```

## Appendix B – Database Design

---

```
// the record map provides a fast way to get close to a particular timestamp in a sorted log file.
//
// struct
// {
//     JULIAN_TIME    TS;           // timestamp of record
//     int            iPos;        // byte position in file
// }
// RecMap[RecMapSize];
// #define RecMapSize 200
// } TXN_LOG_HEADER, *PTXN_LOG_HEADER;

#define READ_BUFFER_SIZE 64*1024
#define WRITE_BUFFER_SIZE 8*1024

#define NUM_READ_BUFFERS 1
#define NUM_WRITE_BUFFERS 2
#define MAX_NUM_BUFFERS 2

// flags passed in to the constructor
#define TXN_LOG_WRITE 0x01
#define TXN_LOG_READ 0x02
#define TXN_LOG_SORTED 0x04

#define TXN_LOG_OS_ERROR 1
#define TXN_LOG_NOT_SORTED 2

#define SKIP_CTRL_RECS 1

class CTxnLog
{
private:
    DWORD iBufferSize; //buffer allocated size
    DWORD iBytesFreeInBuffer; //total bytes available for use in buffer
    int iNumBuffers; //buffers in use
    int iActiveBuffer; //indicates which buffer is
active: 0 or 1
    int iIoBuffer; //buffer for any
pending IO operation
    int iFilePointer; //position in file.
    int iNextRec; //when reading, ordinal value
of next record

    // A "save point" is remembered each time GetNextRecord is called with a start time specified.
    // The next time it is called, if start time is after the save point, we start scanning from the
    // save point. This is particularly useful in FindBestInterval, where the log is scanned
repeatedly.
    JULIAN_TIME SavePtTime;
    int iSavePtFilePointer;
    int iSavePtNextRec;

    JULIAN_TIME lastTS; //when writing sorted output,
used to verify records are sorted
    BOOL bWrite; //writing log file

    BOOL bLogSorted; // is log file sorted?
applies to both input and output
    JULIAN_TIME BeginTxnTS; // timestamp of first
(lowest) txn start
    JULIAN_TIME EndTxnTS; // timestamp of last (highest) txn
completion time
    int iRecCount; // number of
records in log file

    BYTE *pCurrent; //ptr to current buffer
    BYTE *pBuffer[MAX_NUM_BUFFERS];

    PTXN_RECORD_HEADER *TxnArray; //transaction record pointer array for sort

    DWORD dwError;
    HANDLE hTxnFile; //handle to log file
    HANDLE hMapFile; //map file used when sorting the log
    HANDLE hIoComplete; //event to signify that there are no
pending IOs
    HANDLE hLogFileIo; //event to signal the IO
thread to write the inactive buffer

    Spinlock Spin; //spin lock to protect the txn log file
buffers

    int Write(BYTE *ptr, DWORD Size);
    static void LogFileIO(CTxnLog *);

public:
    CTxnLog(LPCTSTR szFileName, DWORD dwOpts);
    ~CTxnLog(void);

    int WriteToLog(PTXN_RECORD_TPCC pTxnRcprd);
    int WriteToLog(PTXN_RECORD_TPCC_DELIV_DEF pTxnRcprd);
    int WriteToLog(PTXN_RECORD_CONTROL pCtrlRec);
    int WriteToLog(PTXN_RECORD_HEADER pCtrlRec);
};
```

## Appendix B – Database Design

---

```
int WriteCtrlRecToLog(BYTE SubType, LPTSTR lpStr, DWORD dwLen);

void CloseTransactionLogFile(void);

PTXN_RECORD_HEADER GetNextRecord(BOOL bSkipCtrlRecs = FALSE);
PTXN_RECORD_HEADER GetNextRecord(JULIAN_TIME SeekTimeT0, BOOL bSkipCtrlRecs = FALSE);

int Sort(void);
PTXN_RECORD_HEADER GetSortedRecord(int index);

inline BOOL IsSorted(void) { return bLogSorted; };
inline JULIAN_TIME BeginTS(void) { return BeginTxnTS; };
inline JULIAN_TIME EndTS(void) { return EndTxnTS; };
inline int RecordCount(void) { return iRecCount; };
};

class CTXNLOG_ERR : public CBaseErr
{
public:
enum CTPCC_DBLIB_ERRS
{
ERR_BAD_FILE_FORMAT = 1, // "File format is invalid."
ERR_UNKNOWN_LOG_VERSION, // "Log file version is unknown."
ERR_BROKEN_LOG_FILE, // "Log file is broken."
ERR_LOG_NOT_SORTED, // "Log file is not sorted"
ERR_INVALID_TIME_SEQ, // "Internal Error: Record Time Sequence
invalid."
};

CTXNLOG_ERR( int iErr ) { m_errno = iErr; };

int m_errno;

int ErrorType() {return ERR_TYPE_TXNLOG;};
int ErrorNum() {return m_errno;};

// TODO: need to complete...
char *ErrorText() {return "";};
};
```

## Appendix B - Database Design

### Build Scripts

```
ECHO OFF
:-----
:---- FILE:      SETUP.CMD
:----           Microsoft TPC-C Kit Ver. 4.62
:----           Copyright Microsoft, 2001, 2002, 2005
:----           All Rights Reserved
:----
:---- PURPOSE:   Calls RunSQLCfg.sql to configure SQL Server
:----
:---- ARGUMENTS:  /* displays help for SETUP
:----
:-----
@cscrip SetupScripts\setup.vbs //H:CScrip //I %1 %2 %3 %4 %5 %6 %7
:-----
-- File:  TABLES.SQL
--       Microsoft TPC-C Benchmark Kit Ver. 4.62
--       Copyright Microsoft, 2005
--
--       Creates TPC-C tables
:-----

SET ANSI_NULL_DFLT_OFF ON
GO

USE tpcc
GO

:-----
-- Remove all existing TPC-C tables
:-----
if exists ( select name from sysobjects where name = 'warehouse' )
drop table warehouse
go
if exists ( select name from sysobjects where name = 'district' )
drop table district
go
if exists ( select name from sysobjects where name = 'customer' )
```

## Appendix B – Database Design

---

```
drop table customer
go
if exists ( select name from sysobjects where name = 'history' )
drop table history
go
if exists ( select name from sysobjects where name = 'new_order' )
drop table new_order
go
if exists ( select name from sysobjects where name = 'orders' )
drop table orders
go
if exists ( select name from sysobjects where name = 'order_line' )
drop table order_line
go
if exists ( select name from sysobjects where name = 'item' )
drop table item
go
if exists ( select name from sysobjects where name = 'stock' )
drop table stock
go

-----
-- Create new tables
-----
create table warehouse
(
    w_id          int,
    w_ytd         money,
    w_tax        smallmoney,
    w_name       char(10),
    w_street_1   char(20),
    w_street_2   char(20),
    w_city       char(20),
    w_state      char(2),
    w_zip        char(9)
) on MSSQL_misc_fg
go

create table district
(
    d_id          tinyint,
    d_w_id        int,
    d_ytd         money,
    d_next_o_id   int,
    d_tax        smallmoney,
    d_name       char(10),
    d_street_1   char(20),
    d_street_2   char(20),
    d_city       char(20),
    d_state      char(2),
    d_zip        char(9)
) on MSSQL_misc_fg
go

create table customer
(
    c_id          int,
    c_d_id        tinyint,
    c_w_id        int,
    c_discount    smallmoney,
    c_credit_lim  money,
    c_last       char(16),
    c_first      char(16),
    c_credit     char(2),
    c_balance    money,
    c_ytd_payment money,
    c_payment_cnt smallint,
    c_delivery_cnt smallint,
    c_street_1   char(20),
    c_street_2   char(20),
    c_city       char(20),
    c_state      char(2),
    c_zip        char(9),
    c_phone     char(16),
    c_since     datetime,
    c_middle    char(2),
    c_data      char(500)
) on MSSQL_cs_fg
go

-- Use the following table option if using c_data varchar(max)
-- sp_tableoption 'customer','large value types out of row','1'
-- go

create table history
(
    h_c_id        int,
    h_c_d_id      tinyint,
    h_c_w_id      int,
    h_d_id        tinyint,
    h_w_id        int,
    h_date        datetime,
    h_amount     smallmoney,
```



## Appendix B – Database Design

---

```
        h_data          char(24)
    ) on MSSQL_misc_fg
go

create table new_order
(
    no_o_id          int,
    no_d_id          tinyint,
    no_w_id          int
) on MSSQL_misc_fg
go

create table orders
(
    o_id            int,
    o_d_id          tinyint,
    o_w_id          int,
    o_c_id          int,
    o_carrier_id    tinyint,
    o_ol_cnt        tinyint,
    o_all_local     tinyint,
    o_entry_d       datetime
) on MSSQL_misc_fg
go

create table order_line
(
    ol_o_id          int,
    ol_d_id          tinyint,
    ol_w_id          int,
    ol_number        tinyint,
    ol_i_id          int,
    ol_delivery_d    datetime,
    ol_amount        smallmoney,
    ol_supply_w_id  int,
    ol_quantity      smallint,
    ol_dist_info     char(24)
) on MSSQL_misc_fg
go

create table item
(
    i_id            int,
    i_name          char(24),
    i_price         smallmoney,
    i_data          char(50),
    i_im_id         int
) on MSSQL_misc_fg
go

create table stock
(
    s_i_id          int,
    s_w_id          int,
    s_quantity      smallint,
    s_ytd           int,
    s_order_cnt     smallint,
    s_remote_cnt    smallint,
    s_data          char(50),
    s_dist_01       char(24),
    s_dist_02       char(24),
    s_dist_03       char(24),
    s_dist_04       char(24),
    s_dist_05       char(24),
    s_dist_06       char(24),
    s_dist_07       char(24),
    s_dist_08       char(24),
    s_dist_09       char(24),
    s_dist_10       char(24)
) on MSSQL_cs_fg
go

-----
--
-- File:      IDXCUSCL.SQL
--           Microsoft TPC-C Benchmark Kit Ver. 4.62
--           Copyright Microsoft, 2005
--
--           Creates clustered index on customer table
-----

USE tpcc
GO

DECLARE @startdate  DATETIME,
        @enddate    DATETIME

SELECT  @startdate = GETDATE()
SELECT  'Start date:',
        CONVERT(VARCHAR(30),@startdate,21)

IF EXISTS ( SELECT name FROM sysindexes WHERE name = 'customer_c1' )
    DROP INDEX customer.customer_c1

CREATE UNIQUE CLUSTERED INDEX customer_c1 ON customer(c_w_id, c_d_id, c_id)
```

# Appendix B – Database Design

---

```
ON MSSQL_cs_fg

SELECT @enddate = GETDATE()
SELECT 'End date:',
       CONVERT(VARCHAR(30),@enddate,21)
SELECT 'Elapsed time (in seconds): ',
       DATEDIFF(second, @startdate, @enddate)
GO

-----
-- File:   IDXCUSNC.SQL
-- Microsoft TPC-C Benchmark Kit Ver. 4.62
-- Copyright Microsoft, 2005
--
-- Creates non-clustered index on customer table
-----

USE tpcc
GO

DECLARE @startdate DATETIME,
        @enddate DATETIME

SELECT @startdate = GETDATE()
SELECT 'Start date:',
       CONVERT(VARCHAR(30),@startdate,21)

IF EXISTS ( SELECT name FROM sysindexes WHERE name = 'customer_nc1' )
DROP INDEX customer.customer_nc1

CREATE UNIQUE NONCLUSTERED INDEX customer_nc1 ON customer(c_w_id, c_d_id, c_last, c_first, c_id)
ON MSSQL_cs_fg

SELECT @enddate = GETDATE()
SELECT 'End date:',
       CONVERT(VARCHAR(30),@enddate,21)
SELECT 'Elapsed time (in seconds): ',
       DATEDIFF(second, @startdate, @enddate)
GO

-----
-- File:   IDXDISCL.SQL
-- Microsoft TPC-C Benchmark Kit Ver. 4.62
-- Copyright Microsoft, 2005
--
-- Creates clustered index on district table
-----

USE tpcc
GO

DECLARE @startdate DATETIME,
        @enddate DATETIME

SELECT @startdate = GETDATE()
SELECT 'Start date:',
       CONVERT(VARCHAR(30),@startdate,21)

IF EXISTS ( SELECT name FROM sysindexes WHERE name = 'district_cl' )
DROP INDEX district.district_cl

CREATE UNIQUE CLUSTERED INDEX district_cl ON district(d_w_id, d_id)
WITH FILLFACTOR=100 ON MSSQL_misc_fg

SELECT @enddate = GETDATE()
SELECT 'End date:',
       CONVERT(VARCHAR(30),@enddate,21)
SELECT 'Elapsed time (in seconds): ',
       DATEDIFF(second, @startdate, @enddate)
GO

-----
-- File:   IDXHISCL.SQL
-- Microsoft TPC-C Benchmark Kit Ver. 4.62
-- Copyright Microsoft, 2005
--
-- Creates clustered index on history table
--
-- CAUTION: This index is only beneficial for systems
-- CAUTION: with 8 or more processors.
-- CAUTION: It may negatively impact performance on
-- CAUTION: systems with less than 8 processors.
-----

USE tpcc
GO

DECLARE @startdate DATETIME,
        @enddate DATETIME

SELECT @startdate = GETDATE()
SELECT 'Start date:',
       CONVERT(VARCHAR(30),@startdate,21)

IF EXISTS ( SELECT name FROM sysindexes WHERE name = 'history_cl' )
```

# Appendix B – Database Design

---

```
DROP INDEX history.history_cl

CREATE UNIQUE CLUSTERED INDEX history_cl ON history(h_c_w_id, h_date, h_c_d_id, h_c_id, h_amount)
ON MSSQL_misc_fg

SELECT @enddate = GETDATE()
SELECT 'End date:',
       CONVERT(VARCHAR(30),@enddate,21)
SELECT 'Elapsed time (in seconds): ',
       DATEDIFF(second, @startdate, @enddate)
GO

-----
-- File:   IDXITMCL.SQL
--         Microsoft TPC-C Benchmark Kit Ver. 4.62
--         Copyright Microsoft, 2005
--         Creates clustered index on item table
-----

USE tpcc
GO

DECLARE @startdate DATETIME,
        @enddate   DATETIME

SELECT @startdate = GETDATE()
SELECT 'Start date:',
       CONVERT(VARCHAR(30),@startdate,21)

IF EXISTS ( SELECT name FROM sysindexes WHERE name = 'item_cl' )
    DROP INDEX item.item_cl

CREATE UNIQUE CLUSTERED INDEX item_cl ON item(i_id)
ON MSSQL_misc_fg

SELECT @enddate = GETDATE()
SELECT 'End date:',
       CONVERT(VARCHAR(30),@enddate,21)
SELECT 'Elapsed time (in seconds): ',
       DATEDIFF(second, @startdate, @enddate)
GO

-----
-- File:   IDXNODCL.SQL
--         Microsoft TPC-C Benchmark Kit Ver. 4.62
--         Copyright Microsoft, 2005
--         Creates clustered index on new-order table
-----

USE tpcc
GO

DECLARE @startdate DATETIME,
        @enddate   DATETIME

SELECT @startdate = GETDATE()
SELECT 'Start date:',
       CONVERT(VARCHAR(30),@startdate,21)

IF EXISTS ( SELECT name FROM sysindexes WHERE name = 'new_order_cl' )
    DROP INDEX new_order.new_order_cl

CREATE UNIQUE CLUSTERED INDEX new_order_cl ON new_order(no_w_id, no_d_id, no_o_id)
ON MSSQL_misc_fg

SELECT @enddate = GETDATE()
SELECT 'End date:',
       CONVERT(VARCHAR(30),@enddate,21)
SELECT 'Elapsed time (in seconds): ',
       DATEDIFF(second, @startdate, @enddate)
GO

-----
-- File:   IDXODLCL.SQL
--         Microsoft TPC-C Benchmark Kit Ver. 4.62
--         Copyright Microsoft, 2005
--         Creates clustered index on order-line table
-----

USE tpcc
GO

DECLARE @startdate DATETIME,
        @enddate   DATETIME

SELECT @startdate = GETDATE()
SELECT 'Start date:',
       CONVERT(VARCHAR(30),@startdate,21)

IF EXISTS ( SELECT name FROM sysindexes WHERE name = 'order_line_cl' )
```

# Appendix B – Database Design

---

```
DROP INDEX order_line.order_line_cl

CREATE UNIQUE CLUSTERED INDEX order_line_cl ON order_line(ol_w_id, ol_d_id, ol_o_id, ol_number)
ON MSSQL_misc_fg

SELECT @enddate = GETDATE()
SELECT 'End date:',
       CONVERT(VARCHAR(30),@enddate,21)
SELECT 'Elapsed time (in seconds): ',
       DATEDIFF(second, @startdate, @enddate)
GO

-----
-- File:   IDXODLCL.SQL
-- Microsoft TPC-C Benchmark Kit Ver. 4.62
-- Copyright Microsoft, 2005
-- Creates clustered index on order-line table
-----

USE tpcc
GO

DECLARE @startdate DATETIME,
        @enddate DATETIME

SELECT @startdate = GETDATE()
SELECT 'Start date:',
       CONVERT(VARCHAR(30),@startdate,21)

IF EXISTS ( SELECT name FROM sysindexes WHERE name = 'order_line_cl' )
DROP INDEX order_line.order_line_cl

CREATE UNIQUE CLUSTERED INDEX order_line_cl ON order_line(ol_w_id, ol_d_id, ol_o_id, ol_number)
ON MSSQL_misc_fg

SELECT @enddate = GETDATE()
SELECT 'End date:',
       CONVERT(VARCHAR(30),@enddate,21)
SELECT 'Elapsed time (in seconds): ',
       DATEDIFF(second, @startdate, @enddate)
GO

-----
-- File:   IDXORDNC.SQL
-- Microsoft TPC-C Benchmark Kit Ver. 4.62
-- Copyright Microsoft, 2005
-- Creates non-clustered index on orders table
-----

USE tpcc
GO

DECLARE @startdate DATETIME,
        @enddate DATETIME

SELECT @startdate = GETDATE()
SELECT 'Start date:',
       CONVERT(VARCHAR(30),@startdate,21)

IF EXISTS ( SELECT name FROM sysindexes WHERE name = 'orders_ncl' )
DROP INDEX orders.orders_ncl

CREATE INDEX orders_ncl ON orders(o_w_id, o_d_id, o_c_id, o_id)
ON MSSQL_misc_fg

SELECT @enddate = GETDATE()
SELECT 'End date:',
       CONVERT(VARCHAR(30),@enddate,21)
SELECT 'Elapsed time (in seconds): ',
       DATEDIFF(second, @startdate, @enddate)
GO

-----
-- File:   IDXSTKCL.SQL
-- Microsoft TPC-C Benchmark Kit Ver. 4.62
-- Copyright Microsoft, 2005
-- Creates clustered index on stock table
-----

USE tpcc
GO

DECLARE @startdate DATETIME,
        @enddate DATETIME

SELECT @startdate = GETDATE()
SELECT 'Start date:',
       CONVERT(VARCHAR(30),@startdate,21)

IF EXISTS ( SELECT name FROM sysindexes WHERE name = 'stock_cl' )
DROP INDEX stock.stock_cl
```

## Appendix B – Database Design

---

```
CREATE UNIQUE CLUSTERED INDEX stock_cl ON stock(s_i_id, s_w_id)
ON MSSQL_cs_fg

SELECT @enddate = GETDATE()
SELECT 'End date:',
CONVERT(VARCHAR(30),@enddate,21)
SELECT 'Elapsed time (in seconds): ',
DATEDIFF(second, @startdate, @enddate)
GO

-----
-- File:      IDXWARCL.SQL                      --
-- Microsoft TPC-C Benchmark Kit Ver. 4.62      --
-- Copyright Microsoft, 2005                    --
-- Creates clustered index on warehouse table   --
-----

USE tpcc
GO

DECLARE @startdate DATETIME,
        @enddate   DATETIME

SELECT @startdate = GETDATE()
SELECT 'Start date:',
CONVERT(VARCHAR(30),@startdate,21)

IF EXISTS ( SELECT name FROM sysindexes WHERE name = 'warehouse_cl' )
DROP INDEX warehouse.warehouse_cl

CREATE UNIQUE CLUSTERED INDEX warehouse_cl ON warehouse(w_id)
WITH FILLFACTOR=100 ON MSSQL_misc_fg

SELECT @enddate = GETDATE()
SELECT 'End date:',
CONVERT(VARCHAR(30),@enddate,21)
SELECT 'Elapsed time (in seconds): ',
DATEDIFF(second, @startdate, @enddate)
GO

dbopt1.sql

-- File:      DBOPT1.SQL
-- Microsoft TPC-C Benchmark Kit Ver. 4.00
-- Copyright Microsoft, 1996
-- Purpose:   Sets database options for data load

use master
go

exec sp_dboption tpcc,'select into/bulkcopy',true
exec sp_dboption tpcc,'trunc. log on chkpt.',true
go

use tpcc
go

checkpoint
go

dbopt2.sql

-- File:      DBOPT2.SQL
-- Microsoft TPC-C Benchmark Kit Ver. 4.00
-- Copyright Microsoft, 1996
-- Purpose:   Resets database options after data load

use master
go

sp_dboption tpcc,'select ',false
go

sp_dboption tpcc,'trunc. ',false
go

use tpcc
go

checkpoint
go
```

## Appendix B – Database Design

---

```
sp_configure allow,1
go

reconfigure with override
go

/*
/* Set option values for user-defined indexes */
/*
*/

sp_indexoption 'customer','AllowPageLocks',FALSE
go
sp_indexoption 'district','AllowPageLocks',FALSE
go
sp_indexoption 'warehouse','AllowPageLocks',FALSE
go
sp_indexoption 'stock','AllowPageLocks',FALSE
go
sp_indexoption 'order_line','AllowPageLocks',FALSE
go
sp_indexoption 'orders','AllowPageLocks',FALSE
go
sp_indexoption 'new_order','AllowRowLocks',FALSE
go
sp_indexoption 'item','AllowRowLocks',FALSE
go
sp_indexoption 'item','AllowPageLocks',FALSE
go

Print ' '
Print '*****'
Print 'Pre-specified Locking Hierarchy:'
Print ' Lockflag = 0 ==> No pre-pecified hierarchy'
Print ' Lockflag = 1 ==> Lock at Page-level then Table-level'
Print ' Lockflag = 2 ==> Lock at Row-level then Table-level'
Print ' Lockflag = 3 ==> Lock at Table-level'
Print ' '

select name,lockflags
from sysindexes
where object_id("warehouse")=id or
      object_id("district")=id or
      object_id("customer")=id or
      object_id("stock")=id or
      object_id("orders")=id or
      object_id("order_line")=id or
      object_id("history")=id or
      object_id("new_order")=id or
      object_id("item")=id
order by lockflags asc
go

sp_configure allow,0
go

reconfigure with override
go

exec sp_dboption tpcc, 'auto update statistics', FALSE
exec sp_dboption tpcc, 'auto create statistics', FALSE
go

exec sp_tableoption "district","pintable",true
exec sp_tableoption "warehouse","pintable",true
exec sp_tableoption "new_order","pintable",true
exec sp_tableoption "item","pintable",true
go

dbopt3.sql

use tpcc
go
sp_indexoption 'orders','AllowPagelocks',TRUE
go
sp_indexoption 'orders','AllowRowlocks',FALSE
go
sp_indexoption 'order_line','AllowPagelocks',TRUE
go
sp_indexoption 'order_line','AllowRowlocks',FALSE
go

-----
--
-- File: BACKUP.SQL
-- Microsoft TPC-C Benchmark Kit Ver. 4.66
-- Copyright Microsoft, 2006
--
-----

DECLARE @startdate DATETIME,
        @enddate DATETIME
```

# Appendix B – Database Design

---

```
SELECT @startdate = GETDATE()
SELECT 'Start date:',
      CONVERT(VARCHAR(30),@startdate, 21)

DUMP DATABASE tpcc TO tpccback1, tpccback2 WITH init, stats = 1

SELECT @enddate = GETDATE()
SELECT 'End date: ',
      CONVERT(VARCHAR(30),@enddate, 21)
SELECT 'Elapsed time (in seconds): ',
      DATEDIFF(second, @startdate, @enddate)
GO
-----
--                                     --
-- File:   RESTORE.SQL                 --
--         Microsoft TPC-C Benchmark Kit Ver. 4.66 --
--         Copyright Microsoft, 2006   --
--                                     --
-----

DECLARE @startdate DATETIME,
        @enddate  DATETIME

SELECT @startdate = GETDATE()
SELECT 'Start date:',
      CONVERT(VARCHAR(30),@startdate, 21)

LOAD DATABASE tpcc FROM tpccback1, tpccback2 WITH stats = 1

SELECT @enddate = GETDATE()
SELECT 'End date: ',
      CONVERT(VARCHAR(30),@enddate, 21)
SELECT 'Elapsed time (in seconds): ',
      DATEDIFF(second, @startdate, @enddate)
GO
-----
--                                     --
-- File:   CREATEDB.SQL                --
--         Microsoft TPC-C Benchmark Kit Ver. 4.66 --
--         Copyright Microsoft, 2006   --
--                                     --
-----

SET ANSI_NULL_DFLT_OFF ON
GO

USE master
GO

-----
-- Create temporary table for timing
-----
IF EXISTS( SELECT name FROM sysobjects WHERE name = 'tpcc_timer' )
  DROP TABLE tpcc_timer
GO

CREATE TABLE tpcc_timer
      (start_date CHAR(30),
       end_date   CHAR(30))
GO

INSERT INTO tpcc_timer VALUES(0,0)
GO

-----
-- Store starting time
-----
UPDATE tpcc_timer
SET start_date = (SELECT CONVERT(CHAR(30), GETDATE(), 21))
GO

-----
-- create main database files
-----
CREATE DATABASE tpcc
ON PRIMARY
( NAME = MSSQL_tpcc_root,
  FILENAME = 'C:\MSSQL_tpcc_root.mdf',
  SIZE = 8MB,
  FILEGROWTH = 0),
FILEGROUP MSSQL_misc_fg
( NAME = MSSQL_misc1,
  FILENAME = 'F:',
  SIZE = 51234MB,
  FILEGROWTH = 0),
( NAME = MSSQL_misc2,
  FILENAME = 'H:',
  SIZE = 51234MB,
  FILEGROWTH = 0),
( NAME = MSSQL_misc3,
  FILENAME = 'I:',
  SIZE = 51234MB,
```

## Appendix B – Database Design

---

```
FILEGROWTH = 0),
FILEGROUP MSSQL_cs_fg
(
    NAME = MSSQL_cs1,
    FILENAME = 'M:',
    SIZE = 107767MB,
    FILEGROWTH = 0),
(
    NAME = MSSQL_cs2,
    FILENAME = 'N:',
    SIZE = 107767MB,
    FILEGROWTH = 0),
(
    NAME = MSSQL_cs3,
    FILENAME = 'O:',
    SIZE = 107767MB,
    FILEGROWTH = 0)
LOG ON
(
    NAME = MSSQL_tpcc_log,
    FILENAME = 'E:',
    SIZE = 250000MB,
    FILEGROWTH = 0)
COLLATE Latin1_General_BIN
GO

-----
-- Store ending time
-----
UPDATE tpcc_timer
SET end_date = (SELECT CONVERT(CHAR(30), GETDATE(), 21))
GO

SELECT DATEDIFF(second,(SELECT start_date FROM tpcc_timer),(SELECT end_date FROM tpcc_timer))
GO

-----
-- remove temporary table
-----
IF EXISTS ( SELECT name FROM sysobjects WHERE name = 'tpcc_timer' )
    DROP TABLE tpcc_timer
GO

-----
-- Store ending time
-----
update tpcc_timer
set end_date = (select convert(char(30), getdate(), 21))
go

select 'Elapsed time (in seconds): ', datediff(second,(select start_date from tpcc_timer),(select end_date from
tpcc_timer))

-----
-- remove temporary table
-----
if exists ( select name from sysobjects where name = 'tpcc_timer' )
    drop table tpcc_timer
go

-----
--
-- File: BACKUPDEV.SQL
-- Microsoft TPC-C Benchmark Kit Ver. 4.66
-- Copyright Microsoft, 2006
--
-----

USE master
GO

-----
-- create backup devices
-----
EXEC sp_addumpdevice 'disk','tpccback1','Y:\tpccback5.dmp'
GO
EXEC sp_addumpdevice 'disk','tpccback2','X:\tpccback6.dmp'
GO
-----
-- create backup devices
-----
exec sp_addumpdevice 'disk','tpccback1','Z:\tpccback1.dmp'
go

-----
--
-- File: REMOVEDB.SQL
-- Microsoft TPC-C Benchmark Kit Ver. 4.66
-- Copyright Microsoft, 2006
-- Go Gators
--
-----

USE master
GO

-----
-- remove any existing database and backup files
-----
```



## Appendix B – Database Design

---

```
EXEC sp_dbremove tpcc, dropdev
GO

EXEC sp_dropdevice 'tpccback1'
EXEC sp_dropdevice 'tpccback2'
GO
```

### Stored Procedures

#### neword.sql

```
-----
--
-- File:      NEWORD.SQL
--           Microsoft TPC-C Benchmark Kit Ver. 4.62
--           Copyright Microsoft, 2005
--
--           Creates neworder stored procedure
--
--           Interface Level:      4.20.000
--
-----
SET QUOTED_IDENTIFIER OFF
GO

SET ANSI_NULLS ON
GO

USE tpcc
GO

IF EXISTS ( SELECT name FROM sysobjects WHERE name = 'tpcc_neworder' )
  DROP PROCEDURE tpcc_neworder
GO

CREATE PROCEDURE      tpcc_neworder
                    @w_id          int,
                    @d_id          tinyint,
                    @c_id          int,
                    @o_ol_cnt      tinyint,
                    @o_all_local   tinyint,
                    @i_id1 int = 0, @s_w_id1 int = 0, @ol_qty1 smallint = 0,
                    @i_id2 int = 0, @s_w_id2 int = 0, @ol_qty2 smallint = 0,
                    @i_id3 int = 0, @s_w_id3 int = 0, @ol_qty3 smallint = 0,
                    @i_id4 int = 0, @s_w_id4 int = 0, @ol_qty4 smallint = 0,
                    @i_id5 int = 0, @s_w_id5 int = 0, @ol_qty5 smallint = 0,
                    @i_id6 int = 0, @s_w_id6 int = 0, @ol_qty6 smallint = 0,
                    @i_id7 int = 0, @s_w_id7 int = 0, @ol_qty7 smallint = 0,
                    @i_id8 int = 0, @s_w_id8 int = 0, @ol_qty8 smallint = 0,
                    @i_id9 int = 0, @s_w_id9 int = 0, @ol_qty9 smallint = 0,
                    @i_id10 int = 0, @s_w_id10 int = 0, @ol_qty10 smallint = 0,
                    @i_id11 int = 0, @s_w_id11 int = 0, @ol_qty11 smallint = 0,
                    @i_id12 int = 0, @s_w_id12 int = 0, @ol_qty12 smallint = 0,
                    @i_id13 int = 0, @s_w_id13 int = 0, @ol_qty13 smallint = 0,
                    @i_id14 int = 0, @s_w_id14 int = 0, @ol_qty14 smallint = 0,
                    @i_id15 int = 0, @s_w_id15 int = 0, @ol_qty15 smallint = 0

AS
DECLARE @w_tax          smallmoney,
        @d_tax          smallmoney,
        @c_last        char(16),
        @c_credit      char(2),
        @c_discount    smallmoney,
        @i_price       smallmoney,
        @i_name        char(24),
        @i_data        char(50),
        @o_entry_d     datetime,
        @remote_flag   int,
        @s_quantity    smallint,
        @s_data        char(50),
        @s_dist        char(24),
        @li_no         int,
        @o_id          int,
        @commit_flag   tinyint,
        @li_id         int,
        @li_s_w_id     int,
        @li_qty        smallint,
        @ol_number     int,
        @c_id_local    int

BEGIN

BEGIN TRANSACTION n

-----
-- get district tax and next available order id and update
-- plus initialize local variables
```

## Appendix B – Database Design

---

```
-----
UPDATE district
SET   @d_tax      = d_tax,
      @o_id       = d_next_o_id,
      d_next_o_id = d_next_o_id + 1,
      @o_entry_d  = GETDATE(),
      @li_no      = 0,
      @commit_flag = 1
WHERE d_w_id      = @w_id AND
      d_id        = @d_id

-----
-- process orderlines
-----
WHILE (@li_no < @o_ol_cnt)
BEGIN
    SELECT @li_no = @li_no + 1

-----
-- set i_id, s_w_id, and qty for this lineitem
-----
    SELECT @li_id = CASE @li_no
                WHEN 1 THEN @i_id1
                WHEN 2 THEN @i_id2
                WHEN 3 THEN @i_id3
                WHEN 4 THEN @i_id4
                WHEN 5 THEN @i_id5
                WHEN 6 THEN @i_id6
                WHEN 7 THEN @i_id7
                WHEN 8 THEN @i_id8
                WHEN 9 THEN @i_id9
                WHEN 10 THEN @i_id10
                WHEN 11 THEN @i_id11
                WHEN 12 THEN @i_id12
                WHEN 13 THEN @i_id13
                WHEN 14 THEN @i_id14
                WHEN 15 THEN @i_id15
            END,

        @li_s_w_id = CASE @li_no
                WHEN 1 THEN @s_w_id1
                WHEN 2 THEN @s_w_id2
                WHEN 3 THEN @s_w_id3
                WHEN 4 THEN @s_w_id4
                WHEN 5 THEN @s_w_id5
                WHEN 6 THEN @s_w_id6
                WHEN 7 THEN @s_w_id7
                WHEN 8 THEN @s_w_id8
                WHEN 9 THEN @s_w_id9
                WHEN 10 THEN @s_w_id10
                WHEN 11 THEN @s_w_id11
                WHEN 12 THEN @s_w_id12
                WHEN 13 THEN @s_w_id13
                WHEN 14 THEN @s_w_id14
                WHEN 15 THEN @s_w_id15
            END,

        @li_qty = CASE @li_no
                WHEN 1 THEN @ol_qty1
                WHEN 2 THEN @ol_qty2
                WHEN 3 THEN @ol_qty3
                WHEN 4 THEN @ol_qty4
                WHEN 5 THEN @ol_qty5
                WHEN 6 THEN @ol_qty6
                WHEN 7 THEN @ol_qty7
                WHEN 8 THEN @ol_qty8
                WHEN 9 THEN @ol_qty9
                WHEN 10 THEN @ol_qty10
                WHEN 11 THEN @ol_qty11
                WHEN 12 THEN @ol_qty12
                WHEN 13 THEN @ol_qty13
                WHEN 14 THEN @ol_qty14
                WHEN 15 THEN @ol_qty15
            END

-----
-- get item data (no one updates item)
-----
    SELECT @i_price = i_price,
           @i_name  = i_name,
           @i_data  = i_data
    FROM   item WITH (repeatableread)
    WHERE  i_id     = @li_id

-----
-- update stock values
-----
    UPDATE stock
    SET   s_ytd      = s_ytd + @li_qty,
          s_quantity = s_quantity - @li_qty +
                    CASE WHEN (s_quantity - @li_qty < 10) THEN 91 ELSE 0 END,
          s_order_cnt = s_order_cnt + 1,
          s_remote_cnt = s_remote_cnt +
```

## Appendix B – Database Design

---

```

        CASE WHEN (@li_s_w_id = @w_id) THEN 0 ELSE 1 END,
@s_data      = s_data,
@s_dist     = CASE @d_id
              WHEN 1 THEN s_dist_01
              WHEN 2 THEN s_dist_02
              WHEN 3 THEN s_dist_03
              WHEN 4 THEN s_dist_04
              WHEN 5 THEN s_dist_05
              WHEN 6 THEN s_dist_06
              WHEN 7 THEN s_dist_07
              WHEN 8 THEN s_dist_08
              WHEN 9 THEN s_dist_09
              WHEN 10 THEN s_dist_10
              END
WHERE    s_i_id      = @li_id AND
        s_w_id      = @li_s_w_id

-----
-- if there actually is a stock (and item) with these ids, go to work
-----
IF (@@rowcount > 0)
BEGIN
-----
-- insert order_line data (using data from item and stock)
-----
INSERT INTO order_line VALUES( @o_id,
                                @d_id,
                                @w_id,
                                @li_no,
                                @li_id,
                                'dec 31, 1899',
                                @i_price * @li_qty,
                                @li_s_w_id,
                                @li_qty,
                                @s_dist)

-----
-- send line-item data to client
-----
SELECT @i_name,
       @s_quantity,
       b_g = CASE WHEN ( (patindex('%ORIGINAL%',@i_data) > 0) AND
                        (patindex('%ORIGINAL%',@s_data) > 0) )
              THEN 'B' ELSE 'G' END,

       @i_price,
       @i_price * @li_qty
END
ELSE
BEGIN
-----
-- no item (or stock) found - triggers rollback condition
-----
SELECT  '',0, '',0,0
SELECT  @commit_flag = 0
END

END

-----
-- get customer last name, discount, and credit rating
-----
SELECT @c_last      = c_last,
       @c_discount = c_discount,
       @c_credit    = c_credit,
       @c_id_local  = c_id
FROM   customer WITH (repeatableread)
WHERE  c_id          = @c_id AND
       c_w_id        = @w_id AND
       c_d_id        = @d_id

-----
-- insert fresh row into orders table
-----
INSERT INTO orders VALUES ( @o_id,
                             @d_id,
                             @w_id,
                             @c_id_local,
                             0,
                             @o_ol_cnt,
                             @o_all_local,
                             @o_entry_d)

-----
-- insert corresponding row into new-order table
-----
INSERT INTO new_order VALUES ( @o_id,
                                @d_id,
                                @w_id)

-----
-- select warehouse tax
-----
SELECT @w_tax = w_tax
FROM   warehouse WITH (repeatableread)
WHERE  w_id    = @w_id
```

## Appendix B – Database Design

---

```
IF (@commit_flag = 1)
    COMMIT TRANSACTION n
ELSE
-----
-- all that work for nuthin!!!
-----
    ROLLBACK TRANSACTION n

-----
-- return order data to client
-----
    SELECT  @w_tax,
            @d_tax,
            @o_id,
            @c_last,
            @c_discount,
            @c_credit,
            @o_entry_d,
            @commit_flag
END
GO

SET QUOTED_IDENTIFIER OFF
GO

SET ANSI_NULLS ON
GO

-----
--
-- File:      PAYMENT.SQL
-- Microsoft TPC-C Benchmark Kit Ver. 4.62
-- Copyright Microsoft, 2005
--
-- Creates payment stored procedure
--
-- Interface Level: 4.20.000
--
-----

SET QUOTED_IDENTIFIER OFF
GO

SET ANSI_NULLS ON
GO

USE tpcc
GO

IF EXISTS ( SELECT name FROM sysobjects WHERE name = 'tpcc_payment' )
    DROP PROCEDURE tpcc_payment
GO

CREATE PROCEDURE    tpcc_payment
                @w_id        int,
                @c_w_id      int,
                @h_amount    smallmoney,
                @d_id        tinyint,
                @c_d_id      tinyint,
                @c_id        int,
                @c_last      char(16) = ""

AS
DECLARE @w_street_1    char(20),
        @w_street_2    char(20),
        @w_city        char(20),
        @w_state       char(2),
        @w_zip         char(9),
        @w_name        char(10),
        @d_street_1    char(20),
        @d_street_2    char(20),
        @d_city        char(20),
        @d_state       char(2),
        @d_zip         char(9),
        @d_name        char(10),
        @c_first       char(16),
        @c_middle      char(2),
        @c_street_1    char(20),
        @c_street_2    char(20),
        @c_city        char(20),
        @c_state       char(2),
        @c_zip         char(9),
        @c_phone       char(16),
        @c_since       datetime,
        @c_credit      char(2),
        @c_credit_lim  money,
        @c_balance     money,
        @c_discount   smallmoney,
        @c_data        char(42),
        @datetime     datetime,
        @w_ytd        money,
        @d_ytd        money,
        @cnt          smallint,
        @val          smallint.
```

## Appendix B – Database Design

---

```

        @screen_data      char(200),
        @d_id_local      tinyint,
        @w_id_local      int,
        @c_id_local      int

SELECT  @screen_data      = ""

BEGIN TRANSACTION p
-- get payment date
SELECT  @datetime = GETDATE()

IF (@c_id = 0)
BEGIN
    -- get customer id and info using last name
    SELECT  @cnt = COUNT(*)
    FROM    customer WITH (repeatableread)
    WHERE   c_last = @c_last AND
            c_w_id = @c_w_id AND
            c_d_id = @c_d_id

    SELECT  @val = (@cnt + 1) / 2

    SET    rowcount @val

    SELECT  @c_id = c_id
    FROM    customer WITH (repeatableread)
    WHERE   c_last = @c_last AND
            c_w_id = @c_w_id AND
            c_d_id = @c_d_id

    ORDER  BY c_last, c_first

    SET    rowcount 0
END

-- get customer info and update balances
UPDATE   customer
SET      @c_balance      = c_balance = c_balance - @h_amount,
        c_payment_cnt    = c_payment_cnt + 1,
        c_ytd_payment    = c_ytd_payment + @h_amount,
        @c_first         = c_first,
        @c_middle        = c_middle,
        @c_last           = c_last,
        @c_street_1      = c_street_1,
        @c_street_2      = c_street_2,
        @c_city           = c_city,
        @c_state          = c_state,
        @c_zip            = c_zip,
        @c_phone          = c_phone,
        @c_credit         = c_credit,
        @c_credit_lim    = c_credit_lim,
        @c_discount      = c_discount,
        @c_since         = c_since,
        @c_id_local      = c_id
WHERE    c_id            = @c_id AND
        c_w_id           = @c_w_id AND
        c_d_id           = @c_d_id

-- if customer has bad credit get some more info
IF (@c_credit = "BC")
BEGIN
    -- compute new info
    SELECT  @c_data = convert(char(5),@c_id) +
                    convert(char(4),@c_d_id) +
                    convert(char(5),@c_w_id) +
                    convert(char(4),@d_id) +
                    convert(char(5),@w_id) +
                    convert(char(19),@h_amount)

    -- update customer info
    UPDATE   customer
    SET      c_data      = @c_data + substring(c_data, 1, 458),
            @screen_data = @c_data + substring(c_data, 1, 158)
    WHERE   c_id        = @c_id AND
            c_w_id      = @c_w_id AND
            c_d_id      = @c_d_id
END

-- get district data and update year-to-date
UPDATE   district
SET      d_ytd      = d_ytd + @h_amount,
        @d_street_1 = d_street_1,
        @d_street_2 = d_street_2,
        @d_city     = d_city,
        @d_state    = d_state,
        @d_zip      = d_zip,
        @d_name     = d_name,
        @d_id_local = d_id
WHERE    d_w_id     = @w_id AND
        d_id        = @d_id

-- get warehouse data and update year-to-date
UPDATE   warehouse
SET      w_ytd      = w_ytd + @h_amount,
```

## Appendix B – Database Design

---

```

        @w_street_1 = w_street_1,
        @w_street_2 = w_street_2,
        @w_city      = w_city,
        @w_state     = w_state,
        @w_zip       = w_zip,
        @w_name      = w_name,
        @w_id_local  = w_id
WHERE   w_id        = @w_id

-- create history record
INSERT INTO          history VALUES (@c_id_local,
                                     @c_d_id,
                                     @c_w_id,
                                     @d_id_local,
                                     @w_id_local,
                                     @datetime,
                                     @h_amount,
                                     @w_name + ' ' + @d_name)

COMMIT TRANSACTION p

-- return data to client
SELECT  @c_id,
        @c_last,
        @datetime,
        @w_street_1,
        @w_street_2,
        @w_city,
        @w_state,
        @w_zip,
        @d_street_1,
        @d_street_2,
        @d_city,
        @d_state,
        @d_zip,
        @c_first,
        @c_middle,
        @c_street_1,
        @c_street_2,
        @c_city,
        @c_state,
        @c_zip,
        @c_phone,
        @c_since,
        @c_credit,
        @c_credit_lim,
        @c_discount,
        @c_balance,
        @screen_data

GO

SET QUOTED_IDENTIFIER OFF
GO

SET ANSI_NULLS ON
GO

-----
-- File:      ORDDSTAT.SQL
-- Microsoft TPC-C Benchmark Kit Ver. 4.62
-- Copyright Microsoft, 2005
--
-- Creates order status stored procedure
--
-- Interface Level: 4.20.000
-----

SET QUOTED_IDENTIFIER OFF
GO

SET ANSI_NULLS ON
GO

USE tpcc
GO

IF EXISTS ( SELECT name FROM sysobjects WHERE name = 'tpcc_orderstatus' )
    DROP PROCEDURE tpcc_orderstatus
GO

CREATE PROCEDURE    tpcc_orderstatus
                   @w_id      int,
                   @d_id      tinyint,
                   @c_id      int,
                   @c_last    char(16) = ''

AS
DECLARE @c_balance    money,
        @c_first     char(16),
        @c_middle    char(2),
        @o_id        int,
        @o_entry_d   datetime,
        @o_carrier_id smallint,
```

## Appendix B – Database Design

---

```
@cnt          smallint

BEGIN TRANSACTION o
IF (@c_id = 0)
BEGIN
-----
-- get customer id and info using last name
-----
SELECT @cnt      = (count(*)+1)/2
FROM   customer WITH (repeatableread)
WHERE  c_last    = @c_last AND
       c_w_id    = @w_id AND
       c_d_id    = @d_id

SET    rowcount @cnt

SELECT @c_id     = c_id,
       @c_balance = c_balance,
       @c_first   = c_first,
       @c_last    = c_last,
       @c_middle  = c_middle
FROM   customer WITH (repeatableread)
WHERE  c_last    = @c_last AND
       c_w_id    = @w_id AND
       c_d_id    = @d_id

ORDER  BY c_w_id, c_d_id, c_last, c_first

SET rowcount 0
END
ELSE
BEGIN
-----
-- get customer info if by id
-----
SELECT @c_balance = c_balance,
       @c_first   = c_first,
       @c_middle  = c_middle,
       @c_last    = c_last
FROM   customer WITH (repeatableread)
WHERE  c_id       = @c_id AND
       c_d_id     = @d_id AND
       c_w_id     = @w_id

SELECT @cnt      = @@rowcount
END

-----
-- if no such customer
-----
IF (@cnt = 0)
BEGIN
    RAISERROR('Customer not found',18,1)
    GOTO custnotfound
END

-----
-- get order info
-----
SELECT @o_id      = o_id,
       @o_entry_d = o_entry_d,
       @o_carrier_id = o_carrier_id
FROM   orders WITH (serializable)
WHERE  o_c_id     = @c_id AND
       o_d_id     = @d_id AND
       o_w_id     = @w_id

ORDER  BY o_id ASC

-----
-- select order lines for the current order
-----
SELECT ol_supply_w_id,
       ol_i_id,
       ol_quantity,
       ol_amount,
       ol_delivery_d
FROM   order_line WITH (repeatableread)
WHERE  ol_o_id = @o_id AND
       ol_d_id = @d_id AND
       ol_w_id = @w_id

custnotfound:

COMMIT TRANSACTION o

-----
-- return data to client
-----
SELECT @c_id,
       @c_last,
       @c_first,
       @c_middle,
       @o_entry_d,
       @o_carrier_id,
```

## Appendix B – Database Design

---

```
@c_balance,
@o_id
GO
-----
-- File: DELIVERY.SQL
-- Microsoft TPC-C Benchmark Kit Ver. 4.62
-- Copyright Microsoft, 2005
--
-- Creates delivery stored procedure
--
-- Interface Level: 4.20.000
--
-----
SET QUOTED_IDENTIFIER OFF
GO

SET ANSI_NULLS ON
GO

USE tpcc
GO

IF EXISTS ( SELECT name FROM sysobjects WHERE name = 'tpcc_delivery' )
DROP PROCEDURE tpcc_delivery
GO

CREATE PROC tpcc_delivery
    @w_id int,
    @o_carrier_id smallint

AS
DECLARE @d_id tinyint,
        @o_id int,
        @c_id int,
        @total money,
        @oid1 int,
        @oid2 int,
        @oid3 int,
        @oid4 int,
        @oid5 int,
        @oid6 int,
        @oid7 int,
        @oid8 int,
        @oid9 int,
        @oid10 int

SELECT @d_id = 0

BEGIN TRANSACTION d
WHILE (@d_id < 10)
BEGIN
    SELECT @d_id = @d_id + 1,
           @total = 0,
           @o_id = 0

    SELECT TOP 1
           @o_id = no_o_id
    FROM new_order WITH (serializable uplock)
    WHERE no_w_id = @w_id AND
          no_d_id = @d_id
    ORDER BY no_o_id ASC

    IF (@@rowcount <> 0)
    BEGIN
        -- claim the order for this district
        DELETE new_order
        WHERE no_w_id = @w_id AND
              no_d_id = @d_id AND
              no_o_id = @o_id

        -- set carrier_id on this order (and get customer id)
        UPDATE orders
        SET o_carrier_id = @o_carrier_id,
            @c_id = o_c_id
        WHERE o_w_id = @w_id AND
              o_d_id = @d_id AND
              o_id = @o_id

        -- set date in all lineitems for this order (and sum amounts)
        UPDATE order_line
        SET ol_delivery_d = GETDATE(),
            @total = @total + ol_amount
        WHERE ol_w_id = @w_id AND
              ol_d_id = @d_id AND
              ol_o_id = @o_id

        -- accumulate lineitem amounts for this order into customer
        UPDATE customer
        SET c_balance = c_balance + @total,
            c_delivery_cnt = c_delivery_cnt + 1
        WHERE c_w_id = @w_id AND
              c_d_id = @d_id AND
```



## Appendix B – Database Design

---

```
                c_id          = @c_id
END

SELECT @oid1 = CASE @d_id WHEN 1 THEN @o_id ELSE @oid1 END,
       @oid2 = CASE @d_id WHEN 2 THEN @o_id ELSE @oid2 END,
       @oid3 = CASE @d_id WHEN 3 THEN @o_id ELSE @oid3 END,
       @oid4 = CASE @d_id WHEN 4 THEN @o_id ELSE @oid4 END,
       @oid5 = CASE @d_id WHEN 5 THEN @o_id ELSE @oid5 END,
       @oid6 = CASE @d_id WHEN 6 THEN @o_id ELSE @oid6 END,
       @oid7 = CASE @d_id WHEN 7 THEN @o_id ELSE @oid7 END,
       @oid8 = CASE @d_id WHEN 8 THEN @o_id ELSE @oid8 END,
       @oid9 = CASE @d_id WHEN 9 THEN @o_id ELSE @oid9 END,
       @oid10 = CASE @d_id WHEN 10 THEN @o_id ELSE @oid10 END
END

COMMIT TRANSACTION d

-- return delivery data to client

SELECT @oid1,
       @oid2,
       @oid3,
       @oid4,
       @oid5,
       @oid6,
       @oid7,
       @oid8,
       @oid9,
       @oid10
GO

SET QUOTED_IDENTIFIER OFF
GO

SET ANSI_NULLS ON
GO
-----
--
-- File:      STOCKLEV.SQL
-- Microsoft TPC-C Benchmark Kit Ver. 4.62
-- Copyright Microsoft, 2005
--
--          Creates stock level stored procedure
--
--          Interface Level: 4.20.000
--
-----
SET QUOTED_IDENTIFIER OFF
GO

SET ANSI_NULLS ON
GO

USE tpcc
GO

IF EXISTS ( SELECT name FROM sysobjects WHERE name = 'tpcc_stocklevel' )
    DROP PROCEDURE tpcc_stocklevel
GO

CREATE PROCEDURE tpcc_stocklevel
    @w_id int,
    @d_id tinyint,
    @threshold smallint
AS
DECLARE @o_id_low int,
        @o_id_high int

SELECT @o_id_low = (d_next_o_id - 20),
       @o_id_high = (d_next_o_id - 1)
FROM district
WHERE d_w_id = @w_id AND
      d_id = @d_id

SELECT COUNT(DISTINCT(s_i_id))
FROM stock,
      order_line
WHERE ol_w_id = @w_id AND
      ol_d_id = @d_id and
      ol_o_id BETWEEN @o_id_low AND
                  @o_id_high AND
      s_w_id = ol_w_id AND
      s_i_id = ol_i_id AND
      s_quantity < @threshold
OPTION(ORDER GROUP)
GO

SET QUOTED_IDENTIFIER OFF
GO

SET ANSI_NULLS ON
GO
```

# Appendix B – Database Design

```
// File: TPC.C.H
// Microsoft TPC-C Kit Ver. 4.51
// Copyright Microsoft, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2005
// Purpose: Header file for TPC-C database loader

// Build number of TPC Benchmark Kit
#define TPCKIT_VER "4.51"

// General headers
#include <windows.h>
#include <winbase.h>
#include <stdlib.h>
#include <stdio.h>
#include <process.h>
#include <stddef.h>
#include <stdarg.h>
#include <string.h>
#include <time.h>
#include <sys\timeb.h>
#include <sys\types.h>
#include <math.h>

// ODBC headers
#include <sql.h>
#include <sqlext.h>
#include <odbc.h>

// General constants
#define MILLI 1000
#define FALSE 0
#define TRUE 1
#define UNDEF -1
#define MINPRINTASCII 32
#define MAXPRINTASCII 126

// Default environment constants
#define SERVER ""
#define DATABASE "tpcc"
#define USER "sa"
#define PASSWORD ""

// Default loader arguments
#define BATCH 10000
#define DEFLDPACKSIZE 32768
#define LOADER_RES_FILE "C:\\MSTPCC.450\\SETUP\\LOGS\\load.out"
#define LOADER_LOG_PATH "C:\\MSTPCC.450\\SETUP\\LOGS\\"
#define LOADER_NURAND_C 123
#define DEF_STARTING_WAREHOUSE 1
#define BUILD_INDEX 1 // build both data and indexes
#define INDEX_ORDER 1 // build indexes before load
#define SCALE_DOWN 0 // build a normal scale database
#define INDEX_SCRIPT_PATH "scripts"

typedef struct
{
    char *server;
    char *database;
    char *user;
    char *password;
    BOOL tables_all; // set if loading all tables
    BOOL table_item; // set if loading ITEM table
    specifically
    BOOL table_warehouse; // set if loading WAREHOUSE, DISTRICT, and STOCK
    BOOL table_customer; // set if loading CUSTOMER and HISTORY
    BOOL table_orders; // set if loading NEW-ORDER, ORDERS,
ORDER-LINE
    long num_warehouses;
    long batch;
    long verbose;
    long pack_size;
    char *loader_res_file;
    char *log_path;
    char *synch_servername;
    long case_sensitivity;
    long starting_warehouse;
    long build_index;
    long index_order;
    long scale_down;
    char *index_script_path;
} TPCLDR_ARGS;

// String length constants
#define SERVER_NAME_LEN 20
#define DATABASE_NAME_LEN 20
#define USER_NAME_LEN 20
#define PASSWORD_LEN 20
#define TABLE_NAME_LEN 20
#define I_DATA_LEN 50
#define I_NAME_LEN 24
#define BRAND_LEN 1
#define LAST_NAME_LEN 16
#define W_NAME_LEN 10
```

# Appendix B – Database Design

---

```
#define ADDRESS_LEN          20
#define STATE_LEN           2
#define ZIP_LEN             9
#define S_DIST_LEN         24
#define S_DATA_LEN         50
#define D_NAME_LEN         10
#define FIRST_NAME_LEN     16
#define MIDDLE_NAME_LEN    2
#define PHONE_LEN          16
#define CREDIT_LEN         2
#define C_DATA_LEN         500
#define H_DATA_LEN         24
#define DIST_INFO_LEN      24
#define MAX_OL_NEW_ORDER_ITEMS 15
#define MAX_OL_ORDER_STATUS_ITEMS 15
#define STATUS_LEN         25
#define OL_DIST_INFO_LEN   24
#define C_SINCE_LEN        23
#define H_DATE_LEN         23
#define OL_DELIVERY_D_LEN  23
#define O_ENTRY_D_LEN      23

// Functions in random.c
void seed();
long irand();
double drand();
void WUCreate();
short WURand();
long RandomNumber(long lower, long upper);

// Functions in getargs.c;
void GetArgsLoader();
void GetArgsLoaderUsage();

// Functions in time.c
long TimeNow();

// Functions in strings.c
void MakeAddress();
void LastName();
int MakeAlphaString();
int MakeAlphaStringPadded();
int MakeOriginalAlphaString();
int MakeNumberString();
int MakeZipNumberString();
void InitString();
void InitAddress();
void PaddString();
//=====
// File: TPCCLDR.C
// Microsoft TPC-C Kit Ver. 4.51
// Copyright Microsoft, 1996, 1997, 1998, 1999,
// 2000, 2001, 2002, 2003
// Purpose: Source file for TPC-C database loader
//=====
// Includes
#include "tpcc.h"
#include "search.h"

// Defines
#define MAXITEMS          100000
#define MAXITEMS_SCALE_DOWN 100
#define CUSTOMERS_PER_DISTRICT 3000
#define CUSTOMERS_SCALE_DOWN 30
#define DISTRICT_PER_WAREHOUSE 10
#define ORDERS_PER_DISTRICT 3000
#define ORDERS_SCALE_DOWN 30
#define MAX_CUSTOMER_THREADS 2
#define MAX_ORDER_THREADS 3
#define MAX_MAIN_THREADS 4
#define MAX_SQL_ERRORS 10

// Functions declarations
void HandleErrorDBC (SQLHDBC hdbc1);
long NURand();
void LoadItem();
void LoadWarehouse();
void Stock();
void District();
void LoadCustomer();
void CustomerBufInit();
void CustomerBufLoad();
void LoadCustomerTable();
void LoadHistoryTable();
void LoadOrders();
void OrdersBufInit();
void OrdersBufLoad();
void LoadOrdersTable();
void LoadNewOrderTable();
void LoadOrderLineTable();
void GetPermutation();
void CheckForCommit();
```

## Appendix B – Database Design

---

```
void CheckForCommit_Big();
void OpenConnections();
void BuildIndex();
void FormatDate ();

// Shared memory structures
typedef struct
{
    double                ol;
    long                  ol_i_id;
    long                  ol_supply_w_id;
    short                 ol_quantity;
    double                ol_amount;
    char                  ol_dist_info[DIST_INFO_LEN+1];
    char                  ol_delivery_d[OL_DELIVERY_D_LEN+1];
} ORDER_LINE_STRUCT;

typedef struct
{
    long                  o_id;
    short                 o_d_id;
    long                  o_w_id;
    long                  o_c_id;
    short                 o_carrier_id;
    short                 o_ol_cnt;
    short                 o_all_local;
    ORDER_LINE_STRUCT    o_ol[15];
} ORDERS_STRUCT;

typedef struct
{
    long                  c_id;
    short                 c_d_id;
    long                  c_w_id;
    char                  c_first[FIRST_NAME_LEN+1];
    char                  c_middle[MIDDLE_NAME_LEN+1];
    char                  c_last[LAST_NAME_LEN+1];
    char                  c_street_1[ADDRESS_LEN+1];
    char                  c_street_2[ADDRESS_LEN+1];
    char                  c_city[ADDRESS_LEN+1];
    char                  c_state[STATE_LEN+1];
    char                  c_zip[ZIP_LEN+1];
    char                  c_phone[PHONE_LEN+1];
    char                  c_credit[CREDIT_LEN+1];
    double                c_credit_lim;
    double                c_discount;
    char                  c_balance[6];
    double                c_ytd_payment;
    short                 c_payment_cnt;
    short                 c_delivery_cnt;
    char                  c_data[C_DATA_LEN+1];
    double                h_amount;
    char                  h_data[H_DATA_LEN+1];
} CUSTOMER_STRUCT;

typedef struct
{
    char                  c_last[LAST_NAME_LEN+1];
    char                  c_first[FIRST_NAME_LEN+1];
    long                  c_id;
} CUSTOMER_SORT_STRUCT;

typedef struct
{
    long                  time_start;
} LOADER_TIME_STRUCT;

// Global variables
char    szLastError[300];

HENV    henv;

HDBC    v_hdbc;
HDBC    i_hdbc1;
HDBC    w_hdbc1;
HDBC    c_hdbc1;
HDBC    c_hdbc2;
HDBC    o_hdbc1;
HDBC    o_hdbc2;
HDBC    o_hdbc3;

HSTMT    v_hstmt;
HSTMT    i_hstmt1;
HSTMT    w_hstmt1;
HSTMT    c_hstmt1, c_hstmt2;
HSTMT    o_hstmt1, o_hstmt2, o_hstmt3;

int    total_db_errors;

ORDERS_STRUCT    orders_buf[ORDERS_PER_DISTRICT];
CUSTOMER_STRUCT    customer_buf[CUSTOMERS_PER_DISTRICT];
long    orders_rows_loaded;
```

## Appendix B – Database Design

---

```
double          new_order_rows_loaded;
double          order_line_rows_loaded;
long            history_rows_loaded;
long            customer_rows_loaded;
double          stock_rows_loaded;
long            district_rows_loaded;
long            item_rows_loaded;
long            warehouse_rows_loaded;
long            main_time_start;
long            main_time_end;
long            max_items;
long            customers_per_district;
long            orders_per_district;
long            first_new_order;
long            last_new_order;

TPCCLDR_ARGS   *aptr, args;

//=====
//
// Function name: main
//
//=====
int main(int  argc, char **argv)
{
    DWORD          dwThreadID[MAX_MAIN_THREADS];
    HANDLE         hThread[MAX_MAIN_THREADS];
    FILE           *fLoader;
    char           buffer[255];
    int            i;

    for (i=0; i<MAX_MAIN_THREADS; i++)
        hThread[i] = NULL;

    printf("\n*****");
    printf("\n*                               *");
    printf("\n* Microsoft SQL Server           *");
    printf("\n*                               *");
    printf("\n* TPC-C BENCHMARK KIT: Database loader *");
    printf("\n* Version %s                      *", TPCKIT_VER);
    printf("\n*                               *");
    printf("\n*****\n\n");

    // process command line arguments
    aptr = &args;
    GetArgsLoader(argc, argv, aptr);

    printf("Build interface is ODBC.\n");

    if (aptr->build_index == 0)
        printf("Data load only - no index creation.\n");
    else
        printf("Data load and index creation.\n");

    if (aptr->index_order == 0)
        printf("Clustered indexes will be created after bulk load.\n");
    else
        printf("Clustered indexes will be created before bulk load.\n");

    // set database scale values
    if (aptr->scale_down == 1)
    {
        printf("**** Scaled Down Database ****\n");
        max_items = MAXITEMS_SCALE_DOWN;
        customers_per_district = CUSTOMERS_SCALE_DOWN;
        orders_per_district = ORDERS_SCALE_DOWN;
        first_new_order = 0;
        last_new_order = 30;
    }
    else
    {
        max_items = MAXITEMS;
        customers_per_district = CUSTOMERS_PER_DISTRICT;
        orders_per_district = ORDERS_PER_DISTRICT;
        first_new_order = 2100;
        last_new_order = 3000;
    }

    // open connections to SQL Server
    OpenConnections();

    // open file for loader results
    fLoader = fopen(aptr->loader_res_file, "w");

    if (fLoader == NULL)
    {
        printf("Error, loader result file open failed.");
        exit(-1);
    }

    // start loading data
```

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---

```
printf(buffer, "TPC-C load started for %ld warehouses.\n", aptr->num_warehouses);
if (aptr->scale_down == 1)
{
    sprintf(buffer, "SCALED DOWN DATABASE.\n");
}

printf("%s", buffer);
fprintf(fLoader, "%s", buffer);

main_time_start = (TimeNow() / MILLI);

// start parallel load threads
if (aptr->tables_all || aptr->table_item)
{
    fprintf(fLoader, "\nStarting loader threads for: item\n");

    hThread[0] = CreateThread(NULL,
                                0,
                                (LPTHREAD_START_ROUTINE) LoadItem,
                                NULL,
                                0,
                                &dwThreadID[0]);

    if (hThread[0] == NULL)
    {
        printf("Error, failed in creating creating thread = 0.\n");
        exit(-1);
    }
}

if (aptr->tables_all || aptr->table_warehouse)
{
    fprintf(fLoader, "Starting loader threads for: warehouse\n");

    hThread[1] = CreateThread(NULL,
                                0,
                                (LPTHREAD_START_ROUTINE)
LoadWarehouse,
                                NULL,
                                0,
                                &dwThreadID[1]);

    if (hThread[1] == NULL)
    {
        printf("Error, failed in creating creating thread = 1.\n");
        exit(-1);
    }
}

if (aptr->tables_all || aptr->table_customer)
{
    fprintf(fLoader, "Starting loader threads for: customer\n");

    hThread[2] = CreateThread(NULL,
                                0,
                                (LPTHREAD_START_ROUTINE)
LoadCustomer,
                                NULL,
                                0,
                                &dwThreadID[2]);

    if (hThread[2] == NULL)
    {
        printf("Error, failed in creating creating main thread = 2.\n");
        exit(-1);
    }
}

if (aptr->tables_all || aptr->table_orders)
{
    fprintf(fLoader, "Starting loader threads for: orders\n");

    hThread[3] = CreateThread(NULL,
                                0,
                                (LPTHREAD_START_ROUTINE) LoadOrders,
                                NULL,
                                0,
                                &dwThreadID[3]);

    if (hThread[3] == NULL)
    {
        printf("Error, failed in creating creating main thread = 3.\n");
        exit(-1);
    }
}

// Wait for threads to finish...
for (i=0; i<MAX_MAIN_THREADS; i++)
{
    if (hThread[i] != NULL)
    {
        WaitForSingleObject( hThread[i], INFINITE );
        CloseHandle(hThread[i]);
    }
}
```

## Appendix B – Database Design

---

```
        hThread[i] = NULL;
    }
    main_time_end = (TimeNow() / MILLI);
    sprintf(buffer, "\nTPC-C load completed successfully in %ld minutes.\n",
            (main_time_end - main_time_start)/60);

    printf("%s",buffer);
    fprintf(fLoader, "%s", buffer);

    fclose(fLoader);

    SQLFreeEnv(henv);

    exit(0);

    return 0;
}

//=====
//
// Function name: LoadItem
//
//=====
void LoadItem()
{
    int          i;
    long         i_id;
    long         i_im_id;
    char         i_name[I_NAME_LEN+1];
    double       i_price;
    char         i_data[I_DATA_LEN+1];
    char         name[20];
    long         time_start;
    RETCODE      rc;
    DBINT        rcint;
    char         bcphint[128];
    char         err_log_path[256];

    // Seed with unique number
    seed(11);

    printf("Loading item table...\n");

    //if build index before load
    if ((aptr->build_index == 1) && (aptr->index_order == 1))
        BuildIndex("idxitmcl");

    InitString(i_name, I_NAME_LEN+1);
    InitString(i_data, I_DATA_LEN+1);

    sprintf(name, "%s..%s", aptr->database, "item");

    strcpy(err_log_path, aptr->log_path);
    strcat(err_log_path, "item.err");
    rc = bcp_init(i_hdbc1, name, NULL, err_log_path, DB_IN);
    if (rc != SUCCEED)
        HandleErrorDBC(i_hdbc1);

    if ((aptr->build_index == 1) && (aptr->index_order == 1))
    {
        sprintf(bcphint, "tablock, order (i_id), ROWS_PER_BATCH = 10000");
        rc = bcp_control(i_hdbc1, BCPHINTS, (void*) bcphint);
        if (rc != SUCCEED)
            HandleErrorDBC(i_hdbc1);
    }

    i = 0;
    rc = bcp_bind(i_hdbc1, (BYTE *) &i_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT4, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(i_hdbc1);
    rc = bcp_bind(i_hdbc1, (BYTE *) i_name, 0, I_NAME_LEN, NULL, 0, 0, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(i_hdbc1);
    rc = bcp_bind(i_hdbc1, (BYTE *) &i_price, 0, SQL_VARLEN_DATA, NULL, 0, SQLFLT8, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(i_hdbc1);
    rc = bcp_bind(i_hdbc1, (BYTE *) i_data, 0, SQL_VARLEN_DATA, "", 1, 0, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(i_hdbc1);
    rc = bcp_bind(i_hdbc1, (BYTE *) &i_im_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT4, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(i_hdbc1);

    time_start = (TimeNow() / MILLI);

    item_rows_loaded = 0;

    for (i_id = 1; i_id <= max_items; i_id++)
    {
```

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---

```
        i_im_id = RandomNumber(1L, 10000L);

        MakeAlphaStringPadded(14, 24, I_NAME_LEN, i_name);

        i_price = ((float) RandomNumber(100L, 10000L))/100.0;

        MakeOriginalAlphaString(26, 50, I_DATA_LEN, i_data, 10);

        rc = bcp_sendrow(i_hdbc1);
        if (rc != SUCCEED)
            HandleErrorDBC(i_hdbc1);

        item_rows_loaded++;
        CheckForCommit(i_hdbc1, i_hstmt1, item_rows_loaded, "item", &time_start);
    }

    rcint = bcp_done(i_hdbc1);
    if (rcint < 0)
        HandleErrorDBC(i_hdbc1);

    printf("Finished loading item table.\n");

    SQLFreeStmt(i_hstmt1, SQL_DROP);
    SQLDisconnect(i_hdbc1);
    SQLFreeConnect(i_hdbc1);

    // if build index after load
    if ((aptr->build_index == 1) && (aptr->index_order == 0))
        BuildIndex("idxitmcl");
}

//=====
//
// Function : LoadWarehouse
//
// Loads WAREHOUSE table and loads Stock and District as Warehouses are created
//
//=====
void LoadWarehouse()
{
    int i;
    long w_id;
    char w_name[W_NAME_LEN+1];
    char w_street_1[ADDRESS_LEN+1];
    char w_street_2[ADDRESS_LEN+1];
    char w_city[ADDRESS_LEN+1];
    char w_state[STATE_LEN+1];
    char w_zip[ZIP_LEN+1];
    double w_tax;
    double w_ytd;
    char name[20];
    long time_start;
    RETCODE rc;
    DBINT rcint;
    char bcphint[128];
    char err_log_path[256];

    // Seed with unique number
    seed(2);

    printf("Loading warehouse table...\n");

    // if build index before load...
    if ((aptr->build_index == 1) && (aptr->index_order == 1))
        BuildIndex("idxwarcl");

    InitString(w_name, W_NAME_LEN+1);
    InitAddress(w_street_1, w_street_2, w_city, w_state, w_zip);

    sprintf(name, "%s.%s", aptr->database, "warehouse");

    strcpy(err_log_path, aptr->log_path);
    strcat(err_log_path, "whouse.err");
    rc = bcp_init(w_hdbc1, name, NULL, err_log_path, DB_IN);

    if (rc != SUCCEED)
        HandleErrorDBC(w_hdbc1);

    if ((aptr->build_index == 1) && (aptr->index_order == 1))
    {
        sprintf(bcphint, "tablock, order (w_id), ROWS_PER_BATCH = %d", aptr->num_warehouses);
        rc = bcp_control(w_hdbc1, BCPHINTS, (void*) bcphint);
        if (rc != SUCCEED)
            HandleErrorDBC(w_hdbc1);
    }

    i = 0;
    rc = bcp_bind(w_hdbc1, (BYTE *) &w_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT4, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(w_hdbc1);
    rc = bcp_bind(w_hdbc1, (BYTE *) &w_ytd, 0, SQL_VARLEN_DATA, NULL, 0, SQLFLT8, ++i);
    if (rc != SUCCEED)
```



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---

```
        HandleErrorDBC(w_hdbc1);
rc = bcp_bind(w_hdbc1, (BYTE *) &w_tax, 0, SQL_VARLEN_DATA, NULL, 0, SQLFLT8, ++i);
if (rc != SUCCEED)
    HandleErrorDBC(w_hdbc1);
rc = bcp_bind(w_hdbc1, (BYTE *) w_name, 0, W_NAME_LEN, NULL, 0, 0, ++i);
if (rc != SUCCEED)
    HandleErrorDBC(w_hdbc1);
rc = bcp_bind(w_hdbc1, (BYTE *) w_street_1, 0, ADDRESS_LEN, NULL, 0, 0, ++i);
if (rc != SUCCEED)
    HandleErrorDBC(w_hdbc1);
rc = bcp_bind(w_hdbc1, (BYTE *) w_street_2, 0, ADDRESS_LEN, NULL, 0, 0, ++i);
if (rc != SUCCEED)
    HandleErrorDBC(w_hdbc1);
rc = bcp_bind(w_hdbc1, (BYTE *) w_city, 0, ADDRESS_LEN, NULL, 0, 0, ++i);
if (rc != SUCCEED)
    HandleErrorDBC(w_hdbc1);
rc = bcp_bind(w_hdbc1, (BYTE *) w_state, 0, STATE_LEN, NULL, 0, 0, ++i);
if (rc != SUCCEED)
    HandleErrorDBC(w_hdbc1);
rc = bcp_bind(w_hdbc1, (BYTE *) w_zip, 0, ZIP_LEN, NULL, 0, 0, ++i);
if (rc != SUCCEED)
    HandleErrorDBC(w_hdbc1);

time_start = (TimeNow() / MILLI);

warehouse_rows_loaded = 0;

for (w_id = (long)aptr->starting_warehouse; w_id <= aptr->num_warehouses; w_id++)
{
    MakeAlphaStringPadded(6,10, W_NAME_LEN, w_name);

    MakeAddress(w_street_1, w_street_2, w_city, w_state, w_zip);

    w_tax = ((float) RandomNumber(0L,2000L))/10000.00;

    w_ytd = 300000.00;

    rc = bcp_sendrow(w_hdbc1);
    if (rc != SUCCEED)
        HandleErrorDBC(w_hdbc1);

    warehouse_rows_loaded++;
    CheckForCommit(w_hdbc1, i_hstmt1, warehouse_rows_loaded, "warehouse", &time_start);
}

rcint = bcp_done(w_hdbc1);
if (rcint < 0)
    HandleErrorDBC(w_hdbc1);

printf("Finished loading warehouse table.\n");

// if build index after load...
if ((aptr->build_index == 1) && (aptr->index_order == 0))
    BuildIndex("idxwarc1");

stock_rows_loaded = 0;
district_rows_loaded = 0;

District();
Stock();
}

//=====
//
// Function : District
//
//=====
void District()
{
    int i;
    short d_id;
    long d_w_id;
    char d_name[D_NAME_LEN+1];
    char d_street_1[ADDRESS_LEN+1];
    char d_street_2[ADDRESS_LEN+1];
    char d_city[ADDRESS_LEN+1];
    char d_state[STATE_LEN+1];
    char d_zip[ZIP_LEN+1];
    double d_tax;
    double d_ytd;
    char name[20];
    long d_next_o_id;
    long time_start;
    long w_id;
    RETCODE rc;
    DBINT rcint;
    char bcp[128];
    char err_log_path[256];

    // Seed with unique number
    seed(4);

    printf("Loading district table...\n");
```

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---

```
// build index before load
if ((aptr->build_index == 1) && (aptr->index_order == 1))
    BuildIndex("idxdiscl");

InitString(d_name, D_NAME_LEN+1);
InitAddress(d_street_1, d_street_2, d_city, d_state, d_zip);
sprintf(name, "%s..%s", aptr->database, "district");

strcpy(err_log_path, aptr->log_path);
strcat(err_log_path, "district.err");
rc = bcp_init(w_hdbc1, name, NULL, err_log_path, DB_IN);
if (rc != SUCCEED)
    HandleErrorDBC(w_hdbc1);

if ((aptr->build_index == 1) && (aptr->index_order == 1))
{
    sprintf(bcphint, "tablock, order (d_w_id, d_id), ROWS_PER_BATCH = %u", (aptr->num_warehouses *
10));
    rc = bcp_control(w_hdbc1, BCPHINTS, (void*) bcphint);
    if (rc != SUCCEED)
        HandleErrorDBC(w_hdbc1);
}

i = 0;
rc = bcp_bind(w_hdbc1, (BYTE *) &d_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT2, ++i);
if (rc != SUCCEED)
    HandleErrorDBC(w_hdbc1);
rc = bcp_bind(w_hdbc1, (BYTE *) &d_w_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT4, ++i);
if (rc != SUCCEED)
    HandleErrorDBC(w_hdbc1);
rc = bcp_bind(w_hdbc1, (BYTE *) &d_ytd, 0, SQL_VARLEN_DATA, NULL, 0, SQLFLT8, ++i);
if (rc != SUCCEED)
    HandleErrorDBC(w_hdbc1);
rc = bcp_bind(w_hdbc1, (BYTE *) &d_next_o_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT4, ++i);
if (rc != SUCCEED)
    HandleErrorDBC(w_hdbc1);
rc = bcp_bind(w_hdbc1, (BYTE *) &d_tax, 0, SQL_VARLEN_DATA, NULL, 0, SQLFLT8, ++i);
if (rc != SUCCEED)
    HandleErrorDBC(w_hdbc1);
rc = bcp_bind(w_hdbc1, (BYTE *) d_name, 0, D_NAME_LEN, NULL, 0, 0, ++i);
if (rc != SUCCEED)
    HandleErrorDBC(w_hdbc1);
rc = bcp_bind(w_hdbc1, (BYTE *) d_street_1, 0, ADDRESS_LEN, NULL, 0, 0, ++i);
if (rc != SUCCEED)
    HandleErrorDBC(w_hdbc1);
rc = bcp_bind(w_hdbc1, (BYTE *) d_street_2, 0, ADDRESS_LEN, NULL, 0, 0, ++i);
if (rc != SUCCEED)
    HandleErrorDBC(w_hdbc1);
rc = bcp_bind(w_hdbc1, (BYTE *) d_city, 0, ADDRESS_LEN, NULL, 0, 0, ++i);
if (rc != SUCCEED)
    HandleErrorDBC(w_hdbc1);
rc = bcp_bind(w_hdbc1, (BYTE *) d_state, 0, STATE_LEN, NULL, 0, 0, ++i);
if (rc != SUCCEED)
    HandleErrorDBC(w_hdbc1);
rc = bcp_bind(w_hdbc1, (BYTE *) d_zip, 0, ZIP_LEN, NULL, 0, 0, ++i);
if (rc != SUCCEED)
    HandleErrorDBC(w_hdbc1);

d_ytd = 30000.0;

d_next_o_id = orders_per_district+1;

time_start = (TimeNow() / MILLI);

for (w_id = aptr->starting_warehouse; w_id <= aptr->num_warehouses; w_id++)
{
    d_w_id = w_id;

    for (d_id = 1; d_id <= DISTRICT_PER_WAREHOUSE; d_id++)
    {
        MakeAlphaStringPadded(6,10,D_NAME_LEN, d_name);

        MakeAddress(d_street_1, d_street_2, d_city, d_state, d_zip);

        d_tax = ((float) RandomNumber(0L,2000L))/10000.00;

        rc = bcp_sendrow(w_hdbc1);
        if (rc != SUCCEED)
            HandleErrorDBC(w_hdbc1);

        district_rows_loaded++;
        CheckForCommit(w_hdbc1, w_hstmt1, district_rows_loaded, "district", &time_start);
    }
}

rcint = bcp_done(w_hdbc1);
if (rcint < 0)
    HandleErrorDBC(w_hdbc1);

printf("Finished loading district table.\n");

// if build index after load...
```

## Appendix B – Database Design

---

```
        if ((aptr->build_index == 1) && (aptr->index_order == 0))
            BuildIndex("idxdiscl");

    return;
}

//=====
//
// Function   : Stock
//
//=====
void Stock()
{
    int          i;
    long         s_i_id;
    long         s_w_id;

    short s_quantity;
    char  s_dist_01[S_DIST_LEN+1];
    char  s_dist_02[S_DIST_LEN+1];
    char  s_dist_03[S_DIST_LEN+1];
    char  s_dist_04[S_DIST_LEN+1];
    char  s_dist_05[S_DIST_LEN+1];
    char  s_dist_06[S_DIST_LEN+1];
    char  s_dist_07[S_DIST_LEN+1];
    char  s_dist_08[S_DIST_LEN+1];
    char  s_dist_09[S_DIST_LEN+1];
    char  s_dist_10[S_DIST_LEN+1];
    long  s_ytd;
    short s_order_cnt;
    short s_remote_cnt;
    char  s_data[S_DATA_LEN+1];
    short len;
    char  name[20];
    long  time_start;
    RETCODE rc;
    DBINT  rcint;
    char  bcphint[128];
    char  err_log_path[256];

    // Seed with unique number
    seed(3);

    // if build index before load...
    if ((aptr->build_index == 1) && (aptr->index_order == 1))
        BuildIndex("idxstkcl");

    sprintf(name, "%s..%s", aptr->database, "stock");

    strcpy(err_log_path, aptr->log_path);
    strcat(err_log_path, "stock.err");
    rc = bcp_init(w_hdbc1, name, NULL, err_log_path, DB_IN);
    if (rc != SUCCEED)
        HandleErrorDBC(w_hdbc1);

    if ((aptr->build_index == 1) && (aptr->index_order == 1))
    {
        sprintf(bcphint, "tablock, order (s_i_id, s_w_id), ROWS_PER_BATCH = %u", (aptr->num_warehouses *
100000));
        rc = bcp_control(w_hdbc1, BCPHINTS, (void*) bcphint);
        if (rc != SUCCEED)
            HandleErrorDBC(w_hdbc1);
    }

    i = 0;
    rc = bcp_bind(w_hdbc1, (BYTE *) &s_i_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT4, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(w_hdbc1);
    rc = bcp_bind(w_hdbc1, (BYTE *) &s_w_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT4, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(w_hdbc1);
    rc = bcp_bind(w_hdbc1, (BYTE *) &s_quantity, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT2, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(w_hdbc1);
    rc = bcp_bind(w_hdbc1, (BYTE *) &s_ytd, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT4, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(w_hdbc1);
    rc = bcp_bind(w_hdbc1, (BYTE *) &s_order_cnt, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT2, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(w_hdbc1);
    rc = bcp_bind(w_hdbc1, (BYTE *) &s_remote_cnt, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT2, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(w_hdbc1);
    rc = bcp_bind(w_hdbc1, (BYTE *) s_data, 0, SQL_VARLEN_DATA, "", 1, 0, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(w_hdbc1);
    rc = bcp_bind(w_hdbc1, (BYTE *) s_dist_01, 0, S_DIST_LEN, NULL, 0, 0, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(w_hdbc1);
    rc = bcp_bind(w_hdbc1, (BYTE *) s_dist_02, 0, S_DIST_LEN, NULL, 0, 0, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(w_hdbc1);
    rc = bcp_bind(w_hdbc1, (BYTE *) s_dist_03, 0, S_DIST_LEN, NULL, 0, 0, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(w_hdbc1);
}
```

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---

```
        HandleErrorDBC(w_hdbc1);
rc = bcp_bind(w_hdbc1, (BYTE *) s_dist_04, 0, S_DIST_LEN, NULL, 0, 0, ++i);
if (rc != SUCCEED)
    HandleErrorDBC(w_hdbc1);
rc = bcp_bind(w_hdbc1, (BYTE *) s_dist_05, 0, S_DIST_LEN, NULL, 0, 0, ++i);
if (rc != SUCCEED)
    HandleErrorDBC(w_hdbc1);
rc = bcp_bind(w_hdbc1, (BYTE *) s_dist_06, 0, S_DIST_LEN, NULL, 0, 0, ++i);
if (rc != SUCCEED)
    HandleErrorDBC(w_hdbc1);
rc = bcp_bind(w_hdbc1, (BYTE *) s_dist_07, 0, S_DIST_LEN, NULL, 0, 0, ++i);
if (rc != SUCCEED)
    HandleErrorDBC(w_hdbc1);
rc = bcp_bind(w_hdbc1, (BYTE *) s_dist_08, 0, S_DIST_LEN, NULL, 0, 0, ++i);
if (rc != SUCCEED)
    HandleErrorDBC(w_hdbc1);
rc = bcp_bind(w_hdbc1, (BYTE *) s_dist_09, 0, S_DIST_LEN, NULL, 0, 0, ++i);
if (rc != SUCCEED)
    HandleErrorDBC(w_hdbc1);
rc = bcp_bind(w_hdbc1, (BYTE *) s_dist_10, 0, S_DIST_LEN, NULL, 0, 0, ++i);
if (rc != SUCCEED)
    HandleErrorDBC(w_hdbc1);

s_ytd = s_order_cnt = s_remote_cnt = 0;

time_start = (TimeNow() / MILLI);

printf("...Loading stock table\n");

for (s_i_id=1; s_i_id <= max_items; s_i_id++)
{
    for (s_w_id = (long)aptr->starting_warehouse; s_w_id <= aptr->num_warehouses; s_w_id++)
    {
        s_quantity = (short)RandomNumber(10L,100L);
        len = MakeAlphaString(24,24,S_DIST_LEN, s_dist_01);
        len = MakeAlphaString(24,24,S_DIST_LEN, s_dist_02);
        len = MakeAlphaString(24,24,S_DIST_LEN, s_dist_03);
        len = MakeAlphaString(24,24,S_DIST_LEN, s_dist_04);
        len = MakeAlphaString(24,24,S_DIST_LEN, s_dist_05);
        len = MakeAlphaString(24,24,S_DIST_LEN, s_dist_06);
        len = MakeAlphaString(24,24,S_DIST_LEN, s_dist_07);
        len = MakeAlphaString(24,24,S_DIST_LEN, s_dist_08);
        len = MakeAlphaString(24,24,S_DIST_LEN, s_dist_09);
        len = MakeAlphaString(24,24,S_DIST_LEN, s_dist_10);

        len = MakeOriginalAlphaString(26,50, S_DATA_LEN, s_data,10);

        rc = bcp_sendrow(w_hdbc1);
        if (rc != SUCCEED)
            HandleErrorDBC(w_hdbc1);

        stock_rows_loaded++;
        CheckForCommit_Big(w_hdbc1, w_hstmt1, stock_rows_loaded, "stock", &time_start);
    }
}

rcint = bcp_done(w_hdbc1);
if (rcint < 0)
    HandleErrorDBC(w_hdbc1);

printf("Finished loading stock table.\n");

SQLFreeStmt(w_hstmt1, SQL_DROP);
SQLDisconnect(w_hdbc1);
SQLFreeConnect(w_hdbc1);

// if build index after load...
if ((aptr->build_index == 1) && (aptr->index_order == 0))
    BuildIndex("idxstkcl");

return;
}

//=====
//
// Function : LoadCustomer
//
//=====
void LoadCustomer()
{
    LOADER_TIME_STRUCT    customer_time_start;
    LOADER_TIME_STRUCT    history_time_start;
    long                  w_id;
    short                 d_id;
    DWORD                  dwThreadId[MAX_CUSTOMER_THREADS];
    HANDLE                 hThread[MAX_CUSTOMER_THREADS];
    char                   name[20];
    RETCODE                rc;
    DBINT                  rcint;
    char                   bcphint[128];
    char                   cmd[256];
}
```

## Appendix B – Database Design

---

```
int                                num_procs;
char                                err_log_path_cust[256];
char                                err_log_path_hist[256];

// Seed with unique number
seed(5);

printf("Loading customer and history tables...\n");

// if build index before load...
if ((aptr->build_index == 1) && (aptr->index_order == 1))
{
    BuildIndex("idxcuscl");
    // check the number of processors on this system
    // if 8 or more processors, then build index on History.
    // if less than 8 processors, do not build the index
    num_procs = atoi(getenv( "NUMBER_OF_PROCESSORS" ));
    if ( num_procs >= 8 )
        BuildIndex("idxhiscl");
}

// Initialize bulk copy
sprintf(name, "%s..%s", aptr->database, "customer");

strcpy(err_log_path_cust, aptr->log_path);
strcat(err_log_path_cust, "customer.err");
rc = bcp_init(c_hdbc1, name, NULL, err_log_path_cust, DB_IN);
if (rc != SUCCEEDED)
    HandleErrorDBC(c_hdbc1);

if ((aptr->build_index == 1) && (aptr->index_order == 1))
{
    sprintf(bcphint, "tablock, order (c_w_id, c_d_id, c_id), ROWS_PER_BATCH = %u", (aptr->
>num_warehouses * 30000));
    rc = bcp_control(c_hdbc1, BCPHINTS, (void*) bcphint);
    if (rc != SUCCEEDED)
        HandleErrorDBC(c_hdbc1);
}

sprintf(name, "%s..%s", aptr->database, "history");

rc = bcp_init(c_hdbc2, name, NULL, "logs\\history.err", DB_IN);
strcpy(err_log_path_hist, aptr->log_path);
strcat(err_log_path_hist, "history.err");
rc = bcp_init(c_hdbc2, name, NULL, err_log_path_hist, DB_IN);
if (rc != SUCCEEDED)
    HandleErrorDBC(c_hdbc2);

sprintf(bcphint, "tablock");
rc = bcp_control(c_hdbc2, BCPHINTS, (void*) bcphint);
if (rc != SUCCEEDED)
    HandleErrorDBC(c_hdbc2);

customer_rows_loaded    = 0;
history_rows_loaded    = 0;

CustomerBufInit();

customer_time_start.time_start = (TimeNow() / MILLI);
history_time_start.time_start = (TimeNow() / MILLI);

for (w_id = (long)aptr->starting_warehouse; w_id <= aptr->num_warehouses; w_id++)
{
    for (d_id = 1; d_id <= DISTRICT_PER_WAREHOUSE; d_id++)
    {

        CustomerBufLoad(d_id, w_id);

        // Start parallel loading threads here...
        // Start customer table thread
        printf("...Loading customer table for: d_id = %d, w_id = %d\n", d_id, w_id);

        hThread[0] = CreateThread(NULL,

                                0,
                                (LPTHREAD_START_ROUTINE)
                                LoadCustomerTable,

                                &customer_time_start,
                                0,
                                &dwThreadId[0]);

        if (hThread[0] == NULL)
        {
            printf("Error, failed in creating creating thread = 0.\n");
            exit(-1);
        }

        // Start History table thread
        printf("...Loading history table for: d_id = %d, w_id = %d\n", d_id, w_id);

        hThread[1] = CreateThread(NULL,

                                0,
                                (LPTHREAD_START_ROUTINE)
                                LoadHistoryTable,
```

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---

```

                                                                    &history_time_start,
                                                                    0,
                                                                    &dwThreadID[1]);

    if (hThread[1] == NULL)
    {
        printf("Error, failed in creating creating thread = 1.\n");
        exit(-1);
    }

    WaitForSingleObject( hThread[0], INFINITE );
    WaitForSingleObject( hThread[1], INFINITE );

    if (CloseHandle(hThread[0]) == FALSE)
    {
        printf("Error, failed in closing customer thread handle with errno: %d\n",
GetLastError());
    }

    if (CloseHandle(hThread[1]) == FALSE)
    {
        printf("Error, failed in closing history thread handle with errno: %d\n",
GetLastError());
    }
}

// flush the bulk connection
rcint = bcp_done(c_hdbc1);
if (rcint < 0)
    HandleErrorDBC(c_hdbc1);

rcint = bcp_done(c_hdbc2);
if (rcint < 0)
    HandleErrorDBC(c_hdbc2);

printf("Finished loading customer table.\n");

// if build index after load...
if ((aptr->build_index == 1) && (aptr->index_order == 0))
{
    BuildIndex("idxcuscl");
    // check the number of processors on this system
    // if 8 or more processors, then build index on History.
    // if less than 8 processors, do not build the index
    num_procs = atoi(getenv( "NUMBER_OF_PROCESSORS" ));
    if (num_procs >= 8)
        BuildIndex("idxhiscl");
}

// build non-clustered index
if (aptr->build_index == 1)
    BuildIndex("idxcusnc");

// Output the NURAND used for the loader into C_FIRST for C_ID = 1,
// C_W_ID = 1, and C_D_ID = 1
sprintf(cmd, "osql -S%s -U%s -P%s -d%s -e -Q\"update customer set c_first = 'C_LOAD = %d' where c_id = 1 and
c_w_id = 1 and c_d_id = 1\" > %snurand_load.log",
        aptr->server,
        aptr->user,
        aptr->password,
        aptr->database,
        LOADER_NURAND_C,
        aptr->log_path);

system(cmd);

SQLFreeStmt(c_hstmt1, SQL_DROP);
SQLDisconnect(c_hdbc1);
SQLFreeConnect(c_hdbc1);

SQLFreeStmt(c_hstmt2, SQL_DROP);
SQLDisconnect(c_hdbc2);
SQLFreeConnect(c_hdbc2);

return;
}

//=====
//
// Function : CustomerBufInit
//
//=====
void CustomerBufInit()
{
    long i;

    for (i=0;i<customers_per_district;i++)
    {
        customer_buf[i].c_id = 0;
        customer_buf[i].c_d_id = 0;
        customer_buf[i].c_w_id = 0;
    }
}

```

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---

```
        strcpy(customer_buf[i].c_first,"");
        strcpy(customer_buf[i].c_middle,"");
        strcpy(customer_buf[i].c_last,"");
        strcpy(customer_buf[i].c_street_1,"");
        strcpy(customer_buf[i].c_street_2,"");
        strcpy(customer_buf[i].c_city,"");
        strcpy(customer_buf[i].c_state,"");
        strcpy(customer_buf[i].c_zip,"");
        strcpy(customer_buf[i].c_phone,"");
        strcpy(customer_buf[i].c_credit,"");

        customer_buf[i].c_credit_lim = 0;
        customer_buf[i].c_discount = (float) 0;

        strcpy(customer_buf[i].c_balance,"");

        customer_buf[i].c_ytd_payment = 0;
        customer_buf[i].c_payment_cnt = 0;
        customer_buf[i].c_delivery_cnt = 0;

        strcpy(customer_buf[i].c_data,"");

        customer_buf[i].h_amount = 0;

        strcpy(customer_buf[i].h_data,"");
    }
}

//=====
//
// Function   : CustomerBufLoad
//
// Fills shared buffer for HISTORY and CUSTOMER
//=====
void CustomerBufLoad(int d_id, long w_id)
{
    long                i;
    CUSTOMER_SORT_STRUCT c[CUSTOMERS_PER_DISTRICT];

    for (i=0;i<customers_per_district;i++)
    {
        if (i < 1000)
            LastName(i, c[i].c_last);
        else
            LastName(NURand(255,0,999,LOADER_NURAND_C), c[i].c_last);

        MakeAlphaStringPadded(8,16,FIRST_NAME_LEN, c[i].c_first);

        c[i].c_id = i+1;
    }

    printf("...Loading customer buffer for: d_id = %d, w_id = %d\n",
           d_id, w_id);

    for (i=0;i<customers_per_district;i++)
    {
        customer_buf[i].c_d_id = d_id;
        customer_buf[i].c_w_id = w_id;
        customer_buf[i].h_amount = 10.0;
        customer_buf[i].c_ytd_payment = 10.0;
        customer_buf[i].c_payment_cnt = 1;
        customer_buf[i].c_delivery_cnt = 0;
        customer_buf[i].c_id = c[i].c_id;
        strcpy(customer_buf[i].c_first, c[i].c_first);
        strcpy(customer_buf[i].c_last, c[i].c_last);
        customer_buf[i].c_middle[0] = 'O';
        customer_buf[i].c_middle[1] = 'E';
        MakeAddress(customer_buf[i].c_street_1,
                   customer_buf[i].c_street_2,
                   customer_buf[i].c_city,
                   customer_buf[i].c_state,
                   customer_buf[i].c_zip);
        MakeNumberString(16, 16, PHONE_LEN, customer_buf[i].c_phone);

        if (RandomNumber(1L, 100L) > 10)
            customer_buf[i].c_credit[0] = 'G';
        else
            customer_buf[i].c_credit[0] = 'B';
        customer_buf[i].c_credit[1] = 'C';
        customer_buf[i].c_credit_lim = 50000.0;
        customer_buf[i].c_discount = ((float) RandomNumber(0L, 5000L)) / 10000.0;

        strcpy(customer_buf[i].c_balance,"-10.0");
        MakeAlphaStringPadded(300, 500, C_DATA_LEN, customer_buf[i].c_data);

        // Generate HISTORY data
        MakeAlphaStringPadded(12, 24, H_DATA_LEN, customer_buf[i].h_data);
    }
}

//=====
//
// Function   : LoadCustomerTable
```

## Appendix B – Database Design

---

```
//
//=====
void LoadCustomerTable(LOADER_TIME_STRUCT *customer_time_start)
{
    long          i;
    long          c_id;
    short         c_g_id;
    long          c_w_id;
    char          c_first[FIRST_NAME_LEN+1];
    char          c_middle[MIDDLE_NAME_LEN+1];
    char          c_last[LAST_NAME_LEN+1];
    char          c_street_1[ADDRESS_LEN+1];
    char          c_street_2[ADDRESS_LEN+1];
    char          c_city[ADDRESS_LEN+1];
    char          c_state[STATE_LEN+1];
    char          c_zip[ZIP_LEN+1];
    char          c_phone[PHONE_LEN+1];
    char          c_credit[CREDIT_LEN+1];
    double        c_credit_lim;
    double        c_discount;
    char          c_balance[6];
    double        c_ytd_payment;
    short         c_payment_cnt;
    short         c_delivery_cnt;
    char          c_data[C_DATA_LEN+1];
    char          c_since[C_SINCE_LEN+1];
    RETCODE       rc;

    i = 0;
    rc = bcp_bind(c_hdbc1, (BYTE *) &c_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT4, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc1);
    rc = bcp_bind(c_hdbc1, (BYTE *) &c_d_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT2, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc1);
    rc = bcp_bind(c_hdbc1, (BYTE *) &c_w_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT4, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc1);
    rc = bcp_bind(c_hdbc1, (BYTE *) &c_discount, 0, SQL_VARLEN_DATA, NULL, 0, SQLFLT8, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc1);
    rc = bcp_bind(c_hdbc1, (BYTE *) &c_credit_lim, 0, SQL_VARLEN_DATA, NULL, 0, SQLFLT8, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc1);
    rc = bcp_bind(c_hdbc1, (BYTE *) c_last, 0, LAST_NAME_LEN, NULL, 0, 0, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc1);
    rc = bcp_bind(c_hdbc1, (BYTE *) c_first, 0, FIRST_NAME_LEN, NULL, 0, 0, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc1);
    rc = bcp_bind(c_hdbc1, (BYTE *) c_credit, 0, CREDIT_LEN, NULL, 0, 0, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc1);
    rc = bcp_bind(c_hdbc1, (BYTE *) c_balance, 0, 5, NULL, 0, SQLCHARACTER, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc1);
    rc = bcp_bind(c_hdbc1, (BYTE *) &c_ytd_payment, 0, SQL_VARLEN_DATA, NULL, 0, SQLFLT8, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc1);
    rc = bcp_bind(c_hdbc1, (BYTE *) &c_payment_cnt, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT2, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc1);
    rc = bcp_bind(c_hdbc1, (BYTE *) &c_delivery_cnt, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT2, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc1);
    rc = bcp_bind(c_hdbc1, (BYTE *) c_street_1, 0, ADDRESS_LEN, NULL, 0, 0, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc1);
    rc = bcp_bind(c_hdbc1, (BYTE *) c_street_2, 0, ADDRESS_LEN, NULL, 0, 0, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc1);
    rc = bcp_bind(c_hdbc1, (BYTE *) c_city, 0, ADDRESS_LEN, NULL, 0, 0, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc1);
    rc = bcp_bind(c_hdbc1, (BYTE *) c_state, 0, STATE_LEN, NULL, 0, 0, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc1);
    rc = bcp_bind(c_hdbc1, (BYTE *) c_zip, 0, ZIP_LEN, NULL, 0, 0, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc1);
    rc = bcp_bind(c_hdbc1, (BYTE *) c_phone, 0, PHONE_LEN, NULL, 0, 0, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc1);
    rc = bcp_bind(c_hdbc1, (BYTE *) &c_since, 0, C_SINCE_LEN, NULL, 0, SQLCHARACTER, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc1);
    rc = bcp_bind(c_hdbc1, (BYTE *) c_middle, 0, MIDDLE_NAME_LEN, NULL, 0, 0, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc1);
    rc = bcp_bind(c_hdbc1, (BYTE *) c_data, 0, C_DATA_LEN, NULL, 0, 0, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc1);
}
```



## Appendix B – Database Design

---

```
for (i = 0; i < customers_per_district; i++)
{
    c_id = customer_buf[i].c_id;
    c_d_id = customer_buf[i].c_d_id;
    c_w_id = customer_buf[i].c_w_id;

    strcpy(c_first, customer_buf[i].c_first);
    strcpy(c_middle, customer_buf[i].c_middle);
    strcpy(c_last, customer_buf[i].c_last);
    strcpy(c_street_1, customer_buf[i].c_street_1);
    strcpy(c_street_2, customer_buf[i].c_street_2);
    strcpy(c_city, customer_buf[i].c_city);
    strcpy(c_state, customer_buf[i].c_state);
    strcpy(c_zip, customer_buf[i].c_zip);
    strcpy(c_phone, customer_buf[i].c_phone);
    strcpy(c_credit, customer_buf[i].c_credit);

    FormatDate(&c_since);

    c_credit_lim = customer_buf[i].c_credit_lim;
    c_discount = customer_buf[i].c_discount;
    strcpy(c_balance, customer_buf[i].c_balance);
    c_ytd_payment = customer_buf[i].c_ytd_payment;
    c_payment_cnt = customer_buf[i].c_payment_cnt;
    c_delivery_cnt = customer_buf[i].c_delivery_cnt;
    strcpy(c_data, customer_buf[i].c_data);

    // Send data to server
    rc = bcp_sendrow(c_hdbc1);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc1);

    customer_rows_loaded++;
    CheckForCommit(c_hdbc1, c_hstmt1, customer_rows_loaded, "customer", &customer_time_start-
>time_start);
}
}

//=====
//
// Function : LoadHistoryTable
//
//=====
void LoadHistoryTable(LOADER_TIME_STRUCT *history_time_start)
{
    long          i;
    long          c_id;
    short         c_d_id;
    long          c_w_id;
    double        h_amount;
    char          h_data[H_DATA_LEN+1];
    char          h_date[H_DATE_LEN+1];
    RETCODE       rc;

    i = 0;
    rc = bcp_bind(c_hdbc2, (BYTE *) &c_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT4, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc2);
    rc = bcp_bind(c_hdbc2, (BYTE *) &c_d_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT2, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc2);
    rc = bcp_bind(c_hdbc2, (BYTE *) &c_w_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT4, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc2);
    rc = bcp_bind(c_hdbc2, (BYTE *) &c_d_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT2, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc2);
    rc = bcp_bind(c_hdbc2, (BYTE *) &c_w_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT4, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc2);
    rc = bcp_bind(c_hdbc2, (BYTE *) &h_date, 0, H_DATE_LEN, NULL, 0, SQLCHARACTER, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc2);
    rc = bcp_bind(c_hdbc2, (BYTE *) &h_amount, 0, SQL_VARLEN_DATA, NULL, 0, SQLFLT8, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc2);
    rc = bcp_bind(c_hdbc2, (BYTE *) h_data, 0, H_DATA_LEN, NULL, 0, 0, ++i);
    if (rc != SUCCEED)
        HandleErrorDBC(c_hdbc2);

    for (i = 0; i < customers_per_district; i++)
    {
        c_id = customer_buf[i].c_id;
        c_d_id = customer_buf[i].c_d_id;
        c_w_id = customer_buf[i].c_w_id;
        h_amount = customer_buf[i].h_amount;
        strcpy(h_data, customer_buf[i].h_data);

        FormatDate(&h_date);

        // send to server
        rc = bcp_sendrow(c_hdbc2);
        if (rc != SUCCEED)
```

## Appendix B – Database Design

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```
        HandleErrorDBC(o_hdbc2);

        history_rows_loaded++;
        CheckForCommit(c_hdbc2, c_hstmt2, history_rows_loaded, "history", &history_time_start->time_start);
    }
}

//=====
//
// Function   : LoadOrders
//
//=====
void LoadOrders()
{
    LOADER_TIME_STRUCT    orders_time_start;
    LOADER_TIME_STRUCT    new_order_time_start;
    LOADER_TIME_STRUCT    order_line_time_start;
    long                  w_id;
    short                 d_id;
    DWORD                 dwThreadID[MAX_ORDER_THREADS];
    HANDLE                 hThread[MAX_ORDER_THREADS];
    char                   name[20];
    RETCODE                rc;
    char                   bcphint[128];
    char                   err_log_path_ord[256];
    char                   err_log_path_nord[256];
    char                   err_log_path_ordl[256];

    // seed with unique number
    seed(6);

    printf("Loading orders...\n");

    // if build index before load...
    if ((aptr->build_index == 1) && (aptr->index_order == 1))
    {
        BuildIndex("idxordc1");
        BuildIndex("idxnodc1");
        BuildIndex("idxodlc1");
    }

    // initialize bulk copy
    sprintf(name, "%s..%s", aptr->database, "orders");

    rc = bcp_init(o_hdbc1, name, NULL, "logs\\orders.err", DB_IN);
    strcpy(err_log_path_ord, aptr->log_path);
    strcat(err_log_path_ord, "orders.err");
    rc = bcp_init(o_hdbc1, name, NULL, err_log_path_ord, DB_IN);
    if (rc != SUCCEED)
        HandleErrorDBC(o_hdbc1);

    if ((aptr->build_index == 1) && (aptr->index_order == 1))
    {
        sprintf(bcphint, "tablock, order (o_w_id, o_d_id, o_id), ROWS_PER_BATCH = %u", (aptr->num_warehouses * 30000));
        rc = bcp_control(o_hdbc1, BCPHINTS, (void*) bcphint);
        if (rc != SUCCEED)
            HandleErrorDBC(o_hdbc1);
    }

    sprintf(name, "%s..%s", aptr->database, "new_order");

    rc = bcp_init(o_hdbc2, name, NULL, "logs\\neword.err", DB_IN);
    strcpy(err_log_path_nord, aptr->log_path);
    strcat(err_log_path_nord, "neword.err");
    rc = bcp_init(o_hdbc2, name, NULL, err_log_path_nord, DB_IN);
    if (rc != SUCCEED)
        HandleErrorDBC(o_hdbc2);

    if ((aptr->build_index == 1) && (aptr->index_order == 1))
    {
        sprintf(bcphint, "tablock, order (no_w_id, no_d_id, no_o_id), ROWS_PER_BATCH = %u", (aptr->num_warehouses * 9000));
        rc = bcp_control(o_hdbc2, BCPHINTS, (void*) bcphint);
        if (rc != SUCCEED)
            HandleErrorDBC(o_hdbc2);
    }

    sprintf(name, "%s..%s", aptr->database, "order_line");

    rc = bcp_init(o_hdbc3, name, NULL, "logs\\ordline.err", DB_IN);
    strcpy(err_log_path_ordl, aptr->log_path);
    strcat(err_log_path_ordl, "ordline.err");
    rc = bcp_init(o_hdbc3, name, NULL, err_log_path_ordl, DB_IN);
    if (rc != SUCCEED)
        HandleErrorDBC(o_hdbc3);

    if ((aptr->build_index == 1) && (aptr->index_order == 1))
    {
        sprintf(bcphint, "tablock, order (ol_w_id, ol_d_id, ol_o_id, ol_number), ROWS_PER_BATCH = %u",
            (aptr->num_warehouses * 300000));
        rc = bcp_control(o_hdbc3, BCPHINTS, (void*) bcphint);
        if (rc != SUCCEED)
            HandleErrorDBC(o_hdbc3);
    }
}
```

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---

```
        HandleErrorDBC(o_hdbc3);
    }

    orders_rows_loaded      = 0;
    new_order_rows_loaded  = 0;
    order_line_rows_loaded = 0;

    OrdersBufInit();

    orders_time_start.time_start = (TimeNow() / MILLI);
    new_order_time_start.time_start = (TimeNow() / MILLI);
    order_line_time_start.time_start = (TimeNow() / MILLI);

    for (w_id = (long)aptr->starting_warehouse; w_id <= aptr->num_warehouses; w_id++)
    {
        for (d_id = 1; d_id <= DISTRICT_PER_WAREHOUSE; d_id++)
        {

            OrdersBufLoad(d_id, w_id);

            // start parallel loading threads here...
            // start Orders table thread
            printf("...Loading Order Table for: d_id = %d, w_id = %d\n", d_id, w_id);

            hThread[0] = CreateThread(NULL,

                                     0,
                                     (LPTHREAD_START_ROUTINE)
LoadOrdersTable,

                                     &orders_time_start,
                                     0,
                                     &dwThreadID[0]);

            if (hThread[0] == NULL)
            {
                printf("Error, failed in creating creating thread = 0.\n");
                exit(-1);
            }

            // start NewOrder table thread
            printf("...Loading New-Order Table for: d_id = %d, w_id = %d\n", d_id, w_id);

            hThread[1] = CreateThread(NULL,

                                     0,
                                     (LPTHREAD_START_ROUTINE)
LoadNewOrderTable,

                                     &new_order_time_start,
                                     0,
                                     &dwThreadID[1]);

            if (hThread[1] == NULL)
            {
                printf("Error, failed in creating creating thread = 1.\n");
                exit(-1);
            }

            // start Order-Line table thread
            printf("...Loading Order-Line Table for: d_id = %d, w_id = %d\n", d_id, w_id);

            hThread[2] = CreateThread(NULL,

                                     0,
                                     (LPTHREAD_START_ROUTINE)
LoadOrderLineTable,

                                     &order_line_time_start,
                                     0,
                                     &dwThreadID[2]);

            if (hThread[2] == NULL)
            {
                printf("Error, failed in creating creating thread = 2.\n");
                exit(-1);
            }

            WaitForSingleObject( hThread[0], INFINITE );
            WaitForSingleObject( hThread[1], INFINITE );
            WaitForSingleObject( hThread[2], INFINITE );

            if (CloseHandle(hThread[0]) == FALSE)
            {
                printf("Error, failed in closing Orders thread handle with errno: %d\n",
GetLastError());
            }

            if (CloseHandle(hThread[1]) == FALSE)
            {
                printf("Error, failed in closing NewOrder thread handle with errno: %d\n",
GetLastError());
            }

            if (CloseHandle(hThread[2]) == FALSE)
            {
                printf("Error, failed in closing OrderLine thread handle with errno: %d\n",
GetLastError());
            }
        }
    }
}
```

## Appendix B – Database Design

---

```
    }
}

printf("Finished loading orders.\n");

return;
}

//=====
//
// Function   : OrdersBufInit
//
// Clears shared buffer for ORDERS, NEWORDER, and ORDERLINE
//
//=====
void OrdersBufInit()
{
    int    i;
    int    j;

    for (i=0;i<orders_per_district;i++)
    {
        orders_buf[i].o_id = 0;
        orders_buf[i].o_d_id = 0;
        orders_buf[i].o_w_id = 0;
        orders_buf[i].o_c_id = 0;
        orders_buf[i].o_carrier_id = 0;
        orders_buf[i].o_ol_cnt = 0;
        orders_buf[i].o_all_local = 0;

        for (j=0;j<=14;j++)
        {
            orders_buf[i].o_ol[j].ol = 0;
            orders_buf[i].o_ol[j].ol_i_id = 0;
            orders_buf[i].o_ol[j].ol_supply_w_id = 0;
            orders_buf[i].o_ol[j].ol_quantity = 0;
            orders_buf[i].o_ol[j].ol_amount = 0;
            strcpy(orders_buf[i].o_ol[j].ol_dist_info,"");
        }
    }
}

//=====
//
// Function   : OrdersBufLoad
//
// Fills shared buffer for ORDERS, NEWORDER, and ORDERLINE
//
//=====
void OrdersBufLoad(short d_id, long w_id)
{
    int    cust[ORDERS_PER_DISTRICT+1];
    long   o_id;
    long   ol;

    printf("...Loading Order Buffer for: d_id = %d, w_id = %d\n",
           d_id, w_id);

    GetPermutation(cust, orders_per_district);

    for (o_id=0;o_id<orders_per_district;o_id++)
    {
        // Generate ORDER and NEW-ORDER data
        orders_buf[o_id].o_d_id = d_id;
        orders_buf[o_id].o_w_id = w_id;
        orders_buf[o_id].o_id = o_id+1;
        orders_buf[o_id].o_c_id = cust[o_id+1];
        orders_buf[o_id].o_ol_cnt = (short)RandomNumber(5L, 15L);

        if (o_id < first_new_order)
        {
            orders_buf[o_id].o_carrier_id = (short)RandomNumber(1L, 10L);
            orders_buf[o_id].o_all_local = 1;
        }
        else
        {
            orders_buf[o_id].o_carrier_id = 0;
            orders_buf[o_id].o_all_local = 1;
        }

        for (ol=0; ol<orders_buf[o_id].o_ol_cnt; ol++)
        {
            orders_buf[o_id].o_ol[ol].ol = ol+1;
            orders_buf[o_id].o_ol[ol].ol_i_id = RandomNumber(1L, max_items);
            orders_buf[o_id].o_ol[ol].ol_supply_w_id = w_id;
            orders_buf[o_id].o_ol[ol].ol_quantity = 5;
            MakeAlphaString(24, 24, OL_DIST_INFO_LEN, &orders_buf[o_id].o_ol[ol].ol_dist_info);

            // Generate ORDER-LINE data
            if (o_id < first_new_order)
            {
```

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---

```
orders_buf[o_id].o_ol[ol].ol_amount = 0;
// Added to insure ol_delivery_d set properly during load
FormatDate(&orders_buf[o_id].o_ol[ol].ol_delivery_d);
}
else
{
orders_buf[o_id].o_ol[ol].ol_amount = RandomNumber(1,999999)/100.0;
// Added to insure ol_delivery_d set properly during load

// odbc datetime format
strcpy(orders_buf[o_id].o_ol[ol].ol_delivery_d,"1899-12-31 00:00:00.000");
}
}
}

//=====
//
// Function : LoadOrdersTable
//
//=====
void LoadOrdersTable(LOADER_TIME_STRUCT *orders_time_start)
{
int i;
long o_id;
short o_d_id;
long o_w_id;
long o_c_id;
short o_carrier_id;
short o_ol_cnt;
short o_all_local;
char o_entry_d[O_ENTRY_D_LEN+1];
RETCODE rc;
DBINT rcint;

// bind ORDER data
i = 0;
rc = bcp_bind(o_hdbc1, (BYTE *) &o_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT4, ++i);
if (rc != SUCCEEDED)
HandleErrorDBC(o_hdbc1);
rc = bcp_bind(o_hdbc1, (BYTE *) &o_d_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT2, ++i);
if (rc != SUCCEEDED)
HandleErrorDBC(o_hdbc1);
rc = bcp_bind(o_hdbc1, (BYTE *) &o_w_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT4, ++i);
if (rc != SUCCEEDED)
HandleErrorDBC(o_hdbc1);
rc = bcp_bind(o_hdbc1, (BYTE *) &o_c_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT4, ++i);
if (rc != SUCCEEDED)
HandleErrorDBC(o_hdbc1);
rc = bcp_bind(o_hdbc1, (BYTE *) &o_carrier_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT2, ++i);
if (rc != SUCCEEDED)
HandleErrorDBC(o_hdbc1);
rc = bcp_bind(o_hdbc1, (BYTE *) &o_ol_cnt, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT2, ++i);
if (rc != SUCCEEDED)
HandleErrorDBC(o_hdbc1);
rc = bcp_bind(o_hdbc1, (BYTE *) &o_all_local, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT2, ++i);
if (rc != SUCCEEDED)
HandleErrorDBC(o_hdbc1);
rc = bcp_bind(o_hdbc1, (BYTE *) &o_entry_d, 0, O_ENTRY_D_LEN, NULL, 0, SQLCHARACTER, ++i);
if (rc != SUCCEEDED)
HandleErrorDBC(o_hdbc1);

for (i = 0; i < orders_per_district; i++)
{
o_id = orders_buf[i].o_id;
o_d_id = orders_buf[i].o_d_id;
o_w_id = orders_buf[i].o_w_id;
o_c_id = orders_buf[i].o_c_id;
o_carrier_id = orders_buf[i].o_carrier_id;
o_ol_cnt = orders_buf[i].o_ol_cnt;
o_all_local = orders_buf[i].o_all_local;

FormatDate(&o_entry_d);

// send data to server
rc = bcp_sendrow(o_hdbc1);
if (rc != SUCCEEDED)
HandleErrorDBC(o_hdbc1);

orders_rows_loaded++;
CheckForCommit(o_hdbc1, o_hstmt1, orders_rows_loaded, "orders", &orders_time_start->time_start);
}

if ((o_w_id == aptr->num_warehouses) && (o_d_id == 10))
{
rcint = bcp_done(o_hdbc1);
if (rcint < 0)
HandleErrorDBC(o_hdbc1);

SQLFreeStmt(o_hstmt1, SQL_DROP);
SQLDisconnect(o_hdbc1);
SQLFreeConnect(o_hdbc1);
}
}
```

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---

```
        // if build index after load...
        if ((aptr->build_index == 1) && (aptr->index_order == 0))
            BuildIndex("idxordcl");

        // build non-clustered index
        if (aptr->build_index == 1)
            BuildIndex("idxordnc");
    }
}

//=====
//
// Function   : LoadNewOrderTable
//
//=====
void LoadNewOrderTable(LOADER_TIME_STRUCT *new_order_time_start)
{
    long          i;
    long          o_id;
    short         o_d_id;
    long          o_w_id;
    RETCODE       rc;
    DBINT         rcint;

    // Bind NEW-ORDER data
    i = 0;
    rc = bcp_bind(o_hdbc2, (BYTE *) &o_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT4, ++i);
    if (rc != SUCCEEDED)
        HandleErrorDBC(o_hdbc2);
    rc = bcp_bind(o_hdbc2, (BYTE *) &o_d_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT2, ++i);
    if (rc != SUCCEEDED)
        HandleErrorDBC(o_hdbc2);
    rc = bcp_bind(o_hdbc2, (BYTE *) &o_w_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT4, ++i);
    if (rc != SUCCEEDED)
        HandleErrorDBC(o_hdbc2);

    for (i = first_new_order; i < last_new_order; i++)
    {
        o_id   = orders_buf[i].o_id;
        o_d_id = orders_buf[i].o_d_id;
        o_w_id = orders_buf[i].o_w_id;

        rc = bcp_sendrow(o_hdbc2);
        if (rc != SUCCEEDED)
            HandleErrorDBC(o_hdbc2);

        new_order_rows_loaded++;
        CheckForCommit_Big(o_hdbc2, o_hstmt2, new_order_rows_loaded, "new_order", &new_order_time_start-
>time_start);
    }

    if ((o_w_id == aptr->num_warehouses) && (o_d_id == 10))
    {
        rcint = bcp_done(o_hdbc2);
        if (rcint < 0)
            HandleErrorDBC(o_hdbc2);

        SQLFreeStmt(o_hstmt2, SQL_DROP);
        SQLDisconnect(o_hdbc2);
        SQLFreeConnect(o_hdbc2);

        // if build index after load...
        if ((aptr->build_index == 1) && (aptr->index_order == 0))
            BuildIndex("idxmodel");
    }
}

//=====
//
// Function   : LoadOrderLineTable
//
//=====
void LoadOrderLineTable(LOADER_TIME_STRUCT *order_line_time_start)
{
    long          i;
    long          j;
    long          o_id;
    short         o_d_id;
    long          o_w_id;
    double        ol;
    long          ol_i_id;
    long          ol_supply_w_id;
    short         ol_quantity;
    double        ol_amount;
    char          ol_dist_info[DIST_INFO_LEN+1];
    char          ol_delivery_d[OL_DELIVERY_D_LEN+1];
    RETCODE       rc;
    DBINT         rcint;

    // bind ORDER-LINE data
    i = 0;
    rc = bcp_bind(o_hdbc3, (BYTE *) &o_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT4, ++i);
```

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```
        if (rc != SUCCEEDED)
            HandleErrorDBC(o_hdbc3);
rc = bcp_bind(o_hdbc3, (BYTE *) &o_d_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT2, ++i);
    if (rc != SUCCEEDED)
        HandleErrorDBC(o_hdbc3);
rc = bcp_bind(o_hdbc3, (BYTE *) &o_w_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT4, ++i);
    if (rc != SUCCEEDED)
        HandleErrorDBC(o_hdbc3);
rc = bcp_bind(o_hdbc3, (BYTE *) &ol, 0, SQL_VARLEN_DATA, NULL, 0, SQLFLT8, ++i);
    if (rc != SUCCEEDED)
        HandleErrorDBC(o_hdbc3);
rc = bcp_bind(o_hdbc3, (BYTE *) &ol_i_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT4, ++i);
    if (rc != SUCCEEDED)
        HandleErrorDBC(o_hdbc3);
rc = bcp_bind(o_hdbc3, (BYTE *) &ol_delivery_d, 0, OL_DELIVERY_D_LEN, NULL, 0, SQLCHARACTER, ++i);
    if (rc != SUCCEEDED)
        HandleErrorDBC(o_hdbc3);
rc = bcp_bind(o_hdbc3, (BYTE *) &ol_amount, 0, SQL_VARLEN_DATA, NULL, 0, SQLFLT8, ++i);
    if (rc != SUCCEEDED)
        HandleErrorDBC(o_hdbc3);
rc = bcp_bind(o_hdbc3, (BYTE *) &ol_supply_w_id, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT4, ++i);
    if (rc != SUCCEEDED)
        HandleErrorDBC(o_hdbc3);
rc = bcp_bind(o_hdbc3, (BYTE *) &ol_quantity, 0, SQL_VARLEN_DATA, NULL, 0, SQLINT2, ++i);
    if (rc != SUCCEEDED)
        HandleErrorDBC(o_hdbc3);
rc = bcp_bind(o_hdbc3, (BYTE *) ol_dist_info, 0, DIST_INFO_LEN, NULL, 0, 0, ++i);
    if (rc != SUCCEEDED)
        HandleErrorDBC(o_hdbc3);

    for (i = 0; i < orders_per_district; i++)
    {
        o_id    = orders_buf[i].o_id;
        o_d_id  = orders_buf[i].o_d_id;
        o_w_id  = orders_buf[i].o_w_id;

        for (j=0; j < orders_buf[i].o_ol_cnt; j++)
        {
            ol            = orders_buf[i].o_ol[j].ol;
            ol_i_id      = orders_buf[i].o_ol[j].ol_i_id;
            ol_supply_w_id = orders_buf[i].o_ol[j].ol_supply_w_id;
            ol_quantity  = orders_buf[i].o_ol[j].ol_quantity;
            ol_amount    = orders_buf[i].o_ol[j].ol_amount;
            strcpy(ol_delivery_d, orders_buf[i].o_ol[j].ol_delivery_d);

            strcpy(ol_dist_info, orders_buf[i].o_ol[j].ol_dist_info);

            rc = bcp_sendrow(o_hdbc3);
            if (rc != SUCCEEDED)
                HandleErrorDBC(o_hdbc3);

            order_line_rows_loaded++;

            CheckForCommit_Big(o_hdbc3, o_hstmt3, order_line_rows_loaded, "order_line",
&order_line_time_start->time_start);
        }
    }

    if ((o_w_id == aptr->num_warehouses) && (o_d_id == 10))
    {
        rcint = bcp_done(o_hdbc3);
        if (rcint < 0)
            HandleErrorDBC(o_hdbc3);

        SQLFreeStmt(o_hstmt3, SQL_DROP);
        SQLDisconnect(o_hdbc3);
        SQLFreeConnect(o_hdbc3);

        // if build index after load...
        if ((aptr->build_index == 1) && (aptr->index_order == 0))
            BuildIndex("idxodlcl");
    }
}

//=====
//
// Function   : GetPermutation
//
//=====
void GetPermutation(int perm[], int n)
{
    int i, r, t;

    for (i=1; i<=n; i++)
        perm[i] = i;

    for (i=1; i<=n; i++)
    {
        r = RandomNumber(i, n);
        t = perm[i];
        perm[i] = perm[r];
        perm[r] = t;
    }
}

```

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```
}

//=====
//
// Function   : CheckForCommit
//
//=====
void CheckForCommit(HDBC hdbc,
                   HSTMT hstmt,
                   long rows_loaded,
                   char *table_name,
                   long *time_start)
{
    long time_end, time_diff;

    if ( !(rows_loaded % aptr->batch) )
    {
        time_end = (TimeNow() / MILLI);
        time_diff = time_end - *time_start;

        printf("-> Loaded %ld rows into %s in %ld sec - Total = %d (%.2f rps)\n",
               aptr->batch,
               table_name,
               time_diff,
               rows_loaded,
               (float) aptr->batch / (time_diff ? time_diff : 1L));

        *time_start = time_end;
    }

    return;
}

//=====
//
// Function   : CheckForCommit_Big
//
//=====
void CheckForCommit_Big(HDBC hdbc,
                       HSTMT hstmt,
                       double rows_loaded,
                       char *table_name,
                       long *time_start)
{
    long time_end, time_diff;

    if ( !(fmod(rows_loaded,aptr->batch) ) )
    {
        time_end = (TimeNow() / MILLI);
        time_diff = time_end - *time_start;

        printf("-> Loaded %ld rows into %s in %ld sec - Total = %.0f (%.2f rps)\n",
               aptr->batch,
               table_name,
               time_diff,
               rows_loaded,
               (float) aptr->batch / (time_diff ? time_diff : 1L));

        *time_start = time_end;
    }

    return;
}

//=====
//
// Function   : OpenConnections
//
//=====
void OpenConnections()
{
    RETCODE      rc;

    char          szDriverString[300];
    char          szDriverStringOut[1024];
    SQLSMALLINT  cbDriverStringOut;

    SQLAllocHandle(SQL_HANDLE_ENV, SQL_NULL_HANDLE, &henv );

    SQLSetEnvAttr(henv, SQL_ATTR_ODBC_VERSION, (void*)SQL_OV_ODBC3, 0 );

    SQLAllocHandle(SQL_HANDLE_DBC, henv , &i_hdbc1);
    SQLAllocHandle(SQL_HANDLE_DBC, henv , &w_hdbc1);
    SQLAllocHandle(SQL_HANDLE_DBC, henv , &c_hdbc1);
    SQLAllocHandle(SQL_HANDLE_DBC, henv , &c_hdbc2);
    SQLAllocHandle(SQL_HANDLE_DBC, henv , &o_hdbc1);
    SQLAllocHandle(SQL_HANDLE_DBC, henv , &o_hdbc2);
    SQLAllocHandle(SQL_HANDLE_DBC, henv , &o_hdbc3);
}
```



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```
SQLSetConnectAttr(i_hdbc1, SQL_COPT_SS_BCP, (void *)SQL_BCP_ON, SQL_IS_INTEGER );
SQLSetConnectAttr(w_hdbc1, SQL_COPT_SS_BCP, (void *)SQL_BCP_ON, SQL_IS_INTEGER );
SQLSetConnectAttr(c_hdbc1, SQL_COPT_SS_BCP, (void *)SQL_BCP_ON, SQL_IS_INTEGER );
SQLSetConnectAttr(o_hdbc1, SQL_COPT_SS_BCP, (void *)SQL_BCP_ON, SQL_IS_INTEGER );
SQLSetConnectAttr(i_hdbc2, SQL_COPT_SS_BCP, (void *)SQL_BCP_ON, SQL_IS_INTEGER );
SQLSetConnectAttr(o_hdbc2, SQL_COPT_SS_BCP, (void *)SQL_BCP_ON, SQL_IS_INTEGER );
SQLSetConnectAttr(o_hdbc3, SQL_COPT_SS_BCP, (void *)SQL_BCP_ON, SQL_IS_INTEGER );

// Open connections to SQL Server
// Connection 1
sprintf( szDriverString , "DRIVER={SQL Server};SERVER=%s;UID=%s;PWD=%s;DATABASE=%s" ,
        aptr->server,
        aptr->user,
        aptr->password,
        aptr->database );

rc = SQLSetConnectOption (i_hdbc1, SQL_PACKET_SIZE, aptr->pack_size);
if (rc != SUCCEED)
    HandleErrorDBC(i_hdbc1);

rc = SQLDriverConnect ( i_hdbc1,
                        NULL,
                        (SQLCHAR*)&szDriverString[0] ,
                        SQL_NTS,
                        (SQLCHAR*)&szDriverStringOut[0],
                        sizeof(szDriverStringOut),
                        &cbDriverStringOut,
                        SQL_DRIVER_NOPROMPT );

if ( (rc != SUCCEED) &&
    (rc != SQL_SUCCESS_WITH_INFO) )
{
    HandleErrorDBC(i_hdbc1);
    printf("TPC-C Loader aborted!\n");
    exit(9);
}

// Connection 2
sprintf( szDriverString , "DRIVER={SQL Server};SERVER=%s;UID=%s;PWD=%s;DATABASE=%s" ,
        aptr->server,
        aptr->user,
        aptr->password,
        aptr->database );

rc = SQLSetConnectOption (w_hdbc1, SQL_PACKET_SIZE, aptr->pack_size);

if (rc != SUCCEED)
    HandleErrorDBC(w_hdbc1);

rc = SQLDriverConnect ( w_hdbc1,
                        NULL,
                        (SQLCHAR*)&szDriverString[0] ,
                        SQL_NTS,
                        (SQLCHAR*)&szDriverStringOut[0],
                        sizeof(szDriverStringOut),
                        &cbDriverStringOut,
                        SQL_DRIVER_NOPROMPT );

if ( (rc != SUCCEED) &&
    (rc != SQL_SUCCESS_WITH_INFO) )
{
    HandleErrorDBC(w_hdbc1);
    printf("TPC-C Loader aborted!\n");
    exit(9);
}

// Connection 3
sprintf( szDriverString , "DRIVER={SQL Server};SERVER=%s;UID=%s;PWD=%s;DATABASE=%s" ,
        aptr->server,
        aptr->user,
        aptr->password,
        aptr->database );

rc = SQLSetConnectOption (c_hdbc1, SQL_PACKET_SIZE, aptr->pack_size);
if (rc != SUCCEED)
    HandleErrorDBC(c_hdbc1);

rc = SQLDriverConnect ( c_hdbc1,
                        NULL,
                        (SQLCHAR*)&szDriverString[0] ,
                        SQL_NTS,
                        (SQLCHAR*)&szDriverStringOut[0],
                        sizeof(szDriverStringOut),
                        &cbDriverStringOut,
                        SQL_DRIVER_NOPROMPT );

if ( (rc != SUCCEED) &&
    (rc != SQL_SUCCESS_WITH_INFO) )
{
    HandleErrorDBC(c_hdbc1);
    printf("TPC-C Loader aborted!\n");
    exit(9);
}

// Connection 4
```

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```
printf( szDriverString , "DRIVER={SQL Server};SERVER=%s;UID=%s;PWD=%s;DATABASE=%s" ,
                                             aptr->server,
                                             aptr->user,
                                             aptr->password,
                                             aptr->database );

rc = SQLSetConnectOption (c_hdbc2, SQL_PACKET_SIZE, aptr->pack_size);
if (rc != SUCCEED)
    HandleErrorDBC(c_hdbc2);

rc = SQLDriverConnect ( c_hdbc2,
                       NULL,
                       (SQLCHAR*)&szDriverString[0] ,
                       SQL_NTS,
                       (SQLCHAR*)&szDriverStringOut[0],
                       sizeof(szDriverStringOut),
                       &cbDriverStringOut,
                       SQL_DRIVER_NOPROMPT );

if ( (rc != SUCCEED) &&
     (rc != SQL_SUCCESS_WITH_INFO) )
{
    HandleErrorDBC(c_hdbc2);
    printf("TPC-C Loader aborted!\n");
    exit(9);
}

// Connection 5
printf( szDriverString , "DRIVER={SQL Server};SERVER=%s;UID=%s;PWD=%s;DATABASE=%s" ,
                                             aptr->server,
                                             aptr->user,
                                             aptr->password,
                                             aptr->database );

rc = SQLSetConnectOption (o_hdbc1, SQL_PACKET_SIZE, aptr->pack_size);
if (rc != SUCCEED)
    HandleErrorDBC(o_hdbc1);

rc = SQLDriverConnect ( o_hdbc1,
                       NULL,
                       (SQLCHAR*)&szDriverString[0] ,
                       SQL_NTS,
                       (SQLCHAR*)&szDriverStringOut[0],
                       sizeof(szDriverStringOut),
                       &cbDriverStringOut,
                       SQL_DRIVER_NOPROMPT );

if ( (rc != SUCCEED) &&
     (rc != SQL_SUCCESS_WITH_INFO) )
{
    HandleErrorDBC(o_hdbc1);
    printf("TPC-C Loader aborted!\n");
    exit(9);
}

// Connection 6
printf( szDriverString , "DRIVER={SQL Server};SERVER=%s;UID=%s;PWD=%s;DATABASE=%s" ,
                                             aptr->server,
                                             aptr->user,
                                             aptr->password,
                                             aptr->database );

rc = SQLSetConnectOption (o_hdbc2, SQL_PACKET_SIZE, aptr->pack_size);
if (rc != SUCCEED)
    HandleErrorDBC(o_hdbc2);

rc = SQLDriverConnect ( o_hdbc2,
                       NULL,
                       (SQLCHAR*)&szDriverString[0] ,
                       SQL_NTS,
                       (SQLCHAR*)&szDriverStringOut[0],
                       sizeof(szDriverStringOut),
                       &cbDriverStringOut,
                       SQL_DRIVER_NOPROMPT );

if ( (rc != SUCCEED) &&
     (rc != SQL_SUCCESS_WITH_INFO) )
{
    HandleErrorDBC(o_hdbc2);
    printf("TPC-C Loader aborted!\n");
    exit(9);
}

// Connection 7
printf( szDriverString , "DRIVER={SQL Server};SERVER=%s;UID=%s;PWD=%s;DATABASE=%s" ,
                                             aptr->server,
                                             aptr->user,
                                             aptr->password,
                                             aptr->database );

rc = SQLSetConnectOption (o_hdbc3, SQL_PACKET_SIZE, aptr->pack_size);
if (rc != SUCCEED)
    HandleErrorDBC(o_hdbc3);

rc = SQLDriverConnect ( o_hdbc3,
                       NULL,
```

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```
(SQLCHAR*)&szDriverString[0] ,
SQL_NTS,
(SQLCHAR*)&szDriverStringOut[0],
sizeof(szDriverStringOut),
&cbDriverStringOut,
SQL_DRIVER_NOPROMPT );

if ( (rc != SUCCEED) &&
      (rc != SQL_SUCCESS_WITH_INFO) )
{
    HandleErrorDBC(o_hdbc3);
    printf("TPC-C Loader aborted!\n");
    exit(9);
}
}

//=====
//
// Function name: BuildIndex
//
//=====
void BuildIndex(char      *index_script)
{
    char      cmd[256];

    printf("Starting index creation:  %s\n",index_script);

    sprintf(cmd, "osql -S%s -U%s -P%s -e -i%s\\%s.sql > %s%s.log",
            aptr->server,
            aptr->user,
            aptr->password,
            aptr->index_script_path,
            index_script,
            aptr->log_path,
            index_script);

    system(cmd);

    printf("Finished index creation:  %s\n",index_script);
}

//=====
//
// Function name: HandleErrorDBC
//
//=====
void HandleErrorDBC (SQLHDBC  hdbc1)
{
    SQLCHAR      SqlState[6], Msg[SQL_MAX_MESSAGE_LENGTH];
    SQLLEN      NativeError;
    SQLSMALLINT i, MsgLen;
    SQLRETURN   rc2;
    char        timebuf[128];
    char        datebuf[128];
    char        err_log_path[256];
    FILE        *fpl;

    i = 1;
    while (( rc2 = SQLGetDiagRec(SQL_HANDLE_DBC , hdbc1, i, SqlState , &NativeError,
                               Msg, sizeof(Msg) , &MsgLen ) != SQL_NO_DATA )
          {
        printf( szLastError , "%s" , Msg );

        _strtime(timebuf);
        _strdate(datebuf);

        printf( "[%s : %s] %s\n=>SQLState: %s\n" , datebuf, timebuf, szLastError, SqlState);

        strcpy(err_log_path,aptr->log_path);
        strcat(err_log_path,"tpccldr.err");
        fpl = fopen(err_log_path,"a+");
        if (fpl == NULL)
            printf("ERROR:  Unable to open errorlog file.\n");
        else
        {
            fprintf(fpl, "[%s : %s] %s\nSQLState: %s\n" , datebuf, timebuf, szLastError, SqlState);
            fclose(fpl);
        }
        i++;
    }
}

//=====
//
// Function  : HandleErrorSTMT
//
//=====
void HandleErrorSTMT (HSTMT  hstmt1)
{
    SQLCHAR      SqlState[6], Msg[SQL_MAX_MESSAGE_LENGTH];
    SQLLEN      NativeError;
    SQLSMALLINT i, MsgLen;
```

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---

```
SQLRETURN rc2;
char timebuf[128];
char datebuf[128];
char err_log_path[256];
FILE *fpl;

i = 1;
while (( rc2 = SQLGetDiagRec(SQL_HANDLE_STMT , hstmt1, i, SqlState , &NativeError,
Msg, sizeof(Msg) , &MsgLen )) != SQL_NO_DATA )
{
    if (total_db_errors >= MAX_SQL_ERRORS)
    {
        printf(">>>> Maximum SQL errors of %d exceeded. Terminating
TPCCldr.<<<<<\n",total_db_errors);
        exit(9);
    }
    total_db_errors++;

    sprintf( szLastError , "%s" , Msg );

    _strtime(timebuf);
    _strdate(datebuf);

    printf( "[%s : %s] %s\nSQLState: %s\n" , datebuf, timebuf, szLastError, SqlState);

    strcpy(err_log_path,aptr->log_path);
    strcat(err_log_path,"tpccldr.err");
    fpl = fopen(err_log_path,"a+");
    if (fpl == NULL)
        printf("ERROR: Unable to open errorlog file.\n");
    else
    {
        fprintf(fpl, "[%s : %s] %s\nSQLState: %s\n" , datebuf, timebuf, szLastError, SqlState);
        fclose(fpl);
    }

    i++;
}

}

//=====
//
// Function : FormatDate
//
//=====
void FormatDate ( char* szTimeCOutput )
{
    struct tm when;
    time_t now;

    time( &now );
    when = *localtime( &now );

    mktime( &when );

    // odbc datetime format
    strftime( szTimeCOutput , 30 , "%Y-%m-%d %H:%M:%S.000" , &when );

    return;
}
// File: GETARGS.C
// Microsoft TPC-C Kit Ver. 4.51
// Copyright Microsoft, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003
// Purpose: Source file for command line processing

// Includes
#include "tpcc.h"

//=====
//
// Function name: GetArgsLoader
//
//=====

void GetArgsLoader(int argc, char **argv, TPCCLDR_ARGS *pargs)
{
    int i;
    char *ptr;

#ifdef DEBUG
    printf("[%ld]DBG: Entering GetArgsLoader()\n", (int) GetCurrentThreadId());
#endif

    /* init args struct with some useful values */
    pargs->server = SERVER;
    pargs->user = USER;
    pargs->password = PASSWORD;
    pargs->database = DATABASE;
    pargs->batch = BATCH;
    pargs->num_warehouses = UNDEF;
    pargs->tables_all = TRUE;
    pargs->table_item = FALSE;
}
```

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```
pargs->table_warehouse = FALSE;
pargs->table_customer = FALSE;
pargs->table_orders = FALSE;
pargs->loader_res_file = LOADER_RES_FILE;
pargs->log_path = LOADER_LOG_PATH;
pargs->pack_size = DEFLDPACKSIZE;
pargs->starting_warehouse = DEF_STARTING_WAREHOUSE;
pargs->build_index = BUILD_INDEX;
pargs->index_order = INDEX_ORDER;
pargs->index_script_path = INDEX_SCRIPT_PATH;
pargs->scale_down = SCALE_DOWN;

/* check for zero command line args */
if ( argc == 1 )
    GetArgsLoaderUsage();

for ( i = 1; i < argc; ++i )
{
    if ( argv[i][0] != '-' && argv[i][0] != '/' )
    {
        printf("\nUnrecognized command");
        GetArgsLoaderUsage();
        exit(1);
    }

    ptr = argv[i];

    switch (ptr[1])
    {
        case '?': /* Fall through */
            GetArgsLoaderUsage();
            break;

        case 'D':
            pargs->database = ptr+2;
            break;

        case 'P':
            pargs->password = ptr+2;
            break;

        case 'S':
            pargs->server = ptr+2;
            break;

        case 'U':
            pargs->user = ptr+2;
            break;

        case 'b':
            pargs->batch = atol(ptr+2);
            break;

        case 'W':
            pargs->num_warehouses = atol(ptr+2);
            break;

        case 's':
            pargs->starting_warehouse = atol(ptr+2);
            break;

        case 't':
            {
                pargs->tables_all = FALSE;
                if (strcmp(ptr+2,"item") == 0)
                    pargs->table_item = TRUE;
                else if (strcmp(ptr+2,"warehouse") == 0)
                    pargs->table_warehouse = TRUE;
                else if (strcmp(ptr+2,"customer") == 0)
                    pargs->table_customer = TRUE;
                else if (strcmp(ptr+2,"orders") == 0)
                    pargs->table_orders = TRUE;
                else
                {
                    printf("\nUnrecognized command");
                    GetArgsLoaderUsage();
                    exit(1);
                }
                break;
            }

        case 'f':
            pargs->loader_res_file = ptr+2;
            break;

        case 'L':
            pargs->log_path = ptr+2;
            break;

        case 'p':
            pargs->pack_size = atol(ptr+2);
            break;
    }
}
```

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```
        case 'i':
            pargs->build_index = atol(ptr+2);
            break;

        case 'o':
            pargs->index_order = atol(ptr+2);
            break;

        case 'c':
            pargs->scale_down = atol(ptr+2);
            break;

        case 'd':
            pargs->index_script_path = ptr+2;
            break;

        default:
            GetArgsLoaderUsage();
            exit(-1);
            break;
    }

}

/* check for required args */
if (pargs->num_warehouses == UNDEF )
{
    printf("Number of Warehouses is required\n");
    exit(-2);
}

return;
}

//=====
//
// Function name: GetArgsLoaderUsage
//
//=====

void GetArgsLoaderUsage()
{
#ifdef DEBUG
    printf("[%ld]DBG: Entering GetArgsLoaderUsage()\n", (int) GetCurrentThreadId());
#endif

    printf("TPCCldr:\n\n");
    printf("Parameter                                     Default\n");
    printf("-----\n\n");
    printf("-W Number of Warehouses to Load                Required \n");
    printf("-S Server                                         %s\n, SERVER);
    printf("-U Username                                       %s\n, USER);
    printf("-P Password                                       %s\n, PASSWORD);
    printf("-D Database                                       %s\n, DATABASE);
    printf("-b Batch Size                                     %ld\n, (long) BATCH);
    printf("-p TDS packet size                               %ld\n, (long) DEFLDPACKSIZE);
    printf("-L Loader BCP Log Path                           %s\n, LOADER_LOG_PATH);
    printf("-f Loader Results Output Filename               %s\n, LOADER_RES_FILE);
    printf("-s Starting Warehouse                           %ld\n, (long) DEF_STARTING_WAREHOUSE);
    printf("-i Build Option (data = 0, data and index = 1) %ld\n, (long) BUILD_INDEX);
    printf("-o Cluster Index Build Order (before = 1, after = 0) %ld\n, (long) INDEX_ORDER);
    printf("-c Build Scaled Database (normal = 0, tiny = 1) %ld\n, (long) SCALE_DOWN);
    printf("-d Index Script Path                             %s\n, INDEX_SCRIPT_PATH);
    printf("-t Table to Load                                 all tables \n");

    printf(" [item|warehouse|customer|orders]\n");
    printf(" Notes: \n");
    printf(" - the '-t' parameter may be included multiple times to \n");
    printf(" specify multiple tables to be loaded \n");
    printf(" - 'item' loads ITEM table \n");
    printf(" - 'warehouse' loads WAREHOUSE, DISTRICT, and STOCK tables \n");
    printf(" - 'customer' loads CUSTOMER and HISTORY tables \n");
    printf(" - 'orders' load NEW-ORDER, ORDERS, ORDER-LINE tables \n");

    printf("\nNote: Command line switches are case sensitive.\n");

    exit(0);
}

// File:          RANDOM.C
//               Microsoft TPC-C Kit Ver. 4.62
//               Copyright Microsoft, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2005
// Purpose: Random number generation routines for database loader

// Includes
#include "tpcc.h"
#include "math.h"

// Defines
```

# Appendix B – Database Design

---

```
#define A          16807
#define M          2147483647
#define Q          127773      /* M div A */
#define R          2836        /* M mod A */
#define Thread    __declspec(thread)

// Globals
long      Thread Seed = 0;      /* thread local seed */

/*****
 *
 * random -
 *      Implements a GOOD pseudo random number generator. This generator
 *      will/should? run the complete period before repeating.
 *
 * Copied from:
 *      Random Numbers Generators: Good Ones Are Hard to Find.
 *      Communications of the ACM - October 1988 Volume 31 Number 10
 *
 * Machine Dependencies:
 *      long must be 2 ^ 31 - 1 or greater.
 *****/

/*****
 * seed - load the Seed value used in irand and drand. Should be used before
 *      first call to irand or drand.
 *****/

void seed(long val)
{
#ifdef DEBUG
    printf("[%ld]DBG: Entering seed()...\n", (int) GetCurrentThreadId());
    printf("Old Seed %ld New Seed %ld\n",Seed, val);
#endif

    if ( val < 0 )
        val = abs(val);

    Seed = val;
}

/*****
 *
 * irand - returns a 32 bit integer pseudo random number with a period of
 *      1 to 2 ^ 32 - 1.
 *
 * parameters:
 *      none.
 *
 * returns:
 *      32 bit integer - defined as long ( see above ).
 *
 * side effects:
 *      seed get recomputed.
 *****/

long irand()
{
    register long  s;      /* copy of seed */
    register long  test;   /* test flag */
    register long  hi;     /* tmp value for speed */
    register long  lo;     /* tmp value for speed */

#ifdef DEBUG
    printf("[%ld]DBG: Entering irand()...\n", (int) GetCurrentThreadId());
#endif

    s = Seed;
    hi = s / Q;
    lo = s % Q;

    test = A * lo - R * hi;
    if ( test > 0 )
        Seed = test;
    else
        Seed = test + M;

    return( Seed );
}

/*****
 *
 * drand - returns a double pseudo random number between 0.0 and 1.0.
 *      See irand.
 *****/
double drand()
{

```

## Appendix B – Database Design

---

```
#ifdef DEBUG
    printf("[%ld]DBG: Entering drand()...\n", (int) GetCurrentThreadId());
#endif

    return( (double)irand() / 2147483647.0);
}

//=====
// Function   : RandomNumber
//
// Description:
//=====
long RandomNumber(long lower, long upper)
{
    long rand_num;

#ifdef DEBUG
    printf("[%ld]DBG: Entering RandomNumber()...\n", (int) GetCurrentThreadId());
#endif

    if ( upper == lower )          /* pgd 08-13-96 perf enhancement */
        return lower;

    upper++;

    if ( upper <= lower )
        rand_num = upper;
    else
        rand_num = lower + irand() % (upper - lower); /* pgd 08-13-96 perf enhancement */

#ifdef DEBUG
    printf("[%ld]DBG: RandomNumber between %ld & %ld ==> %ld\n",
           (int) GetCurrentThreadId(), lower, upper, rand_num);
#endif

    return rand_num;
}

#if 0
//Original code pgd 08/13/96
long RandomNumber(long lower,
                  long upper)
{
    long rand_num;

#ifdef DEBUG
    printf("[%ld]DBG: Entering RandomNumber()...\n", (int) GetCurrentThreadId());
#endif

    upper++;

    if ((upper <= lower))
        rand_num = upper;
    else
        rand_num = lower + irand() % ((upper > lower) ? upper - lower : upper);

#ifdef DEBUG
    printf("[%ld]DBG: RandomNumber between %ld & %ld ==> %ld\n",
           (int) GetCurrentThreadId(), lower, upper, rand_num);
#endif

    return rand_num;
}
#endif

//=====
// Function   : NURand
//
// Description:
//=====
long NURand(int iConst,
            long x,
            long y,
            long C)
{
    long rand_num;

#ifdef DEBUG
    printf("[%ld]DBG: Entering NURand()...\n", (int) GetCurrentThreadId());
#endif

    rand_num = (((RandomNumber(0,iConst) | RandomNumber(x,y)) + C) % (y-x+1))+x;

#ifdef DEBUG
    printf("[%ld]DBG: NURand: num = %d\n", (int) GetCurrentThreadId(), rand_num);
#endif
}
```



## Appendix B – Database Design

---

```
#endif

    return rand_num;
}

//      File:                STRINGS.C
//                                Microsoft TPC-C Kit Ver. 4.51
//                                Copyright Microsoft, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003
//      Purpose: Source file for database loader string functions

// Includes
#include "tpcc.h"
#include <string.h>
#include <ctype.h>

//=====
//
// Function name: MakeAddress
//
//=====

void MakeAddress(char *street_1,
                char *street_2,
                char *city,
                char *state,
                char *zip)
{
#ifdef DEBUG
    printf("[%ld]DBG: Entering MakeAddress()\n", (int) GetCurrentThreadId());
#endif

    MakeAlphaString (10, 20, ADDRESS_LEN, street_1);
    MakeAlphaString (10, 20, ADDRESS_LEN, street_2);
    MakeAlphaString (10, 20, ADDRESS_LEN, city);
    MakeAlphaString ( 2,  2, STATE_LEN, state);
    MakeZipNumberString( 9,  9, ZIP_LEN, zip);

#ifdef DEBUG
    printf("[%ld]DBG: MakeAddress: street_1: %s, street_2: %s, city: %s, state: %s, zip: %s\n",
           (int) GetCurrentThreadId(), street_1, street_2, city, state, zip);
#endif

    return;
}

//=====
//
// Function name: LastName
//
//=====

void LastName(int num,
             char *name)
{
    static char *n[] =
    {
        "BAR" , "OUGHT" , "ABLE" , "PRI" , "PRES",
        "ESE" , "ANTI" , "CALLY" , "ATION" , "EING"
    };

#ifdef DEBUG
    printf("[%ld]DBG: Entering LastName()\n", (int) GetCurrentThreadId());
#endif

    if ((num >= 0) && (num < 1000))
    {
        strcpy(name, n[(num/100)%10]);
        strcat(name, n[(num/10)%10]);
        strcat(name, n[(num/1)%10]);

        if (strlen(name) < LAST_NAME_LEN)
        {
            PaddString(LAST_NAME_LEN, name);
        }
    }
    else
    {
        printf("\nError in LastName()... num < %ld> out of range (0,999)\n", num);
        exit(-1);
    }

#ifdef DEBUG
    printf("[%ld]DBG: LastName: num = [%d] ==> [%d][%d][%d]\n",
           (int) GetCurrentThreadId(), num, num/100, (num/10)%10, num%10);
    printf("[%ld]DBG: LastName: String = %s\n", (int) GetCurrentThreadId(), name);
#endif
}
#endif
```

## Appendix B – Database Design

---

```
    return;
}

//=====
//
// Function name: MakeAlphaString
//
//=====

//philipdu 08/13/96 Changed MakeAlphaString to use A-Z, a-z, and 0-9 in
//accordance with spec see below:
//The spec says:
//4.3.2.2 The notation random a-string [x .. y]
//(respectively, n-string [x .. y]) represents a string of random alphanumeric
//(respectively, numeric) characters of a random length of minimum x, maximum y,
//and mean (y+x)/2. Alphanumerics are A..Z, a..z, and 0..9. The only other
//requirement is that the character set used "must be able to represent a minimum
//of 128 different characters". We are using 8-bit chars, so this is a non issue.
//It is completely unreasonable to stuff non-printing chars into the text fields.
//--CLevine 08/13/96

int MakeAlphaString( int x, int y, int z, char *str)
{
    int len;
    int i;
    char cc = 'a';
    static char chArray[] = "0123456789ABCDEFGHIJKLMNOPQRSTUVWXYZ";
    static int chArrayMax = 61;

#ifdef DEBUG
    printf("[%ld]DBG: Entering MakeAlphaString()\n", (int) GetCurrentThreadId());
#endif

    len= RandomNumber(x, y);

    for (i=0; i<len; i++)
        str[i] = chArray[RandomNumber(0,chArrayMax)];
    str[len] = 0;

    return len;
}

int MakeAlphaStringPadded( int minLen, int maxLen, int padLen, char *str)
{
    int len;
    int i;
    char cc = 'a';
    static char chArray[] = "0123456789ABCDEFGHIJKLMNOPQRSTUVWXYZ";
    static int chArrayMax = 61;

#ifdef DEBUG
    printf("[%ld]DBG: Entering MakeAlphaStringPadded()\n", (int) GetCurrentThreadId());
#endif

    len= RandomNumber(minLen, maxLen);

    for (i=0; i<len; i++)
        str[i] = chArray[RandomNumber(0,chArrayMax)];
    if (len < padLen)
        memset(str+len, ' ', padLen - len);
    str[padLen] = 0;
    return padLen;
}

//=====
//
// Function name: MakeOriginalAlphaString
//
//=====

int MakeOriginalAlphaString(int x,
                            int y,
                            int z,
                            char *str,
                            int percent)
{
    int len;
    int val;
    int start;

#ifdef DEBUG
    printf("[%ld]DBG: Entering MakeOriginalAlphaString()\n", (int) GetCurrentThreadId());
#endif

    // verify prcentage is valid
    if ((percent < 0) || (percent > 100))
    {
        printf("MakeOrigianlAlphaString: Invalid percentage: %d\n", percent);
    }
}
```

## Appendix B – Database Design

---

```
        exit(-1);
    }

    // verify string is at least 8 chars in length
    if (x < 8)
    {
        printf("MakeOriginalAlphaString: string length must be >= 8\n");
        exit(-1);
    }

    // Make Alpha String
    len = MakeAlphaString(x,y, z, str);

    val = RandomNumber(1,100);
    if (val <= percent)
    {
        start = RandomNumber(0, len - 8);
        strncpy(str + start, "ORIGINAL", 8);
    }

#ifdef DEBUG
    printf("[%ld]DBG: MakeOriginalAlphaString: : %s\n",
           (int) GetCurrentThreadId(), str);
#endif

    return len;
}

//=====
//
// Function name: MakeNumberString
//
//=====
int MakeNumberString(int x, int y, int z, char *str)
{
    char tmp[16];

    //MakeNumberString is always called MakeZipNumberString(16, 16, 16, string)

    memset(str, '0', 16);
    itoa(RandomNumber(0, 99999999), tmp, 10);
    memcpy(str, tmp, strlen(tmp));

    itoa(RandomNumber(0, 99999999), tmp, 10);
    memcpy(str+8, tmp, strlen(tmp));

    str[16] = 0;

    return 16;
}

//=====
//
// Function name: MakeZipNumberString
//
//=====
int MakeZipNumberString(int x, int y, int z, char *str)
{
    char tmp[16];

    //MakeZipNumberString is always called MakeZipNumberString(9, 9, 9, string)

    strcpy(str, "000011111");

    itoa(RandomNumber(0, 9999), tmp, 10);
    memcpy(str, tmp, strlen(tmp));

    return 9;
}

//=====
//
// Function name: InitString
//
//=====
void InitString(char *str, int len)
{
#ifdef DEBUG
    printf("[%ld]DBG: Entering InitString()\n", (int) GetCurrentThreadId());
#endif

    memset(str, ' ', len);
    str[len] = 0;
}

//=====
// Function name: InitAddress
//
```

## Appendix B – Database Design

---

```
// Description:
//
//=====
void InitAddress(char *street_1, char *street_2, char *city, char *state, char *zip)
{
    memset(street_1, ' ', ADDRESS_LEN+1);
    memset(street_2, ' ', ADDRESS_LEN+1);
    memset(city, ' ', ADDRESS_LEN+1);

    street_1[ADDRESS_LEN+1] = 0;
    street_2[ADDRESS_LEN+1] = 0;
    city[ADDRESS_LEN+1] = 0;

    memset(state, ' ', STATE_LEN+1);
    state[STATE_LEN+1] = 0;

    memset(zip, ' ', ZIP_LEN+1);
    zip[ZIP_LEN+1] = 0;
}

//=====
//
// Function name: PaddString
//
//=====
void PaddString(int max, char *name)
{
    int len;

    len = strlen(name);
    if ( len < max )
        memset(name+len, ' ', max - len);
    name[max] = 0;

    return;
}
// File: TIME.C Microsoft TPC-C Kit Ver. 4.62
// Copyright Microsoft, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2005
// Purpose: Source file for time functions

// Includes
#include "tpcc.h"

// Globals
static long start_sec;

//=====
//
// Function name: TimeNow
//
//=====
long TimeNow()
{
    long time_now;
    struct _timeb el_time;

#ifdef DEBUG
    printf("[%ld]DBG: Entering TimeNow()\n", (int) GetCurrentThreadId());
#endif

    _ftime(&el_time);

    time_now = ((el_time.time - start_sec) * 1000) + el_time.millitm;
}
```

### Appendix C - Tunable Parameters

#### *Server Configuration Parameters*

##### Microsoft Windows 2003 Server Parameters

The following registry key was added to disable the kernel counters for Global and Per-Process I/Os:

```
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Session Manager\I/O System]  
"CountOperations"=dword:00000000
```

##### Microsoft Windows 2003 Server Configuration

The following services were disabled on the server:

- Alerter
- Automatic Updates
- Computer Browser
- Cryptographic Services
- DHCP Client
- Distributed File System
- Distributed Link Tracking Client
- DNS Client
- Global Array Manager Server
- Help and Support
- IPSEC Policy Agent
- License Logging Service
- Messenger
- MSSQLserver
- Microsoft Search
- Print Spooler
- Process Control Service
- Remote Registry Service
- Removable Storage
- Run as Service
- System Event Notification
- SSDP Discovery service
- Task Scheduler
- Wireless configuration

##### **Microsoft SQL Server 2005 Startup Parameters**

Microsoft SQL Server was started with the following command line options

```
sqlservr -c -x -T3502 -T8011 -T8012 -T1018 -T1019 -T661 -T836
```

where

## Appendix C – Tunable Parameters

---

-c	Start SQL Server independently of the Microsoft Windows NT Service Control Manager.
-x	Disable the keeping of CPU time and cache-hit ratio statistics.
-T3502	Prints a message to the log at the beginning and end of each checkpoint.
-T661	Disable ghost writer
-T8011	Disable diagnostics for resource monitor
-T8012	Disable ring buffer for scheduler
-T1018	Disable exceptions ring buffer
-T1019	Disable stack collection for exception ring buffer
-T836	Force max server memory

### Microsoft SQL Server 2005 Configuration Parameters

name	minimum	maximum	config_value	run_value
Ad Hoc Distributed Queries	0	0	1	0
affinity I/O mask	0	-2147483648	2147483647	0
affinity mask	0	-2147483648	2147483647	3
affinity64 I/O mask	0	-2147483648	2147483647	0
affinity64 mask	0	-2147483648	2147483647	0
Agent XPs	0	0	1	0
allow updates	0	0	1	0
awe enabled	0	0	1	1
blocked process threshold	0	0	86400	0
c2 audit mode	0	0	1	0
clr enabled	0	0	1	0
cost threshold for parallelism	0	0	32767	0
cross db ownership chaining	0	0	1	0
cursor threshold	-1	-1	2147483647	-1
Database Mail XPs	0	0	1	0
default full-text language	1033	0	2147483647	1033
default language	0	0	9999	0
default trace enabled	0	0	1	1
disallow results from triggers	0	0	1	0
fill factor (%)	0	0	100	0
ft crawl bandwidth (max)	100	0	32767	100
ft crawl bandwidth (min)	0	0	32767	0
ft notify bandwidth (max)	0	0	32767	100

## Appendix C – Tunable Parameters

100			
ft notify bandwidth (min)	0	32767	0
0			
in-doubt xact resolution	0	2	0
0			
index create memory (KB)	704	2147483647	0
0			
lightweight pooling	0	1	1
1			
locks	5000	2147483647	0
0			
max degree of parallelism	0	64	0
0			
max full-text crawl range	0	256	4
4			
max server memory (MB)	16	2147483647	2147483647
2147483647			
max text repl size (B)	0	2147483647	65536
65536			
max worker threads	128	32767	720
720			
media retention	0	365	0
0			
min memory per query (KB)	512	2147483647	1024
1024			
min server memory (MB)	0	2147483647	0
0			
nested triggers	0	1	1
1			
network packet size (B)	512	32767	4096
4096			
Ole Automation Procedures	0	1	0
0			
open objects	0	2147483647	0
0			
PH timeout (s)	1	3600	60
60			
precompute rank	0	1	0
0			
priority boost	0	1	1
1			
query governor cost limit	0	2147483647	0
0			
query wait (s)	-1	2147483647	-1
-1			
recovery interval (min)	0	32767	32767
32767			
remote access	0	1	1
1			
remote admin connections	0	1	0
0			
remote login timeout (s)	0	2147483647	20
20			
remote proc trans	0	1	0
0			
remote query timeout (s)	0	2147483647	600
600			
Replication XPs	0	1	0
0			
scan for startup procs	0	1	0
0			
server trigger recursion	0	1	1
1			
set working set size	0	1	0
0			
show advanced options	0	1	1
1			
SMO and DMO XPs	0	1	1
1			
SOL Mail XPs	0	1	0

## Appendix C – Tunable Parameters

---

transform noise words	0	1	0
two digit year cutoff	1753	9999	2049
user connections	0	32767	0
user options	0	32767	0
Web Assistant Procedures	0	1	0
xp_cmdshell	0	1	0



# Appendix C – Tunable Parameters

---

System Information report written at: 06/24/06 11:47:18

System Name: PE2900

[System Summary (C: \PE2900.nfo)]

Item Value

OS Name Microsoft(R) Windows(R) Server 2003 Standard x64 Edition  
Version 5.2.3790 Service Pack 1 Build 3790  
Other OS Description Not Available  
OS Manufacturer Microsoft Corporation  
Activation Status Activation Pending (25 days remaining)  
System Name PE2900  
System Manufacturer Dell Inc.  
System Model PowerEdge 2900  
System Type x64-based PC  
Processor EM64T Family 6 Model 15 Stepping 4 GenuineIntel ~2993 Mhz  
Processor EM64T Family 6 Model 15 Stepping 4 GenuineIntel ~2993 Mhz  
BIOS Version/Date Dell Inc. A01, 5/17/2006  
SMBIOS Version 2.4  
Windows Directory C:\WINDOWS  
System Directory C:\WINDOWS\system32  
Boot Device \Device\HarddiskVolume9  
Locale United States  
Hardware Abstraction Layer Version = "5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447)"  
User Name PE2900\Administrator  
Time Zone Central Daylight Time  
Total Physical Memory 24,574.98 MB  
Available Physical Memory 23.05 GB  
Total Virtual Memory 25.24 GB  
Available Virtual Memory 25.07 GB  
Page File Space 2.00 GB  
Page File C:\pagefile.sys

[Hardware Resources]

[Conflicts/Sharing]

Resource	Device
I/O Port 0x00000000-0x00000CF7	PCI bus
I/O Port 0x00000000-0x00000CF7	Direct memory access controller

IRQ 20 Standard Universal PCI to USB Host Controller

IRQ 20 Standard Universal PCI to USB Host Controller

Memory Address 0xFC800000-0xFC9FFFFF	PCI standard PCI-to-PCI bridge
Memory Address 0xFC800000-0xFC9FFFFF	PCI standard PCI-to-PCI bridge
Memory Address 0xFC800000-0xFC9FFFFF	PCI standard PCI-to-PCI bridge

IRQ 21 Standard Universal PCI to USB Host Controller

IRQ 21 Standard Universal PCI to USB Host Controller

IRQ 21 Standard Enhanced PCI to USB Host Controller

Memory Address 0xD8000000-0xD80FFFFF	PCI standard PCI-to-PCI bridge
Memory Address 0xD8000000-0xD80FFFFF	PCI standard PCI-to-PCI bridge

---

## Appendix C – Tunable Parameters

---

Memory Address 0xD8100000-0xD81FFFFF	PCI standard PCI-to-PCI bridge
Memory Address 0xD8100000-0xD81FFFFF	PCI standard PCI-to-PCI bridge
Memory Address 0xD8100000-0xD81FFFFF	PCI standard PCI-to-PCI bridge
Memory Address 0xD8100000-0xD81FFFFF	PCI standard PCI-to-PCI bridge
Memory Address 0xD8200000-0xD82FFFFF	PCI standard PCI-to-PCI bridge
Memory Address 0xD8200000-0xD82FFFFF	PCI standard PCI-to-PCI bridge
IRQ 16	PCI standard host CPU bridge
IRQ 16	PCI standard PCI-to-PCI bridge
IRQ 16	PCI standard PCI-to-PCI bridge
IRQ 16	PCI standard PCI-to-PCI bridge
IRQ 16	PCI standard PCI-to-PCI bridge
IRQ 16	PCI standard PCI-to-PCI bridge
IRQ 16	PCI standard PCI-to-PCI bridge
IRQ 16	PCI standard PCI-to-PCI bridge
IRQ 16	PCI standard PCI-to-PCI bridge
IRQ 16	PCI standard PCI-to-PCI bridge
IRQ 16	PCI standard PCI-to-PCI bridge
IRQ 16	Broadcom BCM5708C NetXtreme II GigE
Memory Address 0xD0000000-0xFDFFFFFF	PCI bus
Memory Address 0xD0000000-0xFDFFFFFF	Standard VGA Graphics Adapter
Memory Address 0xA0000-0xBFFFF	PCI bus
Memory Address 0xA0000-0xBFFFF	Standard VGA Graphics Adapter
Memory Address 0xF8000000-0xFBFFFFFF	PCI standard PCI-to-PCI bridge
Memory Address 0xF8000000-0xFBFFFFFF	PCI standard PCI-to-PCI bridge
Memory Address 0xF8000000-0xFBFFFFFF	Broadcom BCM5708C NetXtreme II GigE

### [DMA]

Resource	Device	Status
Channel 4	Direct memory access controller	OK
Channel 2	Standard floppy disk controller	OK

### [Forced Hardware]

Device PNP\_Device\_ID

### [I/O]

Resource	Device	Status
0x00000000-0x00000CF7	PCI bus	OK
0x00000000-0x00000CF7	Direct memory access controller	OK
0x00000D00-0x0000FFFF	PCI bus	OK
0x0000DCE0-0x0000DCFF	Standard Universal PCI to USB Host Controller	OK
0x0000DCC0-0x0000DCDF	Standard Universal PCI to USB Host Controller	OK
0x0000DCA0-0x0000DCBF	Standard Universal PCI to USB Host Controller	OK
0x0000DC80-0x0000DC9F	Standard Universal PCI to USB Host Controller	OK
0x0000EC00-0x0000ECFF	Standard VGA Graphics Adapter	OK
0x000003B0-0x000003BB	Standard VGA Graphics Adapter	OK

## Appendix C – Tunable Parameters

0x000003C0-0x000003DF	Standard VGA Graphics Adapter	OK
0x00000080-0x0000009F	Direct memory access controller	OK
0x000000C0-0x000000DF	Direct memory access controller	OK
0x000000F0-0x000000FF	Numeric data processor	OK
0x00000020-0x0000003F	Programmable interrupt controller	OK
0x000000A0-0x000000BF	Programmable interrupt controller	OK
0x000004D0-0x000004D1	Programmable interrupt controller	OK
0x00000061-0x00000061	System board	OK
0x00000070-0x0000007F	System CMOS/real time clock	OK
0x00000040-0x0000005F	System timer	OK
0x000003F0-0x000003F5	Standard floppy disk controller	OK
0x000003F7-0x000003F7	Standard floppy disk controller	OK
0x000003F8-0x000003FF	Communications Port (COM2)	OK
0x000002F8-0x000002FF	Communications Port (COM1)	OK
0x00000800-0x0000087F	System board	OK
0x00000880-0x000008BF	System board	OK
0x000008C0-0x000008DF	System board	OK
0x000008E0-0x000008E3	System board	OK
0x00000C00-0x00000C7F	System board	OK
0x00000CA0-0x00000CA7	System board	OK
0x00000CA9-0x00000CAB	System board	OK
0x00000CAD-0x00000CAF	System board	OK
0x00000060-0x00000060	System board	OK
0x00000064-0x00000064	System board	OK
0x00000CA8-0x00000CA8	System board	OK
0x00000CAC-0x00000CAC	System board	OK
0x0000FC00-0x0000FC0F	Standard Dual Channel PCI IDE Controller	OK
0x000001F0-0x000001F7	Primary IDE Channel	OK
0x000003F6-0x000003F6	Primary IDE Channel	OK
0x00000170-0x00000177	Secondary IDE Channel	OK
0x00000376-0x00000376	Secondary IDE Channel	OK

### [IRQs]

Resource	Device	Status
IRQ 9	Microsoft ACPI-Compliant System	OK
IRQ 16	PCI standard host CPU bridge	OK
IRQ 16	PCI standard PCI-to-PCI bridge	OK
IRQ 16	PCI standard PCI-to-PCI bridge	OK
IRQ 16	PCI standard PCI-to-PCI bridge	OK
IRQ 16	PCI standard PCI-to-PCI bridge	OK
IRQ 16	PCI standard PCI-to-PCI bridge	OK
IRQ 16	PCI standard PCI-to-PCI bridge	OK
IRQ 16	PCI standard PCI-to-PCI bridge	OK
IRQ 16	PCI standard PCI-to-PCI bridge	OK
IRQ 16	PCI standard PCI-to-PCI bridge	OK
IRQ 16	PCI standard PCI-to-PCI bridge	OK
IRQ 16	Broadcom BCM5708C NetXtreme II GigE	OK
IRQ 19	DELL PERC 5/E Adapter RAID Controller	OK
IRQ 142	DELL PERC 5/i Integrated RAID Controller	OK
IRQ 18	DELL PERC 5/E Adapter RAID Controller	OK
IRQ 21	Standard Universal PCI to USB Host Controller	OK
IRQ 21	Standard Universal PCI to USB Host Controller	OK
IRQ 21	Standard Enhanced PCI to USB Host Controller	OK
IRQ 20	Standard Universal PCI to USB Host Controller	OK
IRQ 20	Standard Universal PCI to USB Host Controller	OK

## Appendix C – Tunable Parameters

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IRQ 13 Numeric data processor OK  
IRQ 8 System CMOS/real time clock OK  
IRQ 0 System timer OK  
IRQ 6 Standard floppy disk controller OK  
IRQ 4 Communications Port (COM2) OK  
IRQ 3 Communications Port (COM1) OK  
IRQ 14 Primary IDE Channel OK

### [Memory]

Resource	Device	Status
0xA0000-0xBFFFF	PCI bus	OK
0xA0000-0xBFFFF	Standard VGA Graphics Adapter	OK
0xD0000000-0xFDFFFFFF	PCI bus	OK
0xD0000000-0xFDFFFFFF	Standard VGA Graphics Adapter	OK
0xFC600000-0xFC9FFFFF	PCI standard PCI-to-PCI bridge	OK
0xD8100000-0xD81FFFFF	PCI standard PCI-to-PCI bridge	OK
0xD8100000-0xD81FFFFF	PCI standard PCI-to-PCI bridge	OK
0xD8100000-0xD81FFFFF	PCI standard PCI-to-PCI bridge	OK
0xD8100000-0xD81FFFFF	PCI standard PCI-to-PCI bridge	OK
0xFC800000-0xFC9FFFFF	PCI standard PCI-to-PCI bridge	OK
0xFC800000-0xFC9FFFFF	PCI standard PCI-to-PCI bridge	OK
0xFC800000-0xFC9FFFFF	PCI standard PCI-to-PCI bridge	OK
0xD81F0000-0xD81FFFFF	DELL PERC 5/E Adapter RAID Controller	OK
0xFC8E0000-0xFC8FFFFF	DELL PERC 5/E Adapter RAID Controller	OK
0xFCA00000-0xFCCFFFFF	PCI standard PCI-to-PCI bridge	OK
0xD8200000-0xD82FFFFF	PCI standard PCI-to-PCI bridge	OK
0xD8200000-0xD82FFFFF	PCI standard PCI-to-PCI bridge	OK
0xFCB00000-0xFCCFFFFF	PCI standard PCI-to-PCI bridge	OK
0xD82F0000-0xD82FFFFF	DELL PERC 5/i Integrated RAID Controller	OK
0xFCBE0000-0xFCBFFFFF	DELL PERC 5/i Integrated RAID Controller	OK
0xFC300000-0xFC5FFFFF	PCI standard PCI-to-PCI bridge	OK
0xD8000000-0xD80FFFFF	PCI standard PCI-to-PCI bridge	OK
0xD8000000-0xD80FFFFF	PCI standard PCI-to-PCI bridge	OK
0xFC400000-0xFC5FFFFF	PCI standard PCI-to-PCI bridge	OK
0xD80F0000-0xD80FFFFF	DELL PERC 5/E Adapter RAID Controller	OK
0xFC4E0000-0xFC4FFFFF	DELL PERC 5/E Adapter RAID Controller	OK
0xF8000000-0xFBFFFFFF	PCI standard PCI-to-PCI bridge	OK
0xF8000000-0xFBFFFFFF	PCI standard PCI-to-PCI bridge	OK
0xF8000000-0xFBFFFFFF	Broadcom BCM5708C NetXtreme II GigE	OK
0xFCD00000-0xFCD003FF	Standard Enhanced PCI to USB Host Controller	OK
0xFC1F0000-0xFC1FFFFF	Standard VGA Graphics Adapter	OK
0xE0000000-0xEFFFFFFF	Motherboard resources	OK
0xFED00000-0xFED003FF	High precision event timer	OK

### [Components]

### [Multimedia]

### [Audio Codecs]

## Appendix C – Tunable Parameters

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CODEC	Manufacturer	Description	Status	File	Version	Size	Creation_Date
c:\windows\system32\msg711.acm	Microsoft Corporation		OK				
	C:\WINDOWS\system32\MSG711.ACM		5.2.3790.1830	(srv03_sp1_rtm.050324-1447)		13.50 KB (13,824 bytes)	3/25/2005 6:00 AM
c:\windows\system32\msgsm32.acm	Microsoft Corporation		OK				
	C:\WINDOWS\system32\MSGSM32.ACM		5.2.3790.1830	(srv03_sp1_rtm.050324-1447)		34.50 KB (35,328 bytes)	3/25/2005 6:00 AM
c:\windows\system32\msadp32.acm	Microsoft Corporation		OK				
	C:\WINDOWS\system32\MSADP32.ACM		5.2.3790.1830	(srv03_sp1_rtm.050324-1447)		23.50 KB (24,064 bytes)	3/25/2005 6:00 AM
c:\windows\system32\imaadp32.acm	Microsoft Corporation		OK				
	C:\WINDOWS\system32\IMAADP32.ACM		5.2.3790.1830	(srv03_sp1_rtm.050324-1447)		24.00 KB (24,576 bytes)	3/25/2005 6:00 AM
c:\windows\system32\tsssoft32.acm	DSP GROUP, INC.		OK				
	C:\WINDOWS\system32\TSSOFT32.ACM		1.01			13.50 KB (13,824 bytes)	3/25/2005 6:00 AM

### [Video Codecs]

CODEC	Manufacturer	Description	Status	File	Version	Size	Creation_Date
c:\windows\system32\msvidc32.dll	Microsoft Corporation		OK				
	C:\WINDOWS\system32\MSVIDC32.DLL		5.2.3790.1830	(srv03_sp1_rtm.050324-1447)		43.00 KB (44,032 bytes)	3/25/2005 6:00 AM
c:\windows\system32\msrle32.dll	Microsoft Corporation		OK				
	C:\WINDOWS\system32\MSRLE32.DLL		5.2.3790.1830	(srv03_sp1_rtm.050324-1447)		15.50 KB (15,872 bytes)	3/25/2005 6:00 AM
c:\windows\system32\iyuv_32.dll	Microsoft Corporation		OK				
	C:\WINDOWS\system32\IYUV_32.DLL		5.2.3790.1830	(srv03_sp1_rtm.050324-1447)		52.50 KB (53,760 bytes)	3/24/2005 11:19 AM
c:\windows\system32\msyuv.dll	Microsoft Corporation		OK				
	C:\WINDOWS\system32\MSYUV.DLL		5.2.3790.1830	(srv03_sp1_rtm.050324-1447)		21.00 KB (21,504 bytes)	3/24/2005 11:21 AM
c:\windows\system32\tscopyuv.dll	Microsoft Corporation		OK				
	C:\WINDOWS\system32\TSBYUV.DLL		5.2.3790.1830	(srv03_sp1_rtm.050324-1447)		12.50 KB (12,800 bytes)	3/24/2005 11:34 AM

### [CD-ROM]

Item	Value
Drive	D:
Description	CD-ROM Drive
Media Loaded	No
Media Type	CD-ROM
Name	TSSTcorp CDRWDVD TS-H492C
Manufacturer	(Standard CD-ROM drives)
Status	OK
Transfer Rate	Not Available
SCSI Target ID	0
PNP Device ID	IDE\CDROMTSSTCORP_CDRWDVD_TS-H492C_____DE02____\5&41A3CB2&0&0.0.0
Driver	c:\windows\system32\drivers\cdrom.sys (5.2.3790.1830 (srv03_sp1_rtm.050324-1447), 75.50 KB (77,312 bytes), 3/25/2005 6:00 AM)

### [Sound Device]

## Appendix C – Tunable Parameters

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Item Value

### [Display]

Item Value

Name Standard VGA Graphics Adapter

PNP Device ID

PCIIVEN\_1002&DEV\_515E&SUBSYS\_01B11028&REV\_02\4&2014205D&0&68F0

Adapter Type ATI ES1000, (Standard display types) compatible

Adapter Description Standard VGA Graphics Adapter

Adapter RAM 16.00 MB (16,777,216 bytes)

Installed Driversvga.dll,framebuf.dll,vga256,vga64k

Driver Version 5.2.3790.1830

INF Filedisplay.inf (vga section)

Color Planes 1

Color Table Entries 4294967296

Resolution 1280 x 1024 x 1 hertz

Bits/Pixel 32

Memory Address 0xD0000000-0xFDFFFFFFFF

I/O Port 0x0000EC00-0x0000ECFF

Memory Address 0xFC1F0000-0xFC1FFFFF

I/O Port 0x000003B0-0x000003BB

I/O Port 0x000003C0-0x000003DF

Memory Address 0xA0000-0xBFFFF

Driver c:\windows\system32\drivers\vgapnp.sys (5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447), 33.00 KB (33,792 bytes), 6/16/2006 1:03 PM)

### [Infrared]

Item Value

### [Input]

### [Keyboard]

Item Value

Description USB Human Interface Device

Name Enhanced (101- or 102-key)

Layout 00000409

PNP Device ID USB\VID\_0557&PID\_2221&MI\_00\6&1D334AC&0&0000

Number of Function Keys 12

Driver c:\windows\system32\drivers\hidusb.sys (5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447), 18.50 KB (18,944 bytes), 3/25/2005 6:00 AM)

### [Pointing Device]

Item Value

Hardware Type USB Human Interface Device

Number of Buttons 5

Status OK

PNP Device ID USB\VID\_0557&PID\_2221&MI\_01\6&1D334AC&0&0001

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## Appendix C – Tunable Parameters

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Power Management Supported No  
Double Click Threshold 6  
Handedness Right Handed Operation  
Driver c:\windows\system32\drivers\hidusb.sys (5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447),  
18.50 KB (18,944 bytes), 3/25/2005 6:00 AM)

[Modem]

Item Value

[Network]

[Adapter]

Item Value

Name [00000001] RAS Async Adapter  
Adapter Type Not Available  
Product Type RAS Async Adapter  
Installed Yes  
PNP Device ID Not Available  
Last Reset 6/22/2006 9:02 AM  
Index 1  
Service Name AsyncMac  
IP Address Not Available  
IP Subnet Not Available  
Default IP Gateway Not Available  
DHCP Enabled No  
DHCP Server Not Available  
DHCP Lease Expires Not Available  
DHCP Lease Obtained Not Available  
MAC Address Not Available

Name [00000002] WAN Miniport (L2TP)  
Adapter Type Not Available  
Product Type WAN Miniport (L2TP)  
Installed Yes  
PNP Device ID ROOT\MS\_L2TPMINIPORT\0000  
Last Reset 6/22/2006 9:02 AM  
Index 2  
Service Name Rasl2tp  
IP Address Not Available  
IP Subnet Not Available  
Default IP Gateway Not Available  
DHCP Enabled No  
DHCP Server Not Available  
DHCP Lease Expires Not Available  
DHCP Lease Obtained Not Available  
MAC Address Not Available  
Driver c:\windows\system32\drivers\rasl2tp.sys (5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447),  
132.00 KB (135,168 bytes), 3/25/2005 6:00 AM)

Name [00000003] WAN Miniport (PPTP)

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## Appendix C – Tunable Parameters

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Adapter Type Wide Area Network (WAN)  
Product Type WAN Miniport (PPTP)  
Installed Yes  
PNP Device ID ROOT\MS\_PPTP\MINIPORT\0000  
Last Reset 6/22/2006 9:02 AM  
Index 3  
Service Name PptpMiniport  
IP Address Not Available  
IP Subnet Not Available  
Default IP Gateway Not Available  
DHCP Enabled No  
DHCP Server Not Available  
DHCP Lease Expires Not Available  
DHCP Lease Obtained Not Available  
MAC Address 50:50:54:50:30:30  
Driver c:\windows\system32\drivers\raspppt.sys (5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447), 117.50 KB (120,320 bytes), 3/25/2005 6:00 AM)

Name [00000004] WAN Miniport (PPPOE)  
Adapter Type Wide Area Network (WAN)  
Product Type WAN Miniport (PPPOE)  
Installed Yes  
PNP Device ID ROOT\MS\_PPPOE\MINIPORT\0000  
Last Reset 6/22/2006 9:02 AM  
Index 4  
Service Name RasPppoe  
IP Address Not Available  
IP Subnet Not Available  
Default IP Gateway Not Available  
DHCP Enabled No  
DHCP Server Not Available  
DHCP Lease Expires Not Available  
DHCP Lease Obtained Not Available  
MAC Address 33:50:6F:45:30:30  
Driver c:\windows\system32\drivers\raspppoe.sys (5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447), 67.50 KB (69,120 bytes), 3/25/2005 6:00 AM)

Name [00000005] Direct Parallel  
Adapter Type Not Available  
Product Type Direct Parallel  
Installed Yes  
PNP Device ID ROOT\MS\_PT\MINIPORT\0000  
Last Reset 6/22/2006 9:02 AM  
Index 5  
Service Name Raspti  
IP Address Not Available  
IP Subnet Not Available  
Default IP Gateway Not Available  
DHCP Enabled No  
DHCP Server Not Available  
DHCP Lease Expires Not Available  
DHCP Lease Obtained Not Available  
MAC Address Not Available  
Driver c:\windows\system32\drivers\raspti.sys (5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447), 30.50 KB (31,232 bytes), 3/25/2005 6:00 AM)



## Appendix C – Tunable Parameters

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Name [00000006] WAN Miniport (IP)  
Adapter Type Not Available  
Product Type WAN Miniport (IP)  
Installed Yes  
PNP Device ID ROOT\MS\_NDISWANIP\0000  
Last Reset 6/22/2006 9:02 AM  
Index 6  
Service Name NdisWan  
IP Address Not Available  
IP Subnet Not Available  
Default IP Gateway Not Available  
DHCP Enabled No  
DHCP Server Not Available  
DHCP Lease Expires Not Available  
DHCP Lease Obtained Not Available  
MAC Address Not Available  
Driver c:\windows\system32\drivers\ndiswan.sys (5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447), 157.50 KB (161,280 bytes), 3/25/2005 6:00 AM)

Name [00000007] Broadcom BCM5708C NetXtreme II GigE (NDIS VBD Client)  
Adapter Type Ethernet 802.3  
Product Type Broadcom BCM5708C NetXtreme II GigE (NDIS VBD Client)  
Installed Yes  
PNP Device ID B06BDR\VL2ND&PCI\_164C14E4&SUBSYS\_01B11028&REV\_11\6&3100A6D6&0&20051600  
Last Reset 6/22/2006 9:02 AM  
Index 7  
Service Name l2nd  
IP Address 192.1.2.29  
IP Subnet 255.255.255.0  
Default IP Gateway Not Available  
DHCP Enabled No  
DHCP Server Not Available  
DHCP Lease Expires Not Available  
DHCP Lease Obtained Not Available  
MAC Address 00:13:72:53:40:1E  
Driver c:\windows\system32\drivers\bxd52a.sys (2.6.14.0 built by: WinDDK, 78.00 KB (79,872 bytes), 4/3/2006 1:53 PM)

[Protocol]

Item	Value
Name	MSAFD Tcpip [TCP/IP]
Connectionless Service	No
Guarantees Delivery	Yes
Guarantees Sequencing	Yes
Maximum Address Size	16 bytes
Maximum Message Size	0 bytes
Message Oriented	No
Minimum Address Size	16 bytes
Pseudo Stream Oriented	No
Supports Broadcasting	No
Supports Connect Data	No

## Appendix C – Tunable Parameters

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Supports Disconnect Data No  
Supports Encryption No  
Supports Expedited Data Yes  
Supports Graceful Closing Yes  
Supports Guaranteed Bandwidth No  
Supports Multicasting No

Name MSAFD Tcpip [UDP/IP]  
Connectionless Service Yes  
Guarantees Delivery No  
Guarantees SequencingNo  
Maximum Address Size 16 bytes  
Maximum Message Size 63.93 KB (65,467 bytes)  
Message Oriented Yes  
Minimum Address Size 16 bytes  
Pseudo Stream Oriented No  
Supports Broadcasting Yes  
Supports Connect Data No  
Supports Disconnect Data No  
Supports Encryption No  
Supports Expedited Data No  
Supports Graceful Closing No  
Supports Guaranteed Bandwidth No  
Supports Multicasting Yes

Name RSVP UDP Service Provider  
Connectionless Service Yes  
Guarantees Delivery No  
Guarantees SequencingNo  
Maximum Address Size 16 bytes  
Maximum Message Size 63.93 KB (65,467 bytes)  
Message Oriented Yes  
Minimum Address Size 16 bytes  
Pseudo Stream Oriented No  
Supports Broadcasting Yes  
Supports Connect Data No  
Supports Disconnect Data No  
Supports Encryption Yes  
Supports Expedited Data No  
Supports Graceful Closing No  
Supports Guaranteed Bandwidth No  
Supports Multicasting Yes

Name RSVP TCP Service Provider  
Connectionless Service No  
Guarantees Delivery Yes  
Guarantees SequencingYes  
Maximum Address Size 16 bytes  
Maximum Message Size 0 bytes  
Message Oriented No  
Minimum Address Size 16 bytes  
Pseudo Stream Oriented No  
Supports Broadcasting No  
Supports Connect Data No  
Supports Disconnect Data No

## Appendix C – Tunable Parameters

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Supports Encryption Yes  
Supports Expedited Data Yes  
Supports Graceful Closing Yes  
Supports Guaranteed Bandwidth No  
Supports Multicasting No

### [WinSock]

Item Value  
File c:\windows\system32\wsock32.dll  
Size 24.50 KB (25,088 bytes)  
Version 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447)

### [Ports]

### [Serial]

Item Value  
Name Communications Port (COM2)  
Status OK  
PNP Device ID ACPI\PNP0501\1  
Maximum Input Buffer Size 0  
Maximum Output Buffer Size No  
Settable Baud Rate Yes  
Settable Data Bits Yes  
Settable Flow Control Yes  
Settable Parity Yes  
Settable Parity Check Yes  
Settable Stop Bits Yes  
Settable RLSD Yes  
Supports RLSD Yes  
Supports 16 Bit Mode No  
Supports Special Characters No  
Baud Rate 9600  
Bits/Byte 8  
Stop Bits 1  
Parity None  
Busy No  
Abort Read/Write on Error No  
Binary Mode Enabled Yes  
Continue XMit on XOff No  
CTS Outflow Control No  
Discard NULL Bytes No  
DSR Outflow Control 0  
DSR Sensitivity 0  
DTR Flow Control Type Enable  
EOF Character 0  
Error Replace Character 0  
Error Replacement Enabled No  
Event Character 0  
Parity Check Enabled No  
RTS Flow Control Type Enable  
XOff Character 19

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XOffXMit Threshold 512  
XOn Character 17  
XOnXMit Threshold 2048  
XOnXOff InFlow Control 0  
XOnXOff OutFlow Control 0  
I/O Port 0x000003F8-0x000003FF  
IRQ Channel IRQ 4  
Driver c:\windows\system32\drivers\serial.sys (5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447),  
118.50 KB (121,344 bytes), 3/25/2005 6:00 AM)

Name Communications Port (COM1)

Status OK  
PNP Device ID ACPI\PNP0501\2  
Maximum Input Buffer Size 0  
Maximum Output Buffer Size No  
Settable Baud Rate Yes  
Settable Data Bits Yes  
Settable Flow Control Yes  
Settable Parity Yes  
Settable Parity Check Yes  
Settable Stop Bits Yes  
Settable RLSD Yes  
Supports RLSD Yes  
Supports 16 Bit Mode No  
Supports Special Characters No  
Baud Rate 9600  
Bits/Byte 8  
Stop Bits 1  
Parity None  
Busy No  
Abort Read/Write on Error No  
Binary Mode Enabled Yes  
Continue XMit on XOff No  
CTS Outflow Control No  
Discard NULL Bytes No  
DSR Outflow Control 0  
DSR Sensitivity 0  
DTR Flow Control Type Enable  
EOF Character 0  
Error Replace Character 0  
Error Replacement Enabled No  
Event Character 0  
Parity Check Enabled No  
RTS Flow Control Type Enable  
XOff Character 19  
XOffXMit Threshold 512  
XOn Character 17  
XOnXMit Threshold 2048  
XOnXOff InFlow Control 0  
XOnXOff OutFlow Control 0  
I/O Port 0x000002F8-0x000002FF  
IRQ Channel IRQ 3  
Driver c:\windows\system32\drivers\serial.sys (5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447),  
118.50 KB (121,344 bytes), 3/25/2005 6:00 AM)

## Appendix C – Tunable Parameters

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[Parallel]

Item Value

[Storage]

[Drives]

Item Value

Drive A:

Description 3 1/2 Inch Floppy Drive

Drive C:

Description Local Fixed Disk

Compressed No

File System NTFS

Size 10.00 GB (10,733,957,120 bytes)

Free Space 4.18 GB (4,483,088,384 bytes)

Volume Name

Volume Serial Number 748B96BE

Drive D:

Description CD-ROM Disc

Drive E:

Description Local Fixed Disk

Compressed Not Available

File System Not Available

Size Not Available

Free Space Not Available

Volume Name Not Available

Volume Serial Number Not Available

Drive F:

Description Local Fixed Disk

Compressed Not Available

File System Not Available

Size Not Available

Free Space Not Available

Volume Name Not Available

Volume Serial Number Not Available

Drive H:

Description Local Fixed Disk

Compressed Not Available

File System Not Available

Size Not Available

Free Space Not Available

Volume Name Not Available

Volume Serial Number Not Available

Drive I:

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Description Local Fixed Disk  
Compressed Not Available  
File System Not Available  
Size Not Available  
Free Space Not Available  
Volume Name Not Available  
Volume Serial Number Not Available

Drive M:  
Description Local Fixed Disk  
Compressed Not Available  
File System Not Available  
Size Not Available  
Free Space Not Available  
Volume Name Not Available  
Volume Serial Number Not Available

Drive N:  
Description Local Fixed Disk  
Compressed Not Available  
File System Not Available  
Size Not Available  
Free Space Not Available  
Volume Name Not Available  
Volume Serial Number Not Available

Drive O:  
Description Local Fixed Disk  
Compressed Not Available  
File System Not Available  
Size Not Available  
Free Space Not Available  
Volume Name Not Available  
Volume Serial Number Not Available

Drive X:  
Description Local Fixed Disk  
Compressed No  
File System NTFS  
Size 845.94 GB (908,325,879,808 bytes)  
Free Space 433.64 GB (465,615,192,064 bytes)  
Volume Name  
Volume Serial Number 543DBF53

Drive Y:  
Description Local Fixed Disk  
Compressed No  
File System NTFS  
Size 845.94 GB (908,325,879,808 bytes)  
Free Space 433.64 GB (465,615,060,992 bytes)  
Volume Name  
Volume Serial Number 844A75A8

[Disks]

## Appendix C – Tunable Parameters

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Item Value  
Description Disk drive  
Manufacturer (Standard disk drives)  
Model DELL PERC 5/E Adapter SCSI Disk Device  
Bytes/Sector 512  
Media Loaded Yes  
Media Type Fixed hard disk  
Partitions 2  
SCSI Bus 1  
SCSI Logical Unit 0  
SCSI Port 2  
SCSI Target ID 0  
Sectors/Track 63  
Size 1,001.24 GB (1,075,076,997,120 bytes)  
Total Cylinders 130,704  
Total Sectors 2,099,759,760  
Total Tracks 33,329,520  
Tracks/Cylinder 255  
Partition Disk #0, Partition #0  
Partition Size 50.05 GB (53,735,721,984 bytes)  
Partition Starting Offset 32,256 bytes  
Partition Disk #0, Partition #1  
Partition Size 105.25 GB (113,015,347,200 bytes)  
Partition Starting Offset 53,735,754,240 bytes

Description Disk drive  
Manufacturer (Standard disk drives)  
Model DELL PERC 5/E Adapter SCSI Disk Device  
Bytes/Sector 512  
Media Loaded Yes  
Media Type Fixed hard disk  
Partitions 3  
SCSI Bus 1  
SCSI Logical Unit 0  
SCSI Port 2  
SCSI Target ID 1  
Sectors/Track 63  
Size 1,001.24 GB (1,075,076,997,120 bytes)  
Total Cylinders 130,704  
Total Sectors 2,099,759,760  
Total Tracks 33,329,520  
Tracks/Cylinder 255  
Partition Disk #1, Partition #0  
Partition Size 50.05 GB (53,735,721,984 bytes)  
Partition Starting Offset 32,256 bytes  
Partition Disk #1, Partition #1  
Partition Size 105.25 GB (113,015,347,200 bytes)  
Partition Starting Offset 53,735,754,240 bytes  
Partition Disk #1, Partition #2  
Partition Size 845.94 GB (908,325,895,680 bytes)  
Partition Starting Offset 166,751,101,440 bytes

Description Disk drive  
Manufacturer (Standard disk drives)  
Model DELL PERC 5/E Adapter SCSI Disk Device

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## Appendix C – Tunable Parameters

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Bytes/Sector 512  
Media Loaded Yes  
Media Type Fixed hard disk  
Partitions 3  
SCSI Bus 1  
SCSI Logical Unit 0  
SCSI Port 2  
SCSI Target ID 2  
Sectors/Track 63  
Size 1,001.24 GB (1,075,076,997,120 bytes)  
Total Cylinders 130,704  
Total Sectors 2,099,759,760  
Total Tracks 33,329,520  
Tracks/Cylinder 255  
Partition Disk #2, Partition #0  
Partition Size 50.05 GB (53,735,721,984 bytes)  
Partition Starting Offset 32,256 bytes  
Partition Disk #2, Partition #1  
Partition Size 105.25 GB (113,015,347,200 bytes)  
Partition Starting Offset 53,735,754,240 bytes  
Partition Disk #2, Partition #2  
Partition Size 845.94 GB (908,325,895,680 bytes)  
Partition Starting Offset 166,751,101,440 bytes

Description Disk drive  
Manufacturer (Standard disk drives)  
Model DELL PERC 5/i SCSI Disk Device  
Bytes/Sector 512  
Media Loaded Yes  
Media Type Fixed hard disk  
Partitions 2  
SCSI Bus 1  
SCSI Logical Unit 0  
SCSI Port 4  
SCSI Target ID 0  
Sectors/Track 63  
Size 270.99 GB (290,977,505,280 bytes)  
Total Cylinders 35,376  
Total Sectors 568,315,440  
Total Tracks 9,020,880  
Tracks/Cylinder 255  
Partition Disk #3, Partition #0  
Partition Size 10.00 GB (10,733,958,144 bytes)  
Partition Starting Offset 32,256 bytes  
Partition Disk #3, Partition #1  
Partition Size 261.00 GB (280,243,514,880 bytes)  
Partition Starting Offset 10,733,990,400 bytes

[SCSI]

Item Value  
Name DELL PERC 5/E Adapter RAID Controller  
Manufacturer DELL  
Status OK



## Appendix C – Tunable Parameters

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### PNP Device ID

PCI\VEN\_1028&DEV\_0015&SUBSYS\_1F011028&REV\_00\7&23DC1E47&0&70000800  
10

Memory Address 0xD81F0000-0xD81FFFFF

Memory Address 0xFC8E0000-0xFC8FFFFF

IRQ Channel IRQ 19

Driver c:\windows\system32\drivers\percsas.sys (1.20.0.64 built by: WinDDK, 26.50 KB (27,136 bytes), 6/16/2006 12:30 PM)

Name DELL PERC 5/i Integrated RAID Controller

Manufacturer DELL

Status OK

### PNP Device ID

PCI\VEN\_1028&DEV\_0015&SUBSYS\_1F031028&REV\_00\5&22FD9970&0&700028

Memory Address 0xD82F0000-0xD82FFFFF

Memory Address 0xFCBE0000-0xFCBFFFFF

IRQ Channel IRQ 142

Driver c:\windows\system32\drivers\percsas.sys (1.20.0.64 built by: WinDDK, 26.50 KB (27,136 bytes), 6/16/2006 12:30 PM)

Name DELL PERC 5/E Adapter RAID Controller

Manufacturer DELL

Status OK

### PNP Device ID

PCI\VEN\_1028&DEV\_0015&SUBSYS\_1F011028&REV\_00\5&376DDE58&0&700030

Memory Address 0xD80F0000-0xD80FFFFF

Memory Address 0xFC4E0000-0xFC4FFFFF

IRQ Channel IRQ 18

Driver c:\windows\system32\drivers\percsas.sys (1.20.0.64 built by: WinDDK, 26.50 KB (27,136 bytes), 6/16/2006 12:30 PM)

## [IDE]

Item Value

Name Standard Dual Channel PCI IDE Controller

Manufacturer (Standard IDE ATA/ATAPI controllers)

Status OK

PNP Device ID PCI\VEN\_8086&DEV\_269E&SUBSYS\_01B11028&REV\_09\3&61AAA01&0&F9

I/O Port 0x0000FC00-0x0000FC0F

Driver c:\windows\system32\drivers\pciide.sys (5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447), 6.00 KB (6,144 bytes), 3/25/2005 6:00 AM)

Name Primary IDE Channel

Manufacturer (Standard IDE ATA/ATAPI controllers)

Status OK

PNP Device ID PCI\IDE\IDECHANNEL\4&1D8A9C03&0&0

I/O Port 0x000001F0-0x000001F7

I/O Port 0x000003F6-0x000003F6

IRQ Channel IRQ 14

Driver c:\windows\system32\drivers\atapi.sys (5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447), 145.00 KB (148,480 bytes), 3/25/2005 6:00 AM)

Name Secondary IDE Channel

Manufacturer (Standard IDE ATA/ATAPI controllers)

Status OK

## Appendix C – Tunable Parameters

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PNP Device ID PCI\IDE\IDECHANNEL\4&1D8A9C03&0&1  
 I/O Port 0x00000170-0x00000177  
 I/O Port 0x00000376-0x00000376  
 Driver c:\windows\system32\drivers\atapi.sys (5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447),  
 145.00 KB (148,480 bytes), 3/25/2005 6:00 AM)

[Printing]

Name	Driver	Port_Name	Server_Name
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[Problem Devices]

Device	PNP_Device_ID	Error_Code
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[USB]

Device	PNP_Device_ID
Standard Universal PCI to USB Host Controller	PCI\VEN_8086&DEV_2688&SUBSYS_01B11028&REV_09\3&61AAA01&0&E8
Standard Universal PCI to USB Host Controller	PCI\VEN_8086&DEV_2689&SUBSYS_01B11028&REV_09\3&61AAA01&0&E9
Standard Universal PCI to USB Host Controller	PCI\VEN_8086&DEV_268A&SUBSYS_01B11028&REV_09\3&61AAA01&0&EA
Standard Universal PCI to USB Host Controller	PCI\VEN_8086&DEV_268B&SUBSYS_01B11028&REV_09\3&61AAA01&0&EB
Standard Enhanced PCI to USB Host Controller	PCI\VEN_8086&DEV_268C&SUBSYS_01B11028&REV_09\3&61AAA01&0&EF

[Software Environment]

[System Drivers]

Name	Description	File	Type	Started	Start_Mode	State	Status	Error_Control
	Accept_Pause	Accept_Stop						
abiosdsk	Abiosdsk		Not Available	Kernel Driver	No	Disabled		
	Stopped	OK	Ignore	No	No			
acpi	Microsoft ACPI Driver	c:\windows\system32\drivers\acpi.sys	Kernel Driver	Yes	Yes	Kernel Driver	Yes	
	Boot	Running	OK	Normal	Yes			
acpiec	ACPIEC	c:\windows\system32\drivers\acpiec.sys	Kernel Driver	No	No	Kernel Driver	No	
	Disabled	Stopped	OK	Normal	No	No		
adpu160m	adpu160m		Not Available	Kernel Driver	No	Disabled		
	Stopped	OK	Normal	No	No			
adpu320	adpu320		Not Available	Kernel Driver	No	Disabled		
	Stopped	OK	Normal	No	No			
afd	AFD	c:\windows\system32\drivers\afd.sys	Kernel Driver	Yes	Yes	Kernel Driver	Yes	System
	Running	OK	Normal	No	Yes			
aic78u2	aic78u2	Not Available	Kernel Driver	No	Disabled	Stopped	OK	
	Normal	No	No					
aic78xx	aic78xx	Not Available	Kernel Driver	No	Disabled	Stopped	OK	
	Normal	No	No					

## Appendix C – Tunable Parameters

aliide	Aliide	Not Available	Kernel Driver	No	Disabled	Stopped	OK
	Normal	No	No				
amdide	Amdlde	Not Available	Kernel Driver	No	Disabled	Stopped	OK
	Normal	No	No				
arc	arc	Not Available	Kernel Driver	No	Disabled	Stopped	OK
	Normal	No	No				
asynmac	RAS Asynchronous Media Driver						
	c:\windows\system32\drivers\asynmac.sys		Kernel Driver	No	Manual		
	Stopped	OK	Normal	No	No		
atapi	Standard IDE/ESDI Hard Disk Controller		c:\windows\system32\drivers\atapi.sys	Kernel			
Driver	Yes	Boot	Running	OK	Normal	No	Yes
atdisk	Atdisk	Not Available	Kernel Driver	No	Disabled	Stopped	OK
	Ignore	No	No				
atmarpc	ATM ARP Client Protocol		c:\windows\system32\drivers\atmarpc.sys				
	Kernel Driver	No	Manual	Stopped	OK	Normal	No
audstub	Audio Stub Driver		c:\windows\system32\drivers\audstub.sys	Kernel Driver			
	Yes	Manual	Running	OK	Normal	No	Yes
b06bdrv	Broadcom NetXtreme II VBD		c:\windows\system32\drivers\bxbvda.sys				
	Kernel Driver	Yes	Boot	Running	OK	Normal	No
beep	Beep	c:\windows\system32\drivers\beep.sys	Kernel Driver	Yes	System		
	Running	OK	Normal	No	Yes		
cdac15ba	CdaC15BA	c:\windows\system32\drivers\cdac15ba.sys	Kernel Driver				
	Yes	Auto	Running	OK	Normal	No	Yes
cdad10ba	CdaD10BA	c:\windows\system32\drivers\cdad10ba.sys	Kernel Driver				
	Yes	Auto	Running	OK	Normal	No	Yes
cdfs	Cdfs	c:\windows\system32\drivers\cdfs.sys	File System Driver	Yes			
	Disabled	Running	OK	Normal	No	Yes	
cdrom	CD-ROM Driver	c:\windows\system32\drivers\cdrom.sys	Kernel Driver	Yes	System		
	Running	OK	Normal	No	Yes		
changer	Changer	Not Available	Kernel Driver	No	System	Stopped	
	OK	Ignore	No				
clusdisk	Cluster Disk Driver	c:\windows\system32\drivers\clusdisk.sys	Kernel Driver				
	No	Disabled	Stopped	OK	Normal	No	No
cmdide	Cmdlde	Not Available	Kernel Driver	No	Disabled	Stopped	OK
	Normal	No	No				
cpqcissm	cpqcissm	Not Available	Kernel Driver	No	Disabled		
	Stopped	OK	Normal	No	No		
crcdisk	CRC Disk Filter Driver	c:\windows\system32\drivers\crcdisk.sys	Kernel Driver	Yes			
	Boot	Running	OK	Normal	No	Yes	
dfsdriver	DfsDriver	c:\windows\system32\drivers\dfs.sys	File System Driver				
	Yes	Boot	Running	OK	Normal	No	Yes
disk	Disk Driver	c:\windows\system32\drivers\disk.sys	Kernel Driver	Yes	Boot		
	Running	OK	Normal	No	Yes		
dmboot	dmboot	c:\windows\system32\drivers\dmboot.sys	Kernel Driver	No			
	Disabled	Stopped	OK	Normal	No	No	
dmio	Logical Disk Manager Driver		c:\windows\system32\drivers\dmio.sys	Kernel Driver			
	Yes	Boot	Running	OK	Normal	No	Yes
dmload	dmload	c:\windows\system32\drivers\dmload.sys	Kernel Driver	Yes	Boot		
	Running	OK	Normal	No	Yes		
dpti2o	dpti2o	Not Available	Kernel Driver	No	Disabled	Stopped	OK
	Normal	No	No				
elxstor	elxstor	Not Available	Kernel Driver	No	Disabled	Stopped	OK
	Normal	No	No				
fastfat	Fastfat	c:\windows\system32\drivers\fastfat.sys	File System Driver	No			
	Disabled	Stopped	OK	Normal	No	No	

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fdc	Floppy Disk Controller Driver	c:\windows\system32\drivers\fdc.sys	Kernel Driver					
	Yes	Manual Running	OK	Normal	No	Yes		
fips	Fips	c:\windows\system32\drivers\fips.sys	Kernel Driver	Yes	System			
	Running	OK	Normal	No	Yes			
flpydisk	Floppy Disk Driver	c:\windows\system32\drivers\flpydisk.sys	Kernel Driver					
	Yes	Manual Running	OK	Normal	No	Yes		
fltmgr	FltMgr	c:\windows\system32\drivers\fltmgr.sys	File System Driver	Yes	Boot			
	Running	OK	Normal	No	Yes			
ftdisk	Volume Manager Driver	c:\windows\system32\drivers\ftdisk.sys	Kernel Driver	Yes				
	Boot	Running	OK	Normal	No	Yes		
gpc	Generic Packet Classifier	c:\windows\system32\drivers\msgpc.sys	Kernel Driver					
	Yes	Manual Running	OK	Normal	No	Yes		
hidusb	Microsoft HID Class Driver	c:\windows\system32\drivers\hidusb.sys	Kernel Driver					
	Yes	Manual Running	OK	Ignore	No	Yes		
hpcisss	hpcisss	Not Available	Kernel Driver	No	Disabled	Stopped	OK	
	Normal	No	No					
http	HTTP	c:\windows\system32\drivers\http.sys	Kernel Driver	No	Manual			
	Stopped	OK	Normal	No	No			
i2omgmt	i2omgmt	Not Available	Kernel Driver	No	System Stopped			
	OK	Normal	No	No				
i8042prt	i8042prt	c:\windows\system32\drivers\i8042prt.sys	Kernel Driver					
	No	System Stopped	OK	Ignore	No	No		
iirsp	iirsp	Not Available	Kernel Driver	No	Disabled	Stopped	OK	
	Normal	No	No					
imapi	CD-Burning Filter Driver	c:\windows\system32\drivers\imapi.sys	Kernel Driver	Yes				
	System	Running	OK	Normal	No	Yes		
intelide	IntelIde	Not Available	Kernel Driver	No	Disabled	Stopped	OK	
	Normal	No	No					
intelppm	Intel Processor Driver	c:\windows\system32\drivers\intelppm.sys	Kernel					
Driver	Yes	Manual Running	OK	Normal	No	Yes		
ip6fw	IPv6 Windows Firewall Driver	c:\windows\system32\drivers\ip6fw.sys	Kernel Driver					
	No	Manual Stopped	OK	Normal	No	No		
ipfilterdriver	IP Traffic Filter Driver	c:\windows\system32\drivers\ipfltdrv.sys	Kernel Driver					
	No	Manual Stopped	OK	Normal	No	No		
ipinip	IP in IP Tunnel Driver	c:\windows\system32\drivers\ipinip.sys	Kernel Driver	No				
	Manual	Stopped	OK	Normal	No	No		
ipnat	IP Network Address Translator	c:\windows\system32\drivers\ipnat.sys	Kernel Driver					
	No	Manual Stopped	OK	Normal	No	No		
ipsec	IPSEC driver	c:\windows\system32\drivers\ipsec.sys	Kernel Driver	Yes	System			
	Running	OK	Normal	No	Yes			
irenum	IR Enumerator Service	c:\windows\system32\drivers\irenum.sys	Kernel Driver	No				
	Manual	Stopped	OK	Normal	No	No		
isapnp	PnP ISA/EISA Bus Driver	c:\windows\system32\drivers\isapnp.sys	Kernel Driver					
	Yes	Boot Running	OK	Critical	No	Yes		
kbdclass	Keyboard Class Driver	c:\windows\system32\drivers\kbdclass.sys	Kernel					
Driver	Yes	System Running	OK	Normal	No	Yes		
kbdhid	Keyboard HID Driver	c:\windows\system32\drivers\kbdhid.sys	Kernel Driver	Yes				
	System	Running	OK	Ignore	No	Yes		
ksecdd	KSecDD	c:\windows\system32\drivers\ksecdd.sys	Kernel Driver	Yes	Boot			
	Running	OK	Normal	No	Yes			
ksthunk	Kernel Streaming WOW64 Thunk Service	c:\windows\system32\drivers\ksthunk.sys	Kernel Driver	Yes	Manual			
	Running	OK	Normal	No	Yes			
l2nd	Broadcom NetXtreme II BXND	c:\windows\system32\drivers\bxnd52a.sys	Kernel					
Driver	Yes	Manual Running	OK	Normal	No	Yes		

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lp6nds35	lp6nds35	Not Available	Kernel Driver	No	Disabled		
	Stopped	OK	Normal	No	No		
mnmd	mnmd	c:\windows\system32\drivers\mnmd.sys	Kernel Driver	Yes	System		
	Running	OK	Ignore	No	Yes		
modem	Modem	c:\windows\system32\drivers\modem.sys	Kernel Driver	No	Manual		
	Stopped	OK	Ignore	No	No		
mouclass	Mouse Class Driver	c:\windows\system32\drivers\mouclass.sys	Kernel Driver	Yes	System		
	Running	OK	Normal	No	Yes		
mouhid	Mouse HID Driver	c:\windows\system32\drivers\mouhid.sys	Kernel Driver	Yes	Manual		
	Running	OK	Ignore	No	Yes		
mountmgr	Mount Point Manager	c:\windows\system32\drivers\mountmgr.sys	Kernel Driver	Yes	Boot		
	Running	OK	Normal	No	Yes		
mraid35x	mraid35x	Not Available	Kernel Driver	No	Disabled		
	Stopped	OK	Normal	No	No		
mrxdav	WebDav Client Redirector	c:\windows\system32\drivers\mrxdav.sys	File System Driver	Yes	Manual		
	Stopped	OK	Normal	No	No		
mrxsm	MRXSMB	c:\windows\system32\drivers\mrxsm.sys	File System Driver	Yes	System		
	Running	OK	Normal	No	Yes		
msfs	Msfs	c:\windows\system32\drivers\msfs.sys	File System Driver	Yes	System		
	Running	OK	Normal	No	Yes		
mssmbios	Microsoft System Management BIOS Driver	c:\windows\system32\drivers\mssmbios.sys	Kernel Driver	Yes	Manual		
	Running	OK	Normal	No	Yes		
mup	Mup	c:\windows\system32\drivers\mup.sys	File System Driver	Yes	Boot		
	Running	OK	Normal	No	Yes		
ndis	NDIS System Driver	c:\windows\system32\drivers\ndis.sys	Kernel Driver	Yes	Boot		
	Running	OK	Normal	No	Yes		
ndistapi	Remote Access NDIS TAPI Driver	c:\windows\system32\drivers\ndistapi.sys	Kernel Driver	Yes	Manual		
	Running	OK	Normal	No	Yes		
ndisuio	NDIS Usermode I/O Protocol	c:\windows\system32\drivers\ndisuio.sys	Kernel Driver	Yes	Manual		
	Stopped	OK	Normal	No	No		
ndiswan	Remote Access NDIS WAN Driver	c:\windows\system32\drivers\ndiswan.sys	Kernel Driver	Yes	Manual		
	Running	OK	Normal	No	Yes		
ndproxy	NDIS Proxy	c:\windows\system32\drivers\ndproxy.sys	Kernel Driver	Yes	Manual		
	Running	OK	Normal	No	Yes		
netbios	NetBIOS Interface	c:\windows\system32\drivers\netbios.sys	File System Driver	Yes	System		
	Running	OK	Normal	No	Yes		
netbt	NetBios over Tcpip	c:\windows\system32\drivers\netbt.sys	Kernel Driver	Yes	System		
	Running	OK	Normal	No	Yes		
nfrd960	nfrd960	Not Available	Kernel Driver	No	Disabled	Stopped	OK
	Normal	No	No				
npfs	Npfs	c:\windows\system32\drivers\npfs.sys	File System Driver	Yes	System		
	Running	OK	Normal	No	Yes		
ntfs	Ntfs	c:\windows\system32\drivers\ntfs.sys	File System Driver	Yes	System		
	Disabled	Running	OK	Normal	No	Yes	
null	Null	c:\windows\system32\drivers\null.sys	Kernel Driver	Yes	System		
	Running	OK	Normal	No	Yes		
parport	Parport	c:\windows\system32\drivers\parport.sys	Kernel Driver	No	Manual		
	Stopped	OK	Ignore	No	No		
partmgr	Partition Manager	c:\windows\system32\drivers\partmgr.sys	Kernel Driver	Yes	Boot		
	Running	OK	Normal	No	Yes		
pci	PCI Bus Driver	c:\windows\system32\drivers\pci.sys	Kernel Driver	Yes	Boot		
	Running	OK	Critical	No	Yes		

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pciide	PCIIde	c:\windows\system32\drivers\pciide.sys	Kernel Driver	Yes	Boot		
	Running	OK	Normal	No	Yes		
pcmcia	Pcmcia	c:\windows\system32\drivers\pcmcia.sys	Kernel Driver	No	Disabled		
	Stopped	OK	Normal	No	No		
pdcomp	PDCOMP	Not Available	Kernel Driver	No	Manual	Stopped	OK
	Ignore	No	No				
pdframe	PDFFRAME	Not Available	Kernel Driver	No	Manual	Stopped	
	OK	Ignore	No	No			
pdreli	PDRELI	Not Available	Kernel Driver	No	Manual	Stopped	OK
	Ignore	No	No				
pdframe	PDRFRAME	Not Available	Kernel Driver	No	Manual	Stopped	
	OK	Ignore	No	No			
percsas	percsas	c:\windows\system32\drivers\percsas.sys	Kernel Driver	Yes	Boot		
	Running	OK	Normal	No	Yes		
pptpminiport	WAN Miniport (PPTP)	c:\windows\system32\drivers\raspppt.sys	Kernel Driver	Yes	Manual	Running	OK
	Driver	Yes	Manual	Running	OK	Normal	No
					Yes		
ptilink	Direct Parallel Link Driver	c:\windows\system32\drivers\ptilink.sys	Kernel Driver	Yes	Manual	Running	OK
	Driver	Yes	Manual	Running	OK	Normal	No
					Yes		
ql2300	ql2300	Not Available	Kernel Driver	No	Disabled	Stopped	OK
	Normal	No	No				
rasacd	Remote Access Auto Connection Driver	c:\windows\system32\drivers\rasacd.sys	Kernel Driver	Yes	System	Running	OK
	Driver	Yes	System	Running	OK	Normal	No
					Yes		
rasl2tp	WAN Miniport (L2TP)	c:\windows\system32\drivers\rasl2tp.sys	Kernel Driver	Yes	Manual	Running	OK
	Driver	Yes	Manual	Running	OK	Normal	No
					Yes		
rasppoe	Remote Access PPPOE Driver	c:\windows\system32\drivers\rasppoe.sys	Kernel Driver	Yes	Manual	Running	OK
	Driver	Yes	Manual	Running	OK	Normal	No
					Yes		
raspti	Direct Parallel	c:\windows\system32\drivers\raspti.sys	Kernel Driver	Yes	Manual	Running	OK
	Running	OK	Normal	No	Yes		
rdbss	Rdbss	c:\windows\system32\drivers\rdbss.sys	File System Driver	Yes	System	Running	OK
	Running	OK	Normal	No	Yes		
rdpcdd	RDPCDD	c:\windows\system32\drivers\rdpcdd.sys	Kernel Driver	Yes	System	Running	OK
	Running	OK	Ignore	No	Yes		
rdpdr	Terminal Server Device Redirector Driver	c:\windows\system32\drivers\rdpdr.sys	Kernel Driver	Yes	Manual	Running	OK
	Driver	Yes	Manual	Running	OK	Normal	No
					Yes		
rdpwd	RDPWD	c:\windows\system32\drivers\rdpwd.sys	Kernel Driver	No	Manual	Stopped	OK
	Stopped	OK	Ignore	No	No		
redbook	Digital CD Audio Playback Filter Driver	c:\windows\system32\drivers\redbook.sys	Kernel Driver	Yes	System	Running	OK
	Driver	Yes	System	Running	OK	Normal	No
					Yes		
secdrv	Security Driver	c:\windows\system32\drivers\secdrv.sys	Kernel Driver	Yes	Auto	Running	OK
	Running	OK	Normal	No	Yes		
serenum	Serenum Filter Driver	c:\windows\system32\drivers\serenum.sys	Kernel Driver	Yes	Manual	Running	OK
	Driver	Yes	Manual	Running	OK	Normal	No
					Yes		
serial	Serial port driver	c:\windows\system32\drivers\serial.sys	Kernel Driver	Yes	System	Running	OK
	System	Running	OK	Ignore	No	Yes	
sfloppy	Sfloppy	c:\windows\system32\drivers\sfloppy.sys	Kernel Driver	No	System	Stopped	OK
	Stopped	OK	Ignore	No	No		
simbad	Simbad	Not Available	Kernel Driver	No	Disabled	Stopped	OK
	Normal	No	No				
srv	Srv	c:\windows\system32\drivers\srv.sys	File System Driver	Yes	Manual	Running	OK
	Running	OK	Normal	No	Yes		
swenum	Software Bus Driver	c:\windows\system32\drivers\swenum.sys	Kernel Driver	Yes	Manual	Running	OK
	Driver	Yes	Manual	Running	OK	Normal	No
					Yes		
symc8xx	symc8xx	Not Available	Kernel Driver	No	Disabled	Stopped	OK
	Stopped	OK	Normal	No	No		

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symmpi	symmpi	Not Available	Kernel Driver	No	Disabled	Stopped	OK
	Normal	No					
sym_hi	sym_hi	Not Available	Kernel Driver	No	Disabled	Stopped	OK
	Normal	No					
sym_u3	sym_u3	Not Available	Kernel Driver	No	Disabled	Stopped	OK
	Normal	No					
tcpip	TCP/IP Protocol Driver		c:\windows\system32\drivers\tcpip.sys	Kernel Driver	Yes		
	System Running		OK	Normal	No	Yes	
tdpipe	TDPIPE		c:\windows\system32\drivers\tdpipe.sys	Kernel Driver	No	Manual	
	Stopped		OK	Ignore	No	No	
tdtcp	TDTCP		c:\windows\system32\drivers\tdtcp.sys	Kernel Driver	No	Manual	
	Stopped		OK	Ignore	No	No	
termdd	Terminal Device Driver		c:\windows\system32\drivers\termdd.sys	Kernel Driver	Yes		
	System Running		OK	Normal	No	Yes	
toside	Toside	Not Available	Kernel Driver	No	Disabled	Stopped	OK
	Normal	No					
udfs	Udfs		c:\windows\system32\drivers\udfs.sys	File System Driver	No		
	Disabled		Stopped	OK	Normal	No	No
ultra	ultra	Not Available	Kernel Driver	No	Disabled	Stopped	OK
	Normal	No					
update	Microcode Update Driver		c:\windows\system32\drivers\update.sys	Kernel Driver			
	Yes	Manual	Running	OK	Normal	No	Yes
usbccgp	Microsoft USB Generic Parent Driver		c:\windows\system32\drivers\usbccgp.sys	Kernel Driver	Yes	Manual	
	Running		OK	Normal	No	Yes	
usbhci	Microsoft USB 2.0 Enhanced Host Controller Miniport Driver		c:\windows\system32\drivers\usbhci.sys	Kernel Driver	Yes	Manual	
	Running		OK	Normal	No	Yes	
usbhub	Microsoft USB Standard Hub Driver		c:\windows\system32\drivers\usbhub.sys	Kernel Driver	Yes	Manual	Running
	Kernel Driver	Yes	Manual	Running	OK	Normal	No
usbstor	USB Mass Storage Driver		c:\windows\system32\drivers\usbstor.sys	Kernel Driver			
	Driver	No	Manual	Stopped	OK	Normal	No
usbuhci	Microsoft USB Universal Host Controller Miniport Driver		c:\windows\system32\drivers\usbuhci.sys	Kernel Driver	Yes	Manual	
	Running		OK	Normal	No	Yes	
vga	vga		c:\windows\system32\drivers\vgapnp.sys	Kernel Driver	Yes	Manual	
	Running		OK	Ignore	No	Yes	
vgasave	VGA Display Controller		c:\windows\system32\drivers\vga.sys	Kernel Driver			
	No	System	Stopped	OK	Ignore	No	No
viaide	Vialde	Not Available	Kernel Driver	No	Disabled	Stopped	OK
	Normal	No					
volsnap	Storage volumes		c:\windows\system32\drivers\volsnap.sys	Kernel Driver			
	Yes	Boot	Running	OK	Normal	No	Yes
wanarp	Remote Access IP ARP Driver		c:\windows\system32\drivers\wanarp.sys	Kernel Driver			
	Driver	Yes	Manual	Running	OK	Normal	No
wdica	WDICA	Not Available	Kernel Driver	No	Manual	Stopped	OK
	No	No					
wlbs	Network Load Balancing		c:\windows\system32\drivers\wlbs.sys	Kernel Driver			
	No	Manual	Stopped	OK	Normal	No	No

[Signed Drivers]

Device_Name	Signed	Device_Class	Driver_Version	Driver_Date	Manufacturer
INF_Name		Driver_Name	Device_ID		

## Appendix C – Tunable Parameters

Microsoft System Management BIOS Driver	Yes	SYSTEM	5.2.3790.1830	10/1/2002	Not Available	Not Available	Not Available	Not Available
10/1/2002 (Standard system devices)		machine.inf						
ROOT\SYSTEM\0002								
Microcode Update Device	Yes	SYSTEM	5.2.3790.1830	10/1/2002	Not Available	Not Available	Not Available	Not Available
(Standard system devices)		machine.inf						
ROOT\SYSTEM\0001								
Plug and Play Software Device Enumerator	Yes	SYSTEM	5.2.3790.1830	10/1/2002	Not Available	Not Available	Not Available	Not Available
10/1/2002 (Standard system devices)		machine.inf						
ROOT\SYSTEM\0000								
Terminal Server Mouse Driver	Yes	SYSTEM	5.2.3790.1830	10/1/2002	Not Available	Not Available	Not Available	Not Available
(Standard system devices)		machine.inf						
ROOT\RDP_MOU\0000								
Terminal Server Keyboard Driver	Yes	SYSTEM	5.2.3790.1830	10/1/2002	Not Available	Not Available	Not Available	Not Available
(Standard system devices)		machine.inf						
ROOT\RDP_KBD\0000								
Terminal Server Device Redirector	Yes	SYSTEM	5.2.3790.1830	10/1/2002	Not Available	Not Available	Not Available	Not Available
(Standard system devices)		machine.inf						
ROOT\RDPDR\0000								
Direct Parallel	Yes	NET	5.2.3790.1830	10/1/2002	Microsoft	netrasa.inf		
Not Available		ROOT\MS_PTMINIPORT\0000						
WAN Miniport (PPTP)	Yes	NET	5.2.3790.1830	10/1/2002	Microsoft			
netrasa.inf	Not Available	ROOT\MS_PPTPMINIPORT\0000						
WAN Miniport (PPPOE)	Yes	NET	5.2.3790.1830	10/1/2002	Microsoft			
netrasa.inf	Not Available	ROOT\MS_PPPOEMINIPORT\0000						
WAN Miniport (IP)	Yes	NET	5.2.3790.1830	10/1/2002	Microsoft			
netrasa.inf	Not Available	ROOT\MS_NDISWANIP\0000						
WAN Miniport (L2TP)	Yes	NET	5.2.3790.1830	10/1/2002	Microsoft			
netrasa.inf	Not Available	ROOT\MS_L2TPMINIPORT\0000						
Video Codecs	Yes	MEDIA	5.2.3790.1830	10/1/2002	(Standard system devices)			
wave.inf	Not Available	ROOT\MEDIA\MS_MMVID						
Legacy Video Capture Devices	Yes	MEDIA	5.2.3790.1830	10/1/2002	(Standard system devices)			
wave.inf	Not Available	ROOT\MEDIA\MS_MMVCD						
Media Control Devices	Yes	MEDIA	5.2.3790.1830	10/1/2002	(Standard system devices)			
wave.inf	Not Available	ROOT\MEDIA\MS_MMMCI						
Legacy Audio Drivers	Yes	MEDIA	5.2.3790.1830	10/1/2002	(Standard system devices)			
wave.inf	Not Available	ROOT\MEDIA\MS_MMDRV						
Audio Codecs	Yes	MEDIA	5.2.3790.1830	10/1/2002	(Standard system devices)			
wave.inf	Not Available	ROOT\MEDIA\MS_MMACM						
Remote Access IP ARP Driver	Not Available	LEGACYDRIVER			Not Available	Not Available	Not Available	Not Available
Available	Not Available	Not Available	Not Available	Not Available				
ROOT\LEGACY_WANARP\0000								
volsnap	Not Available	LEGACYDRIVER			Not Available	Not Available	Not Available	Not Available
Not Available	Not Available	ROOT\LEGACY_VOLSNAP\0000						
TCP/IP Protocol Driver	Not Available	LEGACYDRIVER			Not Available	Not Available	Not Available	Not Available
Not Available	Not Available	ROOT\LEGACY_TCPIP\0000						
Security Driver	Not Available	LEGACYDRIVER			Not Available	Not Available	Not Available	Not Available
Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
ROOT\LEGACY_SECDRV\0000								
RDPCCD	Not Available	LEGACYDRIVER			Not Available	Not Available	Not Available	Not Available
Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
ROOT\LEGACY_RDPCCD\0000								
Remote Access Auto Connection Driver	Not Available	LEGACYDRIVER			Not Available	Not Available	Not Available	Not Available
Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
ROOT\LEGACY_RASACD\0000								
Partition Manager	Not Available	LEGACYDRIVER			Not Available	Not Available	Not Available	Not Available
Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
ROOT\LEGACY_PARTMGR\0000								
Null	Not Available	LEGACYDRIVER			Not Available	Not Available	Not Available	Not Available
Not Available	Not Available	ROOT\LEGACY_NULL\0000						
NetBios over Tcpip	Not Available	LEGACYDRIVER			Not Available	Not Available	Not Available	Not Available
Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
ROOT\LEGACY_NETBT\0000								



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NDProxy Available	Not Available	LEGACYDRIVER	Not Available	Not Available	Not Available
NDIS Usermode Available	Not Available	LEGACYDRIVER	Not Available	Not Available	Not Available
Remote Access Driver	Not Available	LEGACYDRIVER	Not Available	Not Available	Not Available
NDIS System Driver	Not Available	LEGACYDRIVER	Not Available	Not Available	Not Available
mountmgr Available	Not Available	LEGACYDRIVER	Not Available	Not Available	Not Available
nmdd Not Available	Not Available	LEGACYDRIVER	Not Available	Not Available	Not Available
ksecdd Not Available	Not Available	LEGACYDRIVER	Not Available	Not Available	Not Available
IPSEC driver Available	Not Available	LEGACYDRIVER	Not Available	Not Available	Not Available
IP Network Address Translator Available	Not Available	LEGACYDRIVER	Not Available	Not Available	Not Available
Generic Packet Classifier Available	Not Available	LEGACYDRIVER	Not Available	Not Available	Not Available
Fips Not Available	Not Available	LEGACYDRIVER	Not Available	Not Available	Not Available
dmload Not Available	Not Available	LEGACYDRIVER	Not Available	Not Available	Not Available
dmboot Not Available	Not Available	LEGACYDRIVER	Not Available	Not Available	Not Available
CRC Disk Filter Driver Available	Not Available	LEGACYDRIVER	Not Available	Not Available	Not Available
CdaD10BA Available	Not Available	LEGACYDRIVER	Not Available	Not Available	Not Available
CdaC15BA Available	Not Available	LEGACYDRIVER	Not Available	Not Available	Not Available
Beep Not Available	Not Available	LEGACYDRIVER	Not Available	Not Available	Not Available
AFD Not Available	Not Available	LEGACYDRIVER	Not Available	Not Available	Not Available
Generic volume Yes	VOLUME	5.2.3790.1830	10/1/2002	Microsoft	
Generic volume Yes	VOLUME	5.2.3790.1830	10/1/2002	Microsoft	
Generic volume Yes	VOLUME	5.2.3790.1830	10/1/2002	Microsoft	
Generic volume Yes	VOLUME	5.2.3790.1830	10/1/2002	Microsoft	

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Generic volume Yes	VOLUME	5.2.3790.1830	10/1/2002	Microsoft	
volume.inf	Not Available				
STORAGE\VOLUME\1&30A96598&0&SIGNATUREBB13679BOFFSET7E00LENGT HC82E60C00					
Generic volume Yes	VOLUME	5.2.3790.1830	10/1/2002	Microsoft	
volume.inf	Not Available				
STORAGE\VOLUME\1&30A96598&0&SIGNATUREBB136798OFFSET26D323E200LENGT HD37C713E00					
Generic volume Yes	VOLUME	5.2.3790.1830	10/1/2002	Microsoft	
volume.inf	Not Available				
STORAGE\VOLUME\1&30A96598&0&SIGNATUREBB136798OFFSETC82E68A00LENGT H1A503D5800					
Generic volume Yes	VOLUME	5.2.3790.1830	10/1/2002	Microsoft	
volume.inf	Not Available				
STORAGE\VOLUME\1&30A96598&0&SIGNATUREBB136798OFFSET7E00LENGT HC82E60C00					
Generic volume Yes	VOLUME	5.2.3790.1830	10/1/2002	Microsoft	
volume.inf	Not Available				
STORAGE\VOLUME\1&30A96598&0&SIGNATUREBB136799OFFSETC82E68A00LENGT H1A503D5800					
Generic volume Yes	VOLUME	5.2.3790.1830	10/1/2002	Microsoft	
volume.inf	Not Available				
STORAGE\VOLUME\1&30A96598&0&SIGNATUREBB136799OFFSET7E00LENGT HC82E60C00					
Volume Manager	Yes	SYSTEM	5.2.3790.1830	10/1/2002	(Standard
system devices)machine.inf	Not Available	ROOT\FTDISK\0000			
Logical Disk Manager	Yes	SYSTEM	5.2.3790.1830	10/1/2002	(Standard
system devices)machine.inf	Not Available	ROOT\DMIO\0000			
ACPI Fixed Feature Button	Yes	SYSTEM	5.2.3790.1830	10/1/2002	
(Standard system devices)	machine.inf	Not Available			
ACPI\FIXEDBUTTON\2&DABA3FF&0					
High precision event timer	Yes	SYSTEM	5.2.3790.1830	10/1/2002	
(Standard system devices)	machine.inf	Not Available			ACPI\PNP0103\0
Motherboard resources	Yes	SYSTEM	5.2.3790.1830	10/1/2002	(Standard
system devices)machine.inf	Not Available	ACPI\PNP0C02\0			
Secondary IDE Channel	Yes	HDC	5.2.3790.1830	10/1/2002	(Standard IDE
ATA/ATAPI controllers)	mshdc.inf	Not Available			
PCI\IDE\IDECHANNEL\4&1D8A9C03&0&1					
CD-ROM Drive	Yes	CDROM	5.2.3790.1830	10/1/2002	(Standard CD-ROM
drives) cdrom.inf	Not Available	IDE\CDROMTSSTCORP_CDRWDVD_TS-			
H492C_DE02_5&41A3CB2&0&0.0.0					
Primary IDE Channel	Yes	HDC	5.2.3790.1830	10/1/2002	(Standard IDE
ATA/ATAPI controllers)	mshdc.inf	Not Available			
PCI\IDE\IDECHANNEL\4&1D8A9C03&0&0					
Standard Dual Channel PCI IDE Controller	Yes	HDC	5.2.3790.1830	10/1/2002	
(Standard IDE ATA/ATAPI controllers)	mshdc.inf	Not Available			
PCI\VEN_8086&DEV_269E&SUBSYS_01B11028&REV_09\3&61AAA01&0&F9					
System board	Yes	SYSTEM	5.2.3790.1830	10/1/2002	(Standard system
devices) machine.inf	Not Available	ACPI\PI0001\5			
System board	Yes	SYSTEM	5.2.3790.1830	10/1/2002	(Standard system
devices) machine.inf	Not Available	ACPI\PNP0C01\0			
Communications Port	Yes	PORTS	5.2.3790.1830	10/1/2002	(Standard port types)
msports.inf	Not Available	ACPI\PNP0501\2			
Communications Port	Yes	PORTS	5.2.3790.1830	10/1/2002	(Standard port types)
msports.inf	Not Available	ACPI\PNP0501\1			

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Floppy disk drive (floppy disk drives)	Yes flpydisk.inf	FLOPPYDISK Not Available	5.2.3790.1830	10/1/2002	(Standard)
FDC\GENERIC_FLOPPY_DRIVE\5&33C0F973&0&0					
Standard floppy disk controller (floppy disk controllers)	Yes fdc.inf	FDC Not Available	5.2.3790.1830	10/1/2002	(Standard)
ACPI\PNP0700\4&2AA4AD3D&0					
System timer (system devices)	Yes machine.inf	SYSTEM Not Available	5.2.3790.1830	10/1/2002	(Standard system devices)
ACPI\PNP0100\4&2AA4AD3D&0					
System CMOS/real time clock (Standard system devices)	Yes machine.inf	SYSTEM Not Available	5.2.3790.1830	10/1/2002	
ACPI\PNP0B00\4&2AA4AD3D&0					
System board (system devices)	Yes machine.inf	SYSTEM Not Available	5.2.3790.1830	10/1/2002	(Standard system devices)
ACPI\PNP0C01\2					
Programmable interrupt controller (Standard system devices)	Yes machine.inf	SYSTEM Not Available	5.2.3790.1830	10/1/2002	
ACPI\PNP0000\4&2AA4AD3D&0					
Numeric data processor (system devices)	Yes machine.inf	SYSTEM Not Available	5.2.3790.1830	10/1/2002	(Standard system devices)
ACPI\PNP0C04\4&2AA4AD3D&0					
Direct memory access controller (Standard system devices)	Yes machine.inf	SYSTEM Not Available	5.2.3790.1830	10/1/2002	
ACPI\PNP0200\4&2AA4AD3D&0					
PCI standard ISA bridge (system devices)	Yes machine.inf	SYSTEM Not Available	5.2.3790.1830	10/1/2002	(Standard system devices)
PCI\VEN_8086&DEV_2670&SUBSYS_00000000&REV_09\3&61AAA01&0&F8					
Default Monitor (types)	Yes monitor.inf	MONITOR Not Available	5.2.3790.1830	10/1/2002	(Standard monitor types)
DISPLAY\DEFAULT_MONITOR\5&EEED524&0&12345678&14&0D					
Standard VGA Graphics Adapter (Standard display types)	Yes display.inf	DISPLAY Not Available	5.2.3790.1830	10/1/2002	
PCI\VEN_1002&DEV_515E&SUBSYS_01B11028&REV_02\4&2014205D&0&68F0					
Intel(R) 82801 PCI Bridge - 244E (Intel)	Yes machine.inf	SYSTEM Not Available	5.2.3790.1830	10/1/2002	
PCI\VEN_8086&DEV_244E&SUBSYS_00000000&REV_D9\3&61AAA01&0&F0					
Generic USB Hub (usb.inf)	Yes Not Available	USB USB\VID_04B4&PID_6560\5&6F526B7&0&7	5.2.3790.1830	10/1/2002	(Generic USB Hub)
USB Root Hub (usbport.inf)	Yes Not Available	USB USB\ROOT_HUB20\4&25F3EE70&0	5.2.3790.1830	10/1/2002	(Standard USB Host Controller)
Standard Enhanced PCI to USB Host Controller (Standard USB Host Controller)	Yes usbport.inf	USB Not Available	5.2.3790.1830	10/1/2002	
PCI\VEN_8086&DEV_268C&SUBSYS_01B11028&REV_09\3&61AAA01&0&EF					
USB Root Hub (usbport.inf)	Yes Not Available	USB USB\ROOT_HUB\4&1C386FEF&0	5.2.3790.1830	10/1/2002	(Standard USB Host Controller)
Standard Universal PCI to USB Host Controller (Standard USB Host Controller)	Yes usbport.inf	USB Not Available	5.2.3790.1830	10/1/2002	
PCI\VEN_8086&DEV_268B&SUBSYS_01B11028&REV_09\3&61AAA01&0&EB					
USB Root Hub (usbport.inf)	Yes Not Available	USB USB\ROOT_HUB\4&2DD355BC&0	5.2.3790.1830	10/1/2002	(Standard USB Host Controller)
Standard Universal PCI to USB Host Controller (Standard USB Host Controller)	Yes usbport.inf	USB Not Available	5.2.3790.1830	10/1/2002	
PCI\VEN_8086&DEV_268A&SUBSYS_01B11028&REV_09\3&61AAA01&0&EA					
HID-compliant mouse (msmouse.inf)	Yes Not Available	MOUSE HID\VID_0557&PID_2221&MI_01\7&7EC711E&0&0000	5.2.3790.1830	10/1/2002	Microsoft
USB Human Interface Device (Standard system devices)	Yes input.inf	HIDCLASS Not Available	5.2.3790.1830	10/1/2002	
USB\VID_0557&PID_2221&MI_01\6&1D334AC&0&0001					

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HID Keyboard Device (Standard keyboards)	Yes	KEYBOARD	5.2.3790.1830	10/1/2002	(Standard keyboards)
	keyboard.inf	Not Available			
		HID\VID_0557&PID_2221&MI_00\7&1B1C8D5C&0&0000			
USB Human Interface Device (Standard system devices)	Yes	HIDCLASS	5.2.3790.1830	10/1/2002	
		input.inf	Not Available		
		USB\VID_0557&PID_2221&MI_00\6&1D334AC&0&0000			
USB Composite Device (Standard USB Host Controller)	Yes	USB	5.2.3790.1830	10/1/2002	(Standard USB Host Controller)
	usb.inf	Not Available			USB\VID_0557&PID_2221\5&3014DA89&0&1
USB Root Hub	Yes	USB	5.2.3790.1830	10/1/2002	(Standard USB Host Controller)
	usbport.inf	Not Available			USB\ROOT_HUB\4&2DC298A6&0
Standard Universal PCI to USB Host Controller (Standard USB Host Controller)	Yes	USB	5.2.3790.1830	10/1/2002	
	usbport.inf	Not Available			PCI\VEN_8086&DEV_2689&SUBSYS_01B11028&REV_09\3&61AAA01&0&E9
USB Root Hub	Yes	USB	5.2.3790.1830	10/1/2002	(Standard USB Host Controller)
	usbport.inf	Not Available			USB\ROOT_HUB\4&1C492D05&0
Standard Universal PCI to USB Host Controller (Standard USB Host Controller)	Yes	USB	5.2.3790.1830	10/1/2002	
	usbport.inf	Not Available			PCI\VEN_8086&DEV_2688&SUBSYS_01B11028&REV_09\3&61AAA01&0&E8
Broadcom BCM5708C NetXtreme II GigE (NDIS VBD Client)	Yes	NET	2.6.14.0		
	4/3/2006	Broadcom Corporation	oem3.inf	Not Available	
		B06BDR\VL2ND&PCI_164C14E4&SUBSYS_01B11028&REV_11\6&3100A6D6&0&20051600			
Broadcom BCM5708C NetXtreme II GigE	Yes	SYSTEM	2.6.17.0		
	4/21/2006	Broadcom Corporation	oem5.inf	Not Available	
		PCI\VEN_14E4&DEV_164C&SUBSYS_01B11028&REV_11\5&2EADD4B0&0&0000E0			
PCI standard PCI-to-PCI bridge (Standard system devices)	Yes	SYSTEM	5.2.3790.1830	10/1/2002	
		machine.inf	Not Available		PCI\VEN_1166&DEV_0103&SUBSYS_00000000&REV_C2\4&187919FE&0&00E0
PCI standard PCI-to-PCI bridge (Standard system devices)	Yes	SYSTEM	5.2.3790.1830	10/1/2002	
		machine.inf	Not Available		PCI\VEN_8086&DEV_2690&SUBSYS_00000000&REV_09\3&61AAA01&0&E0
PCI standard host CPU bridge (Standard system devices)	Yes	SYSTEM	5.2.3790.1830	10/1/2002	
		machine.inf	Not Available		PCI\VEN_8086&DEV_25F6&SUBSYS_00000000&REV_12\3&61AAA01&0&B0
PCI standard host CPU bridge (Standard system devices)	Yes	SYSTEM	5.2.3790.1830	10/1/2002	
		machine.inf	Not Available		PCI\VEN_8086&DEV_25F5&SUBSYS_00000000&REV_12\3&61AAA01&0&A8
PCI standard host CPU bridge (Standard system devices)	Yes	SYSTEM	5.2.3790.1830	10/1/2002	
		machine.inf	Not Available		PCI\VEN_8086&DEV_25F3&SUBSYS_00000000&REV_12\3&61AAA01&0&98
PCI standard host CPU bridge (Standard system devices)	Yes	SYSTEM	5.2.3790.1830	10/1/2002	
		machine.inf	Not Available		PCI\VEN_8086&DEV_25F1&SUBSYS_00000000&REV_12\3&61AAA01&0&88
PCI standard host CPU bridge (Standard system devices)	Yes	SYSTEM	5.2.3790.1830	10/1/2002	
		machine.inf	Not Available		PCI\VEN_8086&DEV_25F0&SUBSYS_00000000&REV_12\3&61AAA01&0&82
PCI standard host CPU bridge (Standard system devices)	Yes	SYSTEM	5.2.3790.1830	10/1/2002	
		machine.inf	Not Available		PCI\VEN_8086&DEV_25F0&SUBSYS_00000000&REV_12\3&61AAA01&0&81
PCI standard host CPU bridge (Standard system devices)	Yes	SYSTEM	5.2.3790.1830	10/1/2002	
		machine.inf	Not Available		PCI\VEN_8086&DEV_25F0&SUBSYS_00000000&REV_12\3&61AAA01&0&80
PCI standard PCI-to-PCI bridge (Standard system devices)	Yes	SYSTEM	5.2.3790.1830	10/1/2002	
		machine.inf	Not Available		PCI\VEN_8086&DEV_25E7&SUBSYS_00000000&REV_12\3&61AAA01&0&38

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PCI standard PCI-to-PCI bridge Yes SYSTEM 5.2.3790.1830 10/1/2002  
 (Standard system devices) machine.inf Not Available  
 PCI\VEN\_8086&DEV\_0372&SUBSYS\_00000000&REV\_00\4&149DD53B&0&0230

DELL PERC RAID Virtual Device No SYSTEM 1.20.0.64 12/9/2005  
 DELL oem0.inf Not Available  
 SCSI\OTHER&VEN\_\_\_RAID&PROD\_\_DUMMYDEVICE&REV\_0001\6&1BE1250F&0&1

400

DELL PERC 5/E Adapter RAID Controller No SCSIADAPTER 1.20.0.64  
 12/9/2005 DELL oem1.inf Not Available  
 PCI\VEN\_1028&DEV\_0015&SUBSYS\_1F011028&REV\_00\5&376DDE58&0&700030

PCI standard PCI-to-PCI bridge Yes SYSTEM 5.2.3790.1830 10/1/2002  
 (Standard system devices) machine.inf Not Available  
 PCI\VEN\_8086&DEV\_0370&SUBSYS\_00000000&REV\_00\4&149DD53B&0&0030

PCI standard PCI-to-PCI bridge Yes SYSTEM 5.2.3790.1830 10/1/2002  
 (Standard system devices) machine.inf Not Available  
 PCI\VEN\_8086&DEV\_25F9&SUBSYS\_00000000&REV\_12\3&61AAA01&0&30

PCI standard PCI-to-PCI bridge Yes SYSTEM 5.2.3790.1830 10/1/2002  
 (Standard system devices) machine.inf Not Available  
 PCI\VEN\_8086&DEV\_0372&SUBSYS\_00000000&REV\_00\4&28CEA4F8&0&0228

DELL PERC RAID Virtual Device No SYSTEM 1.20.0.64 12/9/2005  
 DELL oem0.inf Not Available  
 SCSI\OTHER&VEN\_\_\_RAID&PROD\_\_DUMMYDEVICE&REV\_0001\6&107D05B&0&14

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Disk drive Yes DISKDRIVE 5.2.3790.1830 10/1/2002 (Standard disk drives)  
 disk.inf Not Available  
 SCSI\DISK&VEN\_DELL&PROD\_PERC\_5\I&REV\_1.00\6&107D05B&0&100

DELL PERC 5/i Integrated RAID Controller No SCSIADAPTER 1.20.0.64  
 12/9/2005 DELL oem1.inf Not Available  
 PCI\VEN\_1028&DEV\_0015&SUBSYS\_1F031028&REV\_00\5&22FD9970&0&700028

PCI standard PCI-to-PCI bridge Yes SYSTEM 5.2.3790.1830 10/1/2002  
 (Standard system devices) machine.inf Not Available  
 PCI\VEN\_8086&DEV\_0370&SUBSYS\_00000000&REV\_00\4&28CEA4F8&0&0028

PCI standard PCI-to-PCI bridge Yes SYSTEM 5.2.3790.1830 10/1/2002  
 (Standard system devices) machine.inf Not Available  
 PCI\VEN\_8086&DEV\_25E5&SUBSYS\_00000000&REV\_12\3&61AAA01&0&28

PCI standard PCI-to-PCI bridge Yes SYSTEM 5.2.3790.1830 10/1/2002  
 (Standard system devices) machine.inf Not Available  
 PCI\VEN\_8086&DEV\_25E4&SUBSYS\_00000000&REV\_12\3&61AAA01&0&20

PCI standard PCI-to-PCI bridge Yes SYSTEM 5.2.3790.1830 10/1/2002  
 (Standard system devices) machine.inf Not Available  
 PCI\VEN\_8086&DEV\_25E3&SUBSYS\_00000000&REV\_12\3&61AAA01&0&18

PCI standard PCI-to-PCI bridge Yes SYSTEM 5.2.3790.1830 10/1/2002  
 (Standard system devices) machine.inf Not Available  
 PCI\VEN\_8086&DEV\_350C&SUBSYS\_00000000&REV\_01\4&3667122&0&0310

PCI standard PCI-to-PCI bridge Yes SYSTEM 5.2.3790.1830 10/1/2002  
 (Standard system devices) machine.inf Not Available  
 PCI\VEN\_8086&DEV\_0372&SUBSYS\_00000000&REV\_00\6&26D2E9F4&0&02080010

DELL PERC RAID Virtual Device No SYSTEM 1.20.0.64 12/9/2005  
 DELL oem0.inf Not Available  
 SCSI\OTHER&VEN\_\_\_RAID&PROD\_\_DUMMYDEVICE&REV\_0001\8&36E18ACB&0&1

400

Disk drive Yes DISKDRIVE 5.2.3790.1830 10/1/2002 (Standard disk drives)  
 disk.inf Not Available  
 SCSI\DISK&VEN\_DELL&PROD\_PERC\_5\E\_ADAPTER&REV\_1.00\8&36E18ACB&0&1

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Disk drive	Yes	DISKDRIVE	5.2.3790.1830	10/1/2002	(Standard disk drives)
disk.inf	Not Available				
SCS\DISK&VEN_DELL&PROD_PERC_5/E_ADAPTER&REV_1.00\8&36E18ACB&0&1					
10					
Disk drive	Yes	DISKDRIVE	5.2.3790.1830	10/1/2002	(Standard disk drives)
disk.inf	Not Available				
SCS\DISK&VEN_DELL&PROD_PERC_5/E_ADAPTER&REV_1.00\8&36E18ACB&0&1					
00					
DELL PERC 5/E Adapter RAID Controller	No	SCSIADAPTER	1.20.0.64		
12/9/2005	DELL	oem1.inf	Not Available		
PCI\VEN_1028&DEV_0015&SUBSYS_1F011028&REV_00\7&23DC1E47&0&70000800					
10					
PCI standard PCI-to-PCI bridge	Yes	SYSTEM	5.2.3790.1830	10/1/2002	
(Standard system devices)		machine.inf	Not Available		
PCI\VEN_8086&DEV_0370&SUBSYS_00000000&REV_00\6&26D2E9F4&0&00080010					
PCI standard PCI-to-PCI bridge	Yes	SYSTEM	5.2.3790.1830	10/1/2002	
(Standard system devices)		machine.inf	Not Available		
PCI\VEN_8086&DEV_3514&SUBSYS_00000000&REV_01\5&2D9FD309&0&080010					
PCI standard PCI-to-PCI bridge	Yes	SYSTEM	5.2.3790.1830	10/1/2002	
(Standard system devices)		machine.inf	Not Available		
PCI\VEN_8086&DEV_3510&SUBSYS_00000000&REV_01\5&2D9FD309&0&000010					
PCI standard PCI-to-PCI bridge	Yes	SYSTEM	5.2.3790.1830	10/1/2002	
(Standard system devices)		machine.inf	Not Available		
PCI\VEN_8086&DEV_3500&SUBSYS_00000000&REV_01\4&3667122&0&0010					
PCI standard PCI-to-PCI bridge	Yes	SYSTEM	5.2.3790.1830	10/1/2002	
(Standard system devices)		machine.inf	Not Available		
PCI\VEN_8086&DEV_25E2&SUBSYS_00000000&REV_12\3&61AAA01&0&10					
PCI standard host CPU bridge	Yes	SYSTEM	5.2.3790.1830	10/1/2002	
(Standard system devices)		machine.inf	Not Available		
PCI\VEN_8086&DEV_25C0&SUBSYS_00000000&REV_12\3&61AAA01&0&00					
PCI bus	Yes	SYSTEM	5.2.3790.1830	10/1/2002	(Standard system devices)
machine.inf	Not Available	ACPI\PNP0A03\2&DABA3FF&0			
Intel Processor	Yes	PROCESSOR	5.2.3790.1830	10/1/2002	Intel cpu.inf Not Available
ACPI\GENUINEINTEL_-EM64T_FAMILY_6_MODEL_15\1					
Intel Processor	Yes	PROCESSOR	5.2.3790.1830	10/1/2002	Intel cpu.inf Not Available
ACPI\GENUINEINTEL_-EM64T_FAMILY_6_MODEL_15\0					
Microsoft ACPI-Compliant System	Yes	SYSTEM	5.2.3790.1830	10/1/2002	
Microsoft acpi.inf	Not Available	ACPI_HAL\PNP0C08\0			
ACPI Multiprocessor x64-based PC	Yes	COMPUTER	5.2.3790.1830	10/1/2002	
(Standard computers)		hal.inf	Not Available		ROOT\ACPI_HAL\0000
Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
Not Available	Not Available	HTREE\ROOT\0			

### [Environment Variables]

Variable	Value	User_Name
ClusterLog	C:\WINDOWS\Cluster\cluster.log	<SYSTEM>
ComSpec	%SystemRoot%\system32\cmd.exe	<SYSTEM>
FP_NO_HOST_CHECKNO	<SYSTEM>	
NUMBER_OF_PROCESSORS	2	<SYSTEM>
OS	Windows_NT	<SYSTEM>
Path	%SystemRoot%\system32;%SystemRoot%;%SystemRoot%\System32\Wbem;C:\Program Files (x86)\Microsoft SQL Server\80\Tools\Binn\;C:\Program Files\Microsoft SQL Server\90\Tools\bin\;C:\Program Files (x86)\Microsoft SQL Server\90\Tools\bin\;C:\Program	

## Appendix C – Tunable Parameters

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```
Files (x86)\Microsoft SQL Server\90\DTS\Binn\;C:\Program Files (x86)\Microsoft SQL
Server\90\Tools\Binn\VSShell\Common7\IDE\;.C:\Program Files (x86)\Microsoft SQL
Server\80\Tools\Binn\;C:\Program Files\Microsoft SQL Server\MSSQL.1\MSSQL\Binn
<SYSTEM>
PATHEXT .COM;.EXE;.BAT;.CMD;.VBS;.VBE;.JS;.JSE;.WSF;.WSH <SYSTEM>
PROCESSOR_ARCHITECTURE AMD64 <SYSTEM>
PROCESSOR_IDENTIFIER EM64T Family 6 Model 15 Stepping 4, GenuineIntel
<SYSTEM>
PROCESSOR_LEVEL 6 <SYSTEM>
PROCESSOR_REVISION 0f04 <SYSTEM>
TEMP %SystemRoot%\TEMP <SYSTEM>
TMP %SystemRoot%\TEMP <SYSTEM>
windir %SystemRoot% <SYSTEM>
TEMP %USERPROFILE%\Local Settings\Temp NT AUTHORITY\SYSTEM
TMP %USERPROFILE%\Local Settings\Temp NT AUTHORITY\SYSTEM
TEMP %USERPROFILE%\Local Settings\Temp NT AUTHORITY\LOCAL SERVICE
TMP %USERPROFILE%\Local Settings\Temp NT AUTHORITY\LOCAL SERVICE
TEMP %USERPROFILE%\Local Settings\Temp NT AUTHORITY\NETWORK SERVICE
TMP %USERPROFILE%\Local Settings\Temp NT AUTHORITY\NETWORK SERVICE
TEMP %USERPROFILE%\Local Settings\Temp PE2900\Administrator
TMP %USERPROFILE%\Local Settings\Temp PE2900\Administrator
```

[Print Jobs]

Document	Size	Owner	Notify	Status	Time_Submitted	Start_Time	Driver
Until_Time	Elapsed_Time	Pages_Printed	Job_ID	Priority	Parameters		
Print_Processor	Host_Print_Queue	Data_Type	Name				

[Network Connections]

Local_Name	Remote_Name	Type	Status	User_Name
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[Running Tasks]

Name	Path	Process_ID	Priority	Min_Working_Set	Max_Working_Set
Start_Time	Version	Size	File_Date		
system	idle process	Not Available	0	0	Not Available
Available	Not Available	Not Available	Not Available	Not Available	Not Available
system	Not Available	4	8	0	1413120
Not Available	Not Available				Not Available
smss.exe	Not Available	360	11	204800	1413120
Not Available	Not Available				6/22/2006 9:02 AM
csrss.exe	Not Available	492	13	Not Available	Not Available
AM	Not Available	Not Available	Not Available		6/22/2006 9:02 AM
winlogon.exe	c:\windows\system32\winlogon.exe		532	13	204800
6/22/2006 9:02 AM		5.2.3790.1830 (srv03_sp1_rtm.050324-1447)			901.00 KB
(922,624 bytes)	3/25/2005 6:00 AM				
services.exe	c:\windows\system32\services.exe		576	9	204800
6/22/2006 9:02 AM		5.2.3790.1830 (srv03_sp1_rtm.050324-1447)			216.50 KB
(221,696 bytes)	3/25/2005 6:00 AM				

## Appendix C – Tunable Parameters

```

lsass.exe      c:\windows\system32\lsass.exe 588 9 204800 1413120
6/22/2006 9:02 AM 5.2.3790.1830 (srv03_sp1_rtm.050324-1447) 14.00 KB
(14,336 bytes) 3/25/2005 6:00 AM
svchost.exe   c:\windows\system32\svchost.exe 792 8 204800 1413120
6/22/2006 9:02 AM 5.2.3790.1830 (srv03_sp1_rtm.050324-1447) 24.50 KB
(25,088 bytes) 3/25/2005 6:00 AM
svchost.exe   Not Available 844 8 Not Available Not Available 6/22/2006 9:02
AM Not Available Not Available Not Available
svchost.exe   Not Available 900 8 Not Available Not Available 6/22/2006 9:02
AM Not Available Not Available Not Available
svchost.exe   Not Available 952 8 Not Available Not Available 6/22/2006 9:02
AM Not Available Not Available Not Available
svchost.exe   c:\windows\system32\svchost.exe 984 8 204800 1413120
6/22/2006 9:02 AM 5.2.3790.1830 (srv03_sp1_rtm.050324-1447) 24.50 KB
(25,088 bytes) 3/25/2005 6:00 AM
msdtc.exe     Not Available 1172 8 Not Available Not Available 6/22/2006 9:02
AM Not Available Not Available Not Available
svchost.exe   c:\windows\system32\svchost.exe 1320 8 204800 1413120
6/22/2006 9:02 AM 5.2.3790.1830 (srv03_sp1_rtm.050324-1447) 24.50 KB
(25,088 bytes) 3/25/2005 6:00 AM
svchost.exe   Not Available 1360 8 Not Available Not Available 6/22/2006 9:02
AM Not Available Not Available Not Available
msftesql.exe c:\program files\microsoft sql server\mssql.1\mssql\binn\msftesql.exe 1488
8 204800 1413120 6/22/2006 9:02 AM 12.0.5626.1 152.20 KB
(155,856 bytes) 8/26/2005 5:17 PM
svchost.exe   c:\windows\system32\svchost.exe 1668 8 204800 1413120
6/22/2006 9:02 AM 5.2.3790.1830 (srv03_sp1_rtm.050324-1447) 24.50 KB
(25,088 bytes) 3/25/2005 6:00 AM
wmiprvse.exe Not Available 1128 8 Not Available Not Available 6/22/2006 9:04
AM Not Available Not Available Not Available
explorer.exe  c:\windows\explorer.exe 1832 8 204800 1413120 6/22/2006 9:16
AM 6.00.3790.1830 (srv03_sp1_rtm.050324-1447) 1.30 MB (1,364,480 bytes)
3/25/2005 6:00 AM
wpabaln.exe  c:\windows\system32\wpabaln.exe 512 8 204800 1413120
6/22/2006 9:18 AM 5.2.3790.1830 (srv03_sp1_rtm.050324-1447) 33.50 KB
(34,304 bytes) 3/25/2005 6:00 AM
wmiprvse.exe Not Available 140 8 Not Available Not Available 6/22/2006 9:55
AM Not Available Not Available Not Available
helpctr.exe  c:\windows\pchealth\helpctr\binaries\helpctr.exe 1404 8 204800
1413120 6/22/2006 9:59 AM 5.2.3790.1830 (srv03_sp1_rtm.050324-1447)
1.30 MB (1,363,456 bytes) 6/16/2006 6:08 PM
helpsvc.exe  c:\windows\pchealth\helpctr\binaries\helpsvc.exe 484 8 204800
1413120 6/22/2006 9:59 AM 5.2.3790.1830 (srv03_sp1_rtm.050324-1447)
1.52 MB (1,591,296 bytes) 6/16/2006 6:08 PM

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### [Loaded Modules]

Name	Version	Size	File_Date	Manufacturer	Path
winlogon	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	901.00 KB (922,624 bytes)	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\winlogon.exe
ntdll	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	1.20 MB (1,257,472 bytes)	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\ntdll.dll
kernel32	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	1.43 MB (1,500,160 bytes)	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\kernel32.dll



## Appendix C – Tunable Parameters

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advapi32	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	1.00 MB (1,051,136 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\advapi32.dll
rpcrt4	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	1.63 MB (1,714,176 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\rpcrt4.dll
crypt32	5.131.3790.1830 (srv03_sp1_rtm.050324-1447)	1.36 MB (1,428,992 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\crypt32.dll
msasn1	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	152.50 KB (156,160 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\msasn1.dll
msvcrt	7.0.3790.1830 (srv03_sp1_rtm.050324-1447)	508.00 KB (520,192 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\msvcrt.dll
user32	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	1.04 MB (1,085,952 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\user32.dll
gdi32	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	592.00 KB (606,208 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\gdi32.dll
nddeapi	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	25.00 KB (25,600 bytes)
AM	Microsoft Corporation	c:\windows\system32\nddeapi.dll
profmap	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	36.00 KB (36,864 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\profmap.dll
netapi32	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	589.00 KB (603,136 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\netapi32.dll
userenv	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	1.02 MB (1,069,056 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\userenv.dll
psapi	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	29.00 KB (29,696 bytes)
AM	Microsoft Corporation	c:\windows\system32\psapi.dll
regapi	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	108.50 KB (111,104 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\regapi.dll
secur32	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	120.00 KB (122,880 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\secur32.dll
setupapi	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	1.45 MB (1,523,200 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\setupapi.dll
version	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	28.00 KB (28,672 bytes)
AM	Microsoft Corporation	c:\windows\system32\version.dll
winsta	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	89.00 KB (91,136 bytes)
AM	Microsoft Corporation	c:\windows\system32\winsta.dll
ws2_32	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	176.50 KB (180,736 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\ws2_32.dll
ws2help	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	30.50 KB (31,232 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\ws2help.dll
msgina	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	1.14 MB (1,193,472 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\msgina.dll
shsvcs	6.00.3790.1830 (srv03_sp1_rtm.050324-1447)	193.50 KB (198,144 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\shsvcs.dll
shlwapi	6.00.3790.1830 (srv03_sp1_rtm.050324-1447)	606.50 KB (621,056 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\shlwapi.dll
sfc	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	6.00 KB (6,144 bytes)
AM	Microsoft Corporation	c:\windows\system32\sfc.dll
sfc_os	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	183.50 KB (187,904 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\sfc_os.dll
wintrust	5.131.3790.1830 (srv03_sp1_rtm.050324-1447)	297.50 KB (304,640 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\wintrust.dll
imagehlp	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	57.50 KB (58,880 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\imagehlp.dll
ole32	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	2.43 MB (2,543,616 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\ole32.dll

## Appendix C – Tunable Parameters

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comctl32 6.0 (srv03\_sp1\_rtm.050324-1447) 1.51 MB (1,584,128 bytes)  
6/16/2006 12:35 PM Microsoft Corporation  
c:\windows\winsxs\amd64\_microsoft.windows.common-  
controls\_6595b64144ccf1df\_6.0.3790.1830\_x-ww\_aced72af\comctl32.dll  
winscard 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 230.00 KB (235,520 bytes)  
3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\winscard.dll  
wtsapi32 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 29.00 KB (29,696 bytes)  
3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\wtsapi32.dll  
sxs 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 1.91 MB (2,003,968 bytes)  
3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\sxs.dll  
shell32 6.00.3790.1830 (srv03\_sp1\_rtm.050324-1447) 10.01 MB (10,492,416 bytes)  
3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\shell32.dll  
rsaenh 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 241.96 KB (247,768 bytes)  
3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\rsaenh.dll  
wldap32 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 390.00 KB (399,360 bytes)  
3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\wldap32.dll  
cscdll 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 151.50 KB (155,136 bytes)  
3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\cscdll.dll  
dimsntfy 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 28.00 KB (28,672 bytes)  
3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\dimsntfy.dll  
wlnotify 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 148.00 KB (151,552 bytes)  
3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\wlnotify.dll  
mpr 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 115.00 KB (117,760 bytes)  
3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\mpr.dll  
oleaut32 5.2.3790.1830 1.06 MB (1,116,160 bytes) 3/25/2005 6:00 AM  
Microsoft Corporation c:\windows\system32\oleaut32.dll  
winmm 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 303.50 KB (310,784 bytes)  
3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\winmm.dll  
winspool 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 247.00 KB (252,928 bytes)  
3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\winspool.drv  
comctl32 5.82 (srv03\_sp1\_rtm.050324-1447) 934.50 KB (956,928 bytes)  
6/16/2006 12:35 PM Microsoft Corporation  
c:\windows\winsxs\amd64\_microsoft.windows.common-  
controls\_6595b64144ccf1df\_5.82.3790.1830\_x-ww\_4d792d2a\comctl32.dll  
uxtheme 6.00.3790.1830 (srv03\_sp1\_rtm.050324-1447) 494.50 KB (506,368 bytes)  
3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\uxtheme.dll  
mprapi 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 154.50 KB (158,208 bytes)  
3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\mprapi.dll  
activeds 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 348.50 KB (356,864 bytes)  
3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\activeds.dll  
adslidpc 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 240.50 KB (246,272 bytes)  
3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\adslidpc.dll  
credui 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 202.00 KB (206,848 bytes)  
3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\credui.dll  
atl 3.05.2284 96.50 KB (98,816 bytes) 3/25/2005 6:00 AM Microsoft Corporation  
c:\windows\system32\atl.dll  
rtutils 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 66.00 KB (67,584 bytes) 3/25/2005 6:00  
AM Microsoft Corporation c:\windows\system32\rtutils.dll  
samlib 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 69.00 KB (70,656 bytes) 3/25/2005 6:00  
AM Microsoft Corporation c:\windows\system32\samlib.dll  
cscui 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 441.00 KB (451,584 bytes)  
3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\cscui.dll  
ntmarta 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 222.50 KB (227,840 bytes)  
3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\ntmarta.dll

## Appendix C – Tunable Parameters

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clbcatq	2001.12.4720.1830 (srv03_sp1_rtm.050324-1447)	865.00 KB (885,760 bytes)
	6/16/2006 6:06 PM Microsoft Corporation	c:\windows\system32\clbcatq.dll
comres	2001.12.4720.1830 (srv03_sp1_rtm.050324-1447)	779.50 KB (798,208 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\comres.dll
xpsp2res	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	2.77 MB (2,899,456 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\xpsp2res.dll
services	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	216.50 KB (221,696 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\services.exe
ncobjapi	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	80.00 KB (81,920 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\ncobjapi.dll
msvcp60	7.0.3790.1830 (srv03_sp1_rtm.050324-1447)	919.50 KB (941,568 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\msvcp60.dll
scesrv	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	594.50 KB (608,768 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\scesrv.dll
authz	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	167.00 KB (171,008 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\authz.dll
umpnpmgr	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	205.00 KB (209,920 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\umpnpmgr.dll
eventlog	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	127.00 KB (130,048 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\eventlog.dll
lsass	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	14.00 KB (14,336 bytes)
AM	Microsoft Corporation	c:\windows\system32\lsass.exe
lsasrv	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	1.50 MB (1,568,256 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\lsasrv.dll
ntdsapi	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	127.50 KB (130,560 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\ntdsapi.dll
dnsapi	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	297.50 KB (304,640 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\dnsapi.dll
samsrv	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	1.01 MB (1,059,328 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\samsrv.dll
cryptdll	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	47.00 KB (48,128 bytes)
AM	Microsoft Corporation	c:\windows\system32\cryptdll.dll
msprivs	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	47.50 KB (48,640 bytes)
AM	Microsoft Corporation	c:\windows\system32\msprivs.dll
kerberos	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	698.00 KB (714,752 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\kerberos.dll
msv1_0	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	253.00 KB (259,072 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\msv1_0.dll
iphlpapi	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	177.00 KB (181,248 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\iphlpapi.dll
netlogon	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	666.00 KB (681,984 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\netlogon.dll
w32time	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	400.50 KB (410,112 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\w32time.dll
schannel	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	248.00 KB (253,952 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\schannel.dll
wdigest	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	130.50 KB (133,632 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\wdigest.dll
rassfm	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	36.00 KB (36,864 bytes)
AM	Microsoft Corporation	c:\windows\system32\rassfm.dll
kdcsvc	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	409.00 KB (418,816 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\kdcsvc.dll
ntdsa	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	2.81 MB (2,948,096 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\ntdsa.dll

## Appendix C – Tunable Parameters

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esent	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	2.26 MB (2,366,976 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\esent.dll
ntdsatq	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	51.00 KB (52,224 bytes)	3/25/2005 6:00 AM
	Microsoft Corporation		c:\windows\system32\ntdsatq.dll
mswsock	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	478.00 KB (489,472 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\mswsock.dll
scecli	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	308.00 KB (315,392 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\scecli.dll
ws03res	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	794.00 KB (813,056 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\ws03res.dll
ipsecsvc	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	358.50 KB (367,104 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\ipsecsvc.dll
oakley	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	372.50 KB (381,440 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\oakley.dll
winiipsec	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	52.50 KB (53,760 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\winiipsec.dll
hnetcfg	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	561.00 KB (574,464 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\hnetcfg.dll
wshtcpip	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	29.00 KB (29,696 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\wshtcpip.dll
pstorsvc	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	36.00 KB (36,864 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\pstorsvc.dll
psbase	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	124.00 KB (126,976 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\psbase.dll
dssenh	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	226.96 KB (232,408 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\dssenh.dll
wlbsctrl	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	137.50 KB (140,800 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\wlbsctrl.dll
svchost	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	24.50 KB (25,088 bytes)	3/25/2005 6:00 AM
	Microsoft Corporation		c:\windows\system32\svchost.exe
rpcss	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	672.00 KB (688,128 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\rpcss.dll
schedsvc	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	308.50 KB (315,904 bytes)	
	6/16/2006 6:08 PM	Microsoft Corporation	c:\windows\system32\schedsvc.dll
msidle	6.00.3790.1830 (srv03_sp1_rtm.050324-1447)	9.00 KB (9,216 bytes)	3/25/2005 6:00 AM
	Microsoft Corporation		c:\windows\system32\msidle.dll
wkssvc	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	221.00 KB (226,304 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\wkssvc.dll
wiarpc	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	57.00 KB (58,368 bytes)	3/25/2005 6:00 AM
	Microsoft Corporation		c:\windows\system32\wiarpc.dll
aelupsvc	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	31.50 KB (32,256 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\aelupsvc.dll
apphelp	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	241.00 KB (246,784 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\apphelp.dll
cryptsvc	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	114.00 KB (116,736 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\cryptsvc.dll
certcli	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	372.00 KB (380,928 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\certcli.dll
vssapi	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	1.26 MB (1,320,960 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\vssapi.dll
dmserver	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	36.50 KB (37,376 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\dmserver.dll
srvsvc	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	156.50 KB (160,256 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\srvsvc.dll

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es	2001.12.4720.1830 (srv03_sp1_rtm.050324-1447)	357.00 KB (365,568 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\es.dll
sens	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	63.50 KB (65,024 bytes)	3/25/2005 6:00 AM
	Microsoft Corporation		c:\windows\system32\sens.dll
seclogon	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	27.50 KB (28,160 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\seclogon.dll
trkwks	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	177.50 KB (181,760 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\trkwks.dll
wmisvc	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	227.00 KB (232,448 bytes)	
	6/16/2006 6:06 PM	Microsoft Corporation	c:\windows\system32\wbem\wmisvc.dll
comsvcs	2001.12.4720.1830 (srv03_sp1_rtm.050324-1447)	2.06 MB (2,156,544 bytes)	
	6/16/2006 6:06 PM	Microsoft Corporation	c:\windows\system32\comsvcs.dll
browser	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	125.50 KB (128,512 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\browser.dll
netrap	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	26.00 KB (26,624 bytes)	3/25/2005 6:00 AM
	Microsoft Corporation		c:\windows\system32\netrap.dll
wbemcore	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	1.24 MB (1,299,968 bytes)	
	6/16/2006 6:06 PM	Microsoft Corporation	c:\windows\system32\wbem\wbemcore.dll
esscli	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	626.50 KB (641,536 bytes)	
	6/16/2006 6:06 PM	Microsoft Corporation	c:\windows\system32\wbem\esscli.dll
wbemcomn	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	524.00 KB (536,576 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\wbem\wbemcomn.dll
fastprox	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	866.50 KB (887,296 bytes)	
	6/16/2006 6:06 PM	Microsoft Corporation	c:\windows\system32\wbem\fastprox.dll
wmiutils	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	171.00 KB (175,104 bytes)	
	6/16/2006 6:06 PM	Microsoft Corporation	c:\windows\system32\wbem\wmiutils.dll
repdrvfs	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	353.50 KB (361,984 bytes)	
	6/16/2006 6:06 PM	Microsoft Corporation	c:\windows\system32\wbem\repdrvfs.dll
wmiprvsd	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	743.00 KB (760,832 bytes)	
	6/16/2006 6:06 PM	Microsoft Corporation	c:\windows\system32\wbem\wmiprvsd.dll
wbemess	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	532.50 KB (545,280 bytes)	
	6/16/2006 6:06 PM	Microsoft Corporation	c:\windows\system32\wbem\wbemess.dll
ncprov	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	73.00 KB (74,752 bytes)	6/16/2006 6:06 PM
	Microsoft Corporation		c:\windows\system32\wbem\ncprov.dll
wbemsvc	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	58.00 KB (59,392 bytes)	
	6/16/2006 6:06 PM	Microsoft Corporation	c:\windows\system32\wbem\wbemsvc.dll
netman	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	457.00 KB (467,968 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\netman.dll
netshell	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	2.32 MB (2,437,120 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\netshell.dll
clusapi	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	127.00 KB (130,048 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\clusapi.dll
rasapi32	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	410.00 KB (419,840 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\rasapi32.dll
rasman	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	95.50 KB (97,792 bytes)	3/25/2005 6:00 AM
	Microsoft Corporation		c:\windows\system32\rasman.dll
tapi32	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	332.50 KB (340,480 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\tapi32.dll
wininet	6.00.3790.1830 (srv03_sp1_rtm.050324-1447)	1.13 MB (1,186,304 bytes)	
	3/25/2005 6:00 AM	Microsoft Corporation	c:\windows\system32\wininet.dll

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wzcsapi 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 49.00 KB (50,176 bytes) 3/24/2005 11:35 AM Microsoft Corporation c:\windows\system32\wzcsapi.dll

wzcsvc 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 492.00 KB (503,808 bytes) 3/24/2005 11:35 AM Microsoft Corporation c:\windows\system32\wzcsvc.dll

wmi 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 5.50 KB (5,632 bytes) 3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\wmi.dll

dhcpcsvc 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 219.00 KB (224,256 bytes) 3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\dhcpcsvc.dll

rasdlg 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 859.50 KB (880,128 bytes) 3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\rasdlg.dll

rasadhlp 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 12.00 KB (12,288 bytes) 3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\rasadhlp.dll

wbemcons 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 65.50 KB (67,072 bytes) 6/16/2006 6:06 PM Microsoft Corporation c:\windows\system32\wbem\wbemcons.dll

pchsvc 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 76.00 KB (77,824 bytes) 6/16/2006 6:08 PM Microsoft Corporation c:\windows\pchealth\helpctr\binaries\pchsvc.dll

ersvc 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 31.00 KB (31,744 bytes) 3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\ersvc.dll

msftesql 12.0.5626.1 152.20 KB (155,856 bytes) 8/26/2005 5:17 PM Microsoft Corporation c:\program files\microsoft sql server\mssql.1\mssql\binn\msftesql.exe

msfte 12.0.5626.1 3.63 MB (3,803,344 bytes) 8/26/2005 5:17 PM Microsoft Corporation c:\program files\microsoft sql server\mssql.1\mssql\binn\msfte.dll

dbghelp 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 1.22 MB (1,274,368 bytes) 3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\dbghelp.dll

msftepxy 12.0.5626.1 121.70 KB (124,624 bytes) 8/26/2005 5:17 PM Microsoft Corporation c:\program files\microsoft sql server\mssql.1\mssql\binn\msftepxy.dll

termsrv 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 354.50 KB (363,008 bytes) 6/16/2006 6:07 PM Microsoft Corporation c:\windows\system32\termsrv.dll

icaapi 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 27.50 KB (28,160 bytes) 6/16/2006 6:07 PM Microsoft Corporation c:\windows\system32\icaapi.dll

mstlsapi 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 187.00 KB (191,488 bytes) 3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\mstlsapi.dll

explorer 6.00.3790.1830 (srv03\_sp1\_rtm.050324-1447) 1.30 MB (1,364,480 bytes) 3/25/2005 6:00 AM Microsoft Corporation c:\windows\explorer.exe

browseui 6.00.3790.1830 (srv03\_sp1\_rtm.050324-1447) 1.53 MB (1,601,536 bytes) 3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\browseui.dll

shdocvw 6.00.3790.1830 (srv03\_sp1\_rtm.050324-1447) 2.30 MB (2,416,128 bytes) 3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\shdocvw.dll

cryptui 5.131.3790.1830 (srv03\_sp1\_rtm.050324-1447) 705.50 KB (722,432 bytes) 3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\cryptui.dll

themeui 6.00.3790.1830 (srv03\_sp1\_rtm.050324-1447) 530.50 KB (543,232 bytes) 3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\themeui.dll

msimg32 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 6.50 KB (6,656 bytes) 3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\msimg32.dll

actxprxy 6.00.3790.1830 (srv03\_sp1\_rtm.050324-1447) 220.50 KB (225,792 bytes) 3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\actxprxy.dll

linkinfo 5.2.3790.1830 (srv03\_sp1\_rtm.050324-1447) 30.00 KB (30,720 bytes) 3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\linkinfo.dll

ntshru 6.00.3790.1830 (srv03\_sp1\_rtm.050324-1447) 184.00 KB (188,416 bytes) 3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\ntshru.dll

webcheck 6.00.3790.1830 (srv03\_sp1\_rtm.050324-1447) 439.00 KB (449,536 bytes) 3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\webcheck.dll

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wsock32	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	24.50 KB (25,088 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\wsock32.dll
stobject	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	142.50 KB (145,920 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\stobject.dll
batmeter	6.00.3790.1830 (srv03_sp1_rtm.050324-1447)	41.50 KB (42,496 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\batmeter.dll
powrprof	6.00.3790.1830 (srv03_sp1_rtm.050324-1447)	32.50 KB (33,280 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\powrprof.dll
browselec	6.00.3790.1830 (srv03_sp1_rtm.050324-1447)	63.00 KB (64,512 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\browselec.dll
urlmon	6.00.3790.1830 (srv03_sp1_rtm.050324-1447)	1.02 MB (1,074,176 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\urlmon.dll
drprov	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	24.00 KB (24,576 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\drprov.dll
ntlanman	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	71.50 KB (73,216 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\ntlanman.dll
netui0	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	130.00 KB (133,120 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\netui0.dll
netui1	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	338.50 KB (346,624 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\netui1.dll
davclnt	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	38.00 KB (38,912 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\davclnt.dll
mlang	6.00.3790.1830 (srv03_sp1_rtm.050324-1447)	686.00 KB (702,464 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\mlang.dll
mydocs	6.00.3790.1830 (srv03_sp1_rtm.050324-1447)	101.00 KB (103,424 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\mydocs.dll
shdoclc	6.00.3790.1830 (srv03_sp1_rtm.050324-1447)	589.50 KB (603,648 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\shdoclc.dll
zipfldr	6.00.3790.1830 (srv03_sp1_rtm.050324-1447)	449.50 KB (460,288 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\zipfldr.dll
wpabaln	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	33.50 KB (34,304 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\wpabaln.exe
helpctr	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	1.30 MB (1,363,456 bytes)
	6/16/2006 6:08 PM Microsoft Corporation	c:\windows\pchealth\helpctr\binaries\helpctr.exe
hcappres	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	7.50 KB (7,680 bytes)
	6/16/2006 6:08 PM Microsoft Corporation	c:\windows\pchealth\helpctr\binaries\hcappres.dll
itss	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	208.00 KB (212,992 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\itss.dll
msxml3	8.70.1104.0	2.04 MB (2,141,184 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\msxml3.dll
pchshell	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	155.00 KB (158,720 bytes)
	6/16/2006 6:08 PM Microsoft Corporation	c:\windows\pchealth\helpctr\binaries\pchshell.dll
mshtml	6.00.3790.1830 (srv03_sp1_rtm.050324-1447)	5.65 MB (5,928,448 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\mshtml.dll
msls31	3.10.349.0	357.00 KB (365,568 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\msls31.dll
msimtf	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	380.50 KB (389,632 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\msimtf.dll
msctf	5.2.3790.1830 (srv03_sp1_rtm.050324-1447)	617.50 KB (632,320 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\msctf.dll
jscript	5.6.0.8827	974.50 KB (997,888 bytes)
	3/25/2005 6:00 AM Microsoft Corporation	c:\windows\system32\jscript.dll

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imm32 5.2.3790.1830 (srv03_sp1_rtm.050324-1447) 208.00 KB (212,992 bytes)
      3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\imm32.dll
mshtml 6.00.3790.1830 (srv03_sp1_rtm.050324-1447) 905.50 KB (927,232 bytes)
      3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\mshtml.dll
vbscript 5.6.0.8827 646.50 KB (662,016 bytes) 3/25/2005 6:00 AM Microsoft
Corporation c:\windows\system32\vbscript.dll
msinfo 5.2.3790.1830 (srv03_sp1_rtm.050324-1447) 636.00 KB (651,264 bytes)
      6/16/2006 6:08 PM Microsoft Corporation
c:\windows\pchealth\helpctr\binaries\msinfo.dll
mfc42u 6.50.9146.0 1.39 MB (1,462,272 bytes) 3/25/2005 6:00 AM Microsoft
Corporation c:\windows\system32\mfc42u.dll
comdlg32 6.00.3790.1830 (srv03_sp1_rtm.050324-1447) 446.50 KB (457,216 bytes)
      3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\comdlg32.dll
riched32 5.2.3790.1830 (srv03_sp1_rtm.050324-1447) 7.00 KB (7,168 bytes)
      3/25/2005 6:00 AM Microsoft Corporation c:\windows\system32\riched32.dll
riched20 5.31.23.1224 1.10 MB (1,157,120 bytes) 3/25/2005 6:00 AM
Microsoft Corporation c:\windows\system32\riched20.dll
wbemprox 5.2.3790.1830 (srv03_sp1_rtm.050324-1447) 38.00 KB (38,912 bytes)
      6/16/2006 6:06 PM Microsoft Corporation
c:\windows\system32\wbem\wbemprox.dll
helpsvc 5.2.3790.1830 (srv03_sp1_rtm.050324-1447) 1.52 MB (1,591,296 bytes)
      6/16/2006 6:08 PM Microsoft Corporation
c:\windows\pchealth\helpctr\binaries\helpsvc.exe

```

[Services]

Display_Name	Name	State	Start_Mode	Service_Type	Path	Error_Control
Start_Name	Tag_ID					
Application Experience Lookup Service	AeLookupSvc	Running	Auto	Share Process	c:\windows\system32\svchost.exe -k netsvcs	0
Alerter	Alerter	Stopped	Disabled	Share Process	c:\windows\system32\svchost.exe -k localservice	0
AUTHORITY\LocalService						
Application Layer Gateway Service	ALG	Stopped	Manual	Own Process	c:\windows\system32\alg.exe	0
Application Management	AppMgmt	Stopped	Manual	Share Process	c:\windows\system32\svchost.exe -k netsvcs	0
ASP.NET State Service	aspnet_state	Stopped	Manual	Own Process	c:\windows\microsoft.net\framework64\v2.0.50727\aspnet_state.exe	0
AUTHORITY\NetworkService						
Windows Audio	AudioSrv	Stopped	Manual	Share Process	c:\windows\system32\svchost.exe -k netsvcs	0
Background Intelligent Transfer Service	BITS	Stopped	Manual	Share Process	c:\windows\system32\svchost.exe -k netsvcs	0
Computer Browser	Browser	Running	Auto	Share Process	c:\windows\system32\svchost.exe -k netsvcs	0
Indexing Service	CiSvc	Stopped	Disabled	Share Process	c:\windows\system32\cisvc.exe	0
ClipBook	ClipSrv	Stopped	Disabled	Own Process	c:\windows\system32\clipsrv.exe	0
.NET Runtime Optimization Service	v2.0.50727_X86	Stopped	Manual	Own Process	c:\windows\microsoft.net\framework\v2.0.50727\mscorsvw.exe	0



## Appendix C – Tunable Parameters

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```
.NET Runtime Optimization Service v2.0.50727_x64    clr_optimization_v2.0.50727_64
  Stopped      Manual Own Process
  c:\windows\microsoft.net\Framework64\v2.0.50727\mscorsvw.exe Ignore LocalSystem
  0
COM+ System Application      COMSysApp  Stopped      Manual Own Process
  c:\windows\system32\dlhhost.exe /processid:{02d4b3f1-fd88-11d1-960d-00805fc79235}
  Normal LocalSystem  0
Cryptographic Services CryptSvc      Running      Auto  Share Process
  c:\windows\system32\svchost.exe -k netsvcs Normal LocalSystem  0
DCOM Server Process Launcher DcomLaunch Running      Auto  Share Process
  c:\windows\system32\svchost.exe -k dcomlaunch Normal LocalSystem  0
Distributed File System Dfs      Stopped      Manual Own Process
  c:\windows\system32\dfssvc.exe Normal LocalSystem  0
DHCP Client Dhcp      Running      Auto  Share Process
  c:\windows\system32\svchost.exe -k networkservice Normal NT
AUTHORITY\NetworkService  0
Logical Disk Manager Administrative Service dmadmin      Stopped      Manual Share
Process      c:\windows\system32\dmadmin.exe /com Normal LocalSystem  0
Logical Disk Manager dmserver      Running      Auto  Share Process
  c:\windows\system32\svchost.exe -k netsvcs Normal LocalSystem  0
DNS Client Dnscache      Running      Auto  Share Process
  c:\windows\system32\svchost.exe -k networkservice Normal NT
AUTHORITY\NetworkService  0
Error Reporting Service ERSvc      Running      Auto  Share Process
  c:\windows\system32\svchost.exe -k winerr Ignore LocalSystem  0
Event Log Eventlog      Running      Auto  Share Process
  c:\windows\system32\services.exe Normal LocalSystem  0
COM+ Event System EventSystem Running      Auto  Share Process
  c:\windows\system32\svchost.exe -k netsvcs Normal LocalSystem  0
Help and Support helpsvc      Running      Manual Share Process
  c:\windows\system32\svchost.exe -k netsvcs Normal LocalSystem  0
Human Interface Device Access HidServ Stopped      Disabled      Share Process
  c:\windows\system32\svchost.exe -k netsvcs Normal LocalSystem  0
HTTP SSL HTTPFilter      Stopped      Manual Share Process
  c:\windows\system32\lsass.exe Normal LocalSystem  0
IAS Jet Database Access IASJet      Stopped      Manual Share Process
  c:\windows\syswow64\svchost.exe -k iasjet Normal LocalSystem  0
IMAPI CD-Burning COM Service ImapiService Stopped      Disabled      Own
Process      c:\windows\system32\imapi.exe Normal LocalSystem  0
Intersite Messaging IsmServ      Stopped      Disabled      Own Process
  c:\windows\system32\ismserv.exe Normal LocalSystem  0
Kerberos Key Distribution Center kdc      Stopped      Disabled      Share Process
  c:\windows\system32\lsass.exe Normal LocalSystem  0
Server lanmanserver      Running      Auto  Share Process
  c:\windows\system32\svchost.exe -k netsvcs Normal LocalSystem  0
Workstation lanmanworkstation Running      Auto  Share Process
  c:\windows\system32\svchost.exe -k netsvcs Normal LocalSystem  0
License Logging LicenseService Stopped      Disabled      Own Process
  c:\windows\system32\lssrv.exe Normal NT AUTHORITY\NetworkService  0
TCP/IP NetBIOS Helper LmHosts      Running      Auto  Share Process
  c:\windows\system32\svchost.exe -k localservice Normal NT
AUTHORITY\LocalService  0
Messenger Messenger      Stopped      Disabled      Share Process
  c:\windows\system32\svchost.exe -k netsvcs Normal LocalSystem  0
```

## Appendix C – Tunable Parameters

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NetMeeting Remote Desktop Sharing Process	mnmsrvc	Stopped	Disabled	Own
c:\windows\system32\mnmsrvc.exe Normal LocalSystem 0				
Distributed Transaction Coordinator	MSDTCRunning	Auto	Own Process	
c:\windows\system32\msdtc.exe Normal NT AUTHORITY\NetworkService 0				
SQL Server FullText Search (MSSQLSERVER) Process	msftesql	Running	Auto	Own
"c:\program files\microsoft sql server\mssql.1\mssql\binn\msftesql.exe" -s:mssql.1-f:mssqlserver Normal LocalSystem 0				
Windows Installer	MSIServer	Stopped	Manual Share Process	
c:\windows\system32\msiexec.exe /v Normal LocalSystem 0				
SQL Server (MSSQLSERVER)	MSSQLSERVER	Stopped	Manual Own Process	
"c:\program files\microsoft sql server\mssql.1\mssql\binn\sqlservr.exe" -smssqlserver Normal LocalSystem 0				
SQL Server Active Directory Helper	MSSQLServerADHelper	Stopped	Disabled	
Own Process "c:\program files\microsoft sql server\90\shared\sqladhlp90.exe" Normal NT AUTHORITY\NetworkService 0				
Network DDE	NetDDE	Stopped	Disabled	Share Process
c:\windows\system32\netdde.exe Normal LocalSystem 0				
Network DDE DSDM	NetDDEdsdm	Stopped	Disabled	Share Process
c:\windows\system32\netdde.exe Normal LocalSystem 0				
Net Logon	Netlogon	Stopped	Manual Share Process	
c:\windows\system32\lsass.exe Normal LocalSystem 0				
Network Connections	NetmanRunning		Manual Share Process	
c:\windows\system32\svchost.exe -k netsvcs Normal LocalSystem 0				
Network Location Awareness (NLA)	Nla	Running	Manual Share Process	
c:\windows\system32\svchost.exe -k netsvcs Normal LocalSystem 0				
File Replication Service	NtFrs	Stopped	Manual Own Process	c:\windows\system32\ntfrs.exe
Ignore LocalSystem 0				
NT LM Security Support Provider	NtLmSsp	Running	Manual Share Process	
c:\windows\system32\lsass.exe Normal LocalSystem 0				
Removable Storage	NtmsSvc	Stopped	Manual Share Process	
c:\windows\system32\svchost.exe -k netsvcs Normal LocalSystem 0				
Office Source Engine	ose	Stopped	Manual Own Process	"c:\program files (x86)\common files\microsoft shared\source engine\ose.exe" Normal LocalSystem 0
Plug and Play	PlugPlay	Running	Auto	Share Process
c:\windows\system32\services.exe Normal LocalSystem 0				
IPSEC Services Policy Agent	Running	Auto	Share Process	
c:\windows\system32\lsass.exe Normal LocalSystem 0				
Protected Storage	ProtectedStorage	Running	Auto	Share Process
c:\windows\system32\lsass.exe Normal LocalSystem 0				
Remote Access Auto Connection Manager Process	RasAuto	Stopped	Manual Share	
c:\windows\system32\svchost.exe -k netsvcs Normal LocalSystem 0				
Remote Access Connection Manager	RasMan	Stopped	Manual Share Process	
c:\windows\system32\svchost.exe -k netsvcs Normal LocalSystem 0				
Remote Desktop Help Session Manager	RDSessMgr	Stopped	Manual Own Process	
c:\windows\system32\sessmgr.exe Normal LocalSystem 0				
Routing and Remote Access	RemoteAccess	Stopped	Disabled	Share Process
c:\windows\system32\svchost.exe -k netsvcs Normal LocalSystem 0				
Remote Registry	RemoteRegistry	Running	Auto	Share Process
c:\windows\system32\svchost.exe -k regsvc Normal NT AUTHORITY\LocalService 0				
Remote Procedure Call (RPC) Locator	RpcLocator	Stopped	Manual Own Process	
c:\windows\system32\locator.exe Normal NT AUTHORITY\NetworkService 0				

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## Appendix C – Tunable Parameters

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Remote Procedure Call (RPC)	RpcSs	Running	Auto	Share Process
c:\windows\system32\svchost.exe -k rpcss			Normal	NT
AUTHORITY\NetworkService		0		
Resultant Set of Policy Provider	RSOPProv	Stopped	Manual	Share Process
c:\windows\system32\rsopprov.exe			Normal	LocalSystem 0
Special Administration Console Helper	sacsvr	Stopped	Manual	Share Process
c:\windows\system32\svchost.exe -k netsvcs			Normal	LocalSystem 0
Security Accounts Manager	SamSs	Running	Auto	Share Process
c:\windows\system32\lsass.exe			Normal	LocalSystem 0
Smart Card	SCardSvr	Stopped	Manual	Share Process
c:\windows\system32\scardsvr.exe			Ignore	NT AUTHORITY\LocalService 0
Task Scheduler	Schedule	Running	Auto	Share Process
c:\windows\system32\svchost.exe -k netsvcs			Normal	LocalSystem 0
Secondary Logon	seclogon	Running	Auto	Share Process
c:\windows\system32\svchost.exe -k netsvcs			Ignore	LocalSystem 0
System Event Notification	SENS	Running	Auto	Share Process
c:\windows\system32\svchost.exe -k netsvcs			Normal	LocalSystem 0
Windows Firewall/Internet Connection Sharing (ICS)		Disabled	Share Process	Stopped
c:\windows\system32\svchost.exe -k netsvcs			Normal	LocalSystem 0
Shell Hardware Detection	ShellHWDetection	Running	Auto	Share Process
c:\windows\system32\svchost.exe -k netsvcs			Ignore	LocalSystem 0
Print Spooler	Spooler	Stopped	Manual	Own Process
c:\windows\system32\spoolsv.exe			Normal	LocalSystem 0
SQL Server Browser	SQLBrowser	Stopped	Disabled	Own Process
"c:\program files (x86)\microsoft sql server\90\shared\sqlbrowser.exe"			Normal	LocalSystem 0
SQL Server Agent (MSSQLSERVER)	SQLSERVERAGENT	Stopped	Manual	Own Process
"c:\program files\microsoft sql server\mssql.1\mssql\binn\sqlagent90.exe" -i			Normal	LocalSystem 0
SQL Server VSS Writer	SQLWriter	Stopped	Manual	Own Process
"c:\program files\microsoft sql server\90\shared\sqlwriter.exe"			Normal	LocalSystem 0
Windows Image Acquisition (WIA)	stisvc	Stopped	Disabled	Share Process
c:\windows\system32\svchost.exe -k imgsvc			Normal	NT AUTHORITY\LocalService 0
Microsoft Software Shadow Copy Provider	swprv	Stopped	Manual	Own Process
c:\windows\system32\svchost.exe -k swprv			Normal	LocalSystem 0
Performance Logs and Alerts	SysmonLog	Stopped	Auto	Own Process
c:\windows\system32\smlogsvc.exe			Normal	NT Authority\NetworkService 0
Telephony	TapiSrv	Stopped	Manual	Share Process
c:\windows\system32\svchost.exe -k tapisrv			Normal	LocalSystem 0
Terminal Services	TermService	Running	Manual	Share Process
c:\windows\system32\svchost.exe -k termsvc			Normal	LocalSystem 0
Themes	Themes	Stopped	Disabled	Share Process
c:\windows\system32\svchost.exe -k netsvcs			Normal	LocalSystem 0
Telnet	TlntSvr	Stopped	Disabled	Own Process
c:\windows\system32\tlntsvr.exe			Normal	NT AUTHORITY\LocalService 0
Distributed Link Tracking Server	TrkSvr	Stopped	Disabled	Share Process
c:\windows\system32\svchost.exe -k netsvcs			Normal	LocalSystem 0
Distributed Link Tracking Client	TrkWks	Running	Auto	Share Process
c:\windows\system32\svchost.exe -k netsvcs			Normal	LocalSystem 0
Terminal Services Session Directory	Tssdis	Stopped	Disabled	Own Process
c:\windows\system32\tssdis.exe			Normal	LocalSystem 0
Windows User Mode Driver Framework	UMWdf	Stopped	Manual	Own Process
c:\windows\system32\wdfmgr.exe			Normal	NT AUTHORITY\LocalService 0

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## Appendix C – Tunable Parameters

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Uninterruptible Power Supply  UPS  Stopped      Manual Own Process
    c:\windows\system32\ups.exe  Normal NT AUTHORITY\LocalService  0
Virtual Disk Service          vds  Stopped      Manual Own Process
    c:\windows\system32\vds.exe  Normal LocalSystem  0
Volume Shadow Copy           VSS  Stopped      Manual Own Process
    c:\windows\system32\vssvc.exe Normal LocalSystem  0
Windows Time                  W32Time  Running      Auto  Share Process
    c:\windows\system32\svchost.exe -k localservice  Normal NT
AUTHORITY\LocalService      0
WebClient                     WebClient  Stopped      Disabled  Share Process
    c:\windows\system32\svchost.exe -k localservice  Normal NT
AUTHORITY\LocalService      0
WinHTTP Web Proxy Auto-Discovery Service  WinHttpAutoProxySvc  Stopped      Manual
    Share Process  c:\windows\system32\svchost.exe -k localservice  Normal NT
AUTHORITY\LocalService      0
Windows Management Instrumentation  winmgmt  Running      Auto  Share Process
    c:\windows\system32\svchost.exe -k netsvcs  Ignore LocalSystem  0
Portable Media Serial Number Service  WmdmPmSN  Stopped      Manual Share Process
    c:\windows\system32\svchost.exe -k netsvcs  Normal LocalSystem  0
Windows Management Instrumentation Driver Extensions  Wmi  Stopped      Manual
    Share Process  c:\windows\system32\svchost.exe -k netsvcs  Normal LocalSystem
    0
WMI Performance Adapter      WmiApSrv  Stopped      Manual Own Process
    c:\windows\system32\wbem\wmiapsrv.exe  Normal LocalSystem  0
Automatic Updates            wuauclt  Stopped      Manual Share Process
    c:\windows\system32\svchost.exe -k netsvcs  Normal LocalSystem  0
Wireless Configuration       WZCSCV  Stopped      Manual Share Process
    c:\windows\system32\svchost.exe -k netsvcs  Normal LocalSystem  0
Network Provisioning Service  xmlprov  Stopped      Manual Share Process
    c:\windows\system32\svchost.exe -k netsvcs  Normal LocalSystem  0

```

### [Program Groups]

```

Group_Name  Name  User_Name
Accessories  Default User:Accessories  Default User
Accessories\Accessibility  Default User:Accessories\Accessibility  Default User
Accessories\Entertainment  Default User:Accessories\Entertainment  Default User
Startup  Default User:Startup  Default User
Accessories  All Users:Accessories  All Users
Accessories\Accessibility  All Users:Accessories\Accessibility  All Users
Accessories\Communications  All Users:Accessories\Communications  All Users
Accessories\Entertainment  All Users:Accessories\Entertainment  All Users
Accessories\System Tools  All Users:Accessories\System Tools  All Users
Administrative Tools  All Users:Administrative Tools  All Users
Microsoft SQL Server 2005  All Users:Microsoft SQL Server 2005  All Users
Microsoft SQL Server 2005\Analysis Services  All Users:Microsoft SQL Server 2005\Analysis
Services  All Users
Microsoft SQL Server 2005\Configuration Tools  All Users:Microsoft SQL Server
2005\Configuration Tools  All Users
Microsoft SQL Server 2005\Performance Tools  All Users:Microsoft SQL Server
2005\Performance Tools  All Users
Startup  All Users:Startup  All Users
Accessories  NT AUTHORITY\SYSTEM:Accessories  NT AUTHORITY\SYSTEM
Accessories\Accessibility  NT AUTHORITY\SYSTEM:Accessories\Accessibility  NT
AUTHORITY\SYSTEM

```

## Appendix C – Tunable Parameters

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Accessories\Entertainment NT AUTHORITY\SYSTEM:Accessories\Entertainment NT AUTHORITY\SYSTEM  
Startup NT AUTHORITY\SYSTEM:Startup NT AUTHORITY\SYSTEM  
Accessories PE2900\Administrator:Accessories PE2900\Administrator  
Accessories\Accessibility PE2900\Administrator:Accessories\Accessibility PE2900\Administrator  
Accessories\Entertainment PE2900\Administrator:Accessories\Entertainment PE2900\Administrator  
Administrative Tools PE2900\Administrator:Administrative Tools PE2900\Administrator  
Startup PE2900\Administrator:Startup PE2900\Administrator

### [Startup Programs]

Program	Command	User_Name	Location
desktopdesktop.ini		NT AUTHORITY\SYSTEM	Startup
desktopdesktop.ini		PE2900\Administrator	Startup
desktopdesktop.ini	.DEFAULT	Startup	
desktopdesktop.ini	All Users	Common	Startup

### [OLE Registration]

Object	Local_Server
Sound (OLE2)	sndrec32.exe
Media Clip	mplay32.exe
Video Clip	mplay32.exe /avi
MIDI Sequence	mplay32.exe /mid
Sound	Not Available
Media Clip	Not Available
WordPad Document	"%programfiles%\windows nt\accessories\wordpad.exe"
Bitmap Image	mspaint.exe

### [Windows Error Reporting]

Time	Type	Details
------	------	---------

### [Internet Settings]

### [Internet Explorer]

### [Summary]

Item	Value
Version	6.0.3790.1830
Build	63790.1830
Application Path	C:\Program Files\Internet Explorer
Language	English (United States)
Active Printer	Not Available

Cipher Strength 128-bit  
Content Advisor Disabled

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## Appendix C – Tunable Parameters

IEAK Install No

[File Versions]

File	Version	Size	Date	Path	Company
actxprxy.dll	6.0.3790.1830	221 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	Microsoft Corporation
actxprxy.dll	6.0.3790.1830	221 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
advpack.dll	6.0.3790.1830	146 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	Microsoft Corporation
advpack.dll	6.0.3790.1830	146 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
asctrls.ocx	6.0.3790.1830	147 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	Microsoft Corporation
asctrls.ocx	6.0.3790.1830	147 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
browsecl.dll	6.0.3790.1830	63 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	Microsoft Corporation
browsecl.dll	6.0.3790.1830	63 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
browseui.dll	6.0.3790.1830	1,564 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	Microsoft Corporation
browseui.dll	6.0.3790.1830	1,564 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
cdfview.dll	6.0.3790.1830	216 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	Microsoft Corporation
cdfview.dll	6.0.3790.1830	216 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
comctl32.dll	5.82.3790.1830	935 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	Microsoft Corporation
comctl32.dll	5.82.3790.1830	935 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
dxtmsft.dll	6.3.3790.1830	320 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	Microsoft Corporation
dxtmsft.dll	6.3.3790.1830	320 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
dxtrans.dll	6.3.3790.1830	549 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	Microsoft Corporation
dxtrans.dll	6.3.3790.1830	549 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
iecont.dll	<File Missing>	Not Available	Not Available	Not Available	Not Available
iecontlc.dll	<File Missing>	Not Available	Not Available	Not Available	Not Available
iedkcs32.dll	16.0.3790.1830	417 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	Microsoft Corporation
iedkcs32.dll	16.0.3790.1830	417 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
iepeers.dll	6.0.3790.1830	361 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	Microsoft Corporation
iepeers.dll	6.0.3790.1830	361 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
iesetup.dll	6.0.3790.1830	71 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	Microsoft Corporation
iesetup.dll	6.0.3790.1830	71 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
ieuinit.inf	Not Available	24 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	Not Available
ieuinit.inf	Not Available	24 KB	3/25/2005 7:00:00 AM	.	Not Available
ieexplore.exe	6.0.3790.1830	94 KB	3/25/2005 7:00:00 AM	C:\Program Files\Internet Explorer	Microsoft Corporation
imgutil.dll	6.0.3790.1830	61 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	Microsoft Corporation
imgutil.dll	6.0.3790.1830	61 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
inetcpl.cpl	6.0.3790.1830	428 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	Microsoft Corporation
inetcpl.cpl	6.0.3790.1830	428 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation

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inetcpic.dll	6.0.3790.1830	110 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	
Microsoft Corporation					
inetcpic.dll	6.0.3790.1830	110 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
inseng.dll	6.0.3790.1830	147 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	
Microsoft Corporation					
inseng.dll	6.0.3790.1830	147 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
mlang.dll	6.0.3790.1830	686 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	
Microsoft Corporation					
mlang.dll	6.0.3790.1830	686 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
msencode.dll	<File Missing>	Not Available	Not Available	Not Available	Not Available
mshta.exe	6.0.3790.1830	38 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	
Microsoft Corporation					
mshta.exe	6.0.3790.1830	38 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
mshtml.dll	6.0.3790.1830	5,790 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	Microsoft Corporation
Microsoft Corporation					
mshtml.dll	6.0.3790.1830	5,790 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
Microsoft Corporation					
mshtml.tlb	6.0.3790.1830	1,320 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	Microsoft Corporation
Microsoft Corporation					
mshtml.tlb	6.0.3790.1830	1,320 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
Microsoft Corporation					
mshtmlled.dll	6.0.3790.1830	906 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	
Microsoft Corporation					
mshtmlled.dll	6.0.3790.1830	906 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
mshtmler.dll	6.0.3790.1830	56 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	
Microsoft Corporation					
mshtmler.dll	6.0.3790.1830	56 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
msident.dll	6.0.3790.1830	69 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	
Microsoft Corporation					
msident.dll	6.0.3790.1830	69 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
msidentld.dll	6.0.3790.1830	16 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	
Microsoft Corporation					
msidentld.dll	6.0.3790.1830	16 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
msieftp.dll	6.0.3790.1830	369 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	
Microsoft Corporation					
msieftp.dll	6.0.3790.1830	369 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
msrating.dll	6.0.3790.1830	240 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	
Microsoft Corporation					
msrating.dll	6.0.3790.1830	240 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
mstime.dll	6.0.3790.1830	878 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	
Microsoft Corporation					
mstime.dll	6.0.3790.1830	878 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
occache.dll	6.0.3790.1830	126 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	
Microsoft Corporation					
occache.dll	6.0.3790.1830	126 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
proctexe.ocx	<File Missing>	Not Available	Not Available	Not Available	Not Available
sendmail.dll	6.0.3790.1830	64 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	
Microsoft Corporation					
sendmail.dll	6.0.3790.1830	64 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
shdoclc.dll	6.0.3790.1830	590 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	
Microsoft Corporation					
shdoclc.dll	6.0.3790.1830	590 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
shdocvw.dll	6.0.3790.1830	2,360 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	Microsoft Corporation

## Appendix C – Tunable Parameters

---

shdocvw.dll	6.0.3790.1830	2,360 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
shfolder.dll	6.0.3790.1830	34 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	Microsoft Corporation
shfolder.dll	6.0.3790.1830	34 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
shlwapi.dll	6.0.3790.1830	607 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	Microsoft Corporation
shlwapi.dll	6.0.3790.1830	607 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
tdc.ocx	1.3.0.3130	91 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	Microsoft Corporation
tdc.ocx	1.3.0.3130	91 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
url.dll	6.0.3790.1830	40 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	Microsoft Corporation
url.dll	6.0.3790.1830	40 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
urlmon.dll	6.0.3790.1830	1,049 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	Microsoft Corporation
urlmon.dll	6.0.3790.1830	1,049 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
webcheck.dll	6.0.3790.1830	439 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	Microsoft Corporation
webcheck.dll	6.0.3790.1830	439 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation
wininet.dll	6.0.3790.1830	1,159 KB	3/25/2005 7:00:00 AM	C:\WINDOWS\system32	Microsoft Corporation
wininet.dll	6.0.3790.1830	1,159 KB	3/25/2005 7:00:00 AM	.	Microsoft Corporation

### [Connectivity]

Item	Value
Connection Preference	Never dial

### LAN Settings

AutoConfigProxy	wininet.dll
AutoProxyDetectMode	Enabled
AutoConfigURL	
Proxy	Disabled
ProxyServer	
ProxyOverride	

### [Cache]

### [Summary]

Item	Value
Page Refresh Type	Automatic
Temporary Internet Files Folder	C:\Documents and Settings\Administrator\Local Settings\Temporary Internet Files
Total Disk Space	Not Available
Available Disk Space	Not Available
Maximum Cache Size	Not Available
Available Cache Size	Not Available



## Appendix C – Tunable Parameters

---

### [List of Objects]

Program\_File Status CodeBase  
No cached object information available

### [Content]

### [Summary]

Item	Value
Content Advisor	Disabled

### [Personal Certificates]

Issued_To	Issued_By	Validity	Signature_Algorithm
No personal certificate information available			

### [Other People Certificates]

Issued_To	Issued_By	Validity	Signature_Algorithm
No other people certificate information available			

### [Publishers]

Name
No publisher information available

### [Security]

Zone	Security_Level
My Computer	Custom
Local intranet	Custom
Trusted sites	Custom
Internet High	
Restricted sites	Custom

# Appendix C – Tunable Parameters

---

## RTE Input Parameters

Profile: 5300\_pe2900

File Path: C:\Program Files\BenchCraft\5300\_pe2900.xml

Version: 5

Number of Engines: 4

Name: DRIVER1

Description: rte103\_1

Directory: c:\tpcclog\rte103\_1.log

Machine: rte103

Parameter Set: PARAM2

Index: 700000000

Seed: 59915

Configured Users: 13250

Pipe Name: DRIVER8-922426029

Connect Rate: 650

Start Rate: 650

Max. Concurrency: -1

Concurrency Rate: 10

CLIENT\_NURAND: 233

CPU: 0

Additional Options:

## Appendix C – Tunable Parameters

---

Name: DRIVER2

Description: rte103\_2

Directory: c:\tpcclog\rte103\_2.log

Machine: rte103

Parameter Set: PARAM2

Index: 100000000

Seed: 59915

Configured Users: 13250

Pipe Name: DRIVER2-1764008608

Connect Rate: 650

Start Rate: 650

Max. Concurrency: -1

Concurrency Rate: 10

CLIENT\_NURAND: 233

CPU: 1

Additional Options:

Name: DRIVER3

Description: rte104\_1

Directory: c:\tpcclog\rte104\_1.log

Machine: rte104

Parameter Set: PARAM2

Index: 200000000

## Appendix C – Tunable Parameters

---

Seed: 59915

Configured Users: 13250

Pipe Name: DRIVER3-1689047983

Connect Rate: 650

Start Rate: 650

Max. Concurrency: -1

Concurrency Rate: 10

CLIENT\_NURAND: 233

CPU: 0

Additional Options:

Name: DRIVER4

Description: rte104\_2

Directory: c:\tpcclog\ret104\_2.log

Machine: rte104

Parameter Set: PARAM2

Index: 300000000

Seed: 59915

Configured Users: 13250

Pipe Name: DRIVER4190963968

Connect Rate: 650

Start Rate: 650

Max. Concurrency: -1

Concurrency Rate: 10

## Appendix C – Tunable Parameters

---

CLIENT\_NURAND: 233

CPU: 1

Additional Options:

Number of User groups: 4

Driver Engine: DRIVER1

IIS Server: client22

SQL Server: pe2900

Database: tpcc

User: sa

Protocol: HTML

w\_id Range: 1 - 1325

w\_id Min Warehouse: 1

w\_id Max Warehouse: 5300

Scale: Normal

User Count: 13250

District id: 1

Scale Down: No

Driver Engine: DRIVER2

IIS Server: client22

SQL Server: pe2900

Database: tpcc

## Appendix C – Tunable Parameters

---

User: sa

Protocol: HTML

w\_id Range: 1326 - 2650

w\_id Min Warehouse: 1

w\_id Max Warehouse: 5300

Scale: Normal

User Count: 13250

District id: 1

Scale Down: No

Driver Engine: DRIVER3

IIS Server: client22

SQL Server: pe2900

Database: tpcc

User: sa

Protocol: HTML

w\_id Range: 2651 - 3975

w\_id Min Warehouse: 1

w\_id Max Warehouse: 5300

Scale: Normal

User Count: 13250

District id: 1

Scale Down: No

# Appendix C – Tunable Parameters

---

Driver Engine: DRIVER4

IIS Server: client22

SQL Server: pe2900

Database: tpcc

User: sa

Protocol: HTML

w\_id Range: 3976 - 5300

w\_id Min Warehouse: 1

w\_id Max Warehouse: 5300

Scale: Normal

User Count: 13250

District id: 1

Scale Down: No

Number of Parameter Sets: 5

~Default

Default Parameter Set

	Txn	Think	Key	RT	RT	Menu	
	Weight	Time	Time	Delay	Fence	Delay	
New Order		10.00	12.05	18.01	0.10	5.00	0.10
Payment		10.00	12.05	3.01	0.10	5.00	0.10
Delivery		1.00	5.05	2.01	0.10	5.00	0.10

## Appendix C – Tunable Parameters

---

Stock Level	1.00	5.05	2.01	0.10	20.00	0.10
Order Status	1.00	10.05	2.01	0.10	5.00	0.10

### PARAM2

Txn	Think	Key	RT	RT	Menu	
	Weight	Time	Time	Delay	Fence	Delay
New Order	44.84	12.04	18.02	0.10	5.00	0.10
Payment	43.04	12.04	3.02	0.10	5.00	0.10
Delivery	4.05	5.04	2.02	0.10	5.00	0.10
Stock Level	4.05	5.04	2.02	0.10	20.00	0.10
Order Status	4.05	10.04	2.02	0.10	5.00	0.10

### 50run

Txn	Think	Key	RT	RT	Menu	
	Weight	Time	Time	Delay	Fence	Delay
New Order	44.84	30.00	18.02	0.10	5.00	0.10
Payment	43.04	30.00	3.02	0.10	5.00	0.10
Delivery	4.05	15.00	2.02	0.10	5.00	0.10
Stock Level	4.05	15.00	2.02	0.10	20.00	0.10
Order Status	4.05	25.00	2.02	0.10	5.00	0.10

### 50run2



## Appendix C – Tunable Parameters

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Txn	Think	Key	RT	RT	Menu	
	Weight	Time	Time	Delay	Fence	Delay
New Order	44.84	33.00	18.02	0.10	5.00	0.10
Payment	43.04	33.00	3.02	0.10	5.00	0.10
Delivery	4.05	18.00	2.02	0.10	5.00	0.10
Stock Level	4.05	18.00	2.02	0.10	20.00	0.10
Order Status	4.05	28.00	2.02	0.10	5.00	0.10

80run

Txn	Think	Key	RT	RT	Menu	
	Weight	Time	Time	Delay	Fence	Delay
New Order	44.84	19.00	18.02	0.10	5.00	0.10
Payment	43.04	19.00	3.02	0.10	5.00	0.10
Delivery	4.05	14.00	2.02	0.10	5.00	0.10
Stock Level	4.05	14.00	2.02	0.10	20.00	0.10
Order Status	4.05	9.00	2.02	0.10	5.00	0.10

# Appendix E – Price Quotations

## Appendix D – Disk Storage


TPC-C 60 Day Space Requirements						
Warehouses	5300				TpmC	65,833.00
Table	Rows	Data KB	Index KB	Extra 5% KB	8hr Space	Total Space KB
Warehouse	5300	568	32	30		630
District	53000	5896	48	297		6241
Customer	159000000	115636368	7215024	6,142,570		128993962
History	159000000	9284680	216		1,845,276	9284896
NewOrder	47700000	849896	2144			852040
Orders	159000000	5191840	2532576		1,031,848	7724416
OrderLine	1589999090	104262240	245576		20,721,510	104507816
Item	100000	9416	48	473		9937
Stock	53000000	169600000	357568	8,497,878		178455446
<b>Total</b>		404,840,904	10,353,232	14,641,248	23,598,634	429,835,384
MB						
Dynamic Space	115,956	Sum of Data for Order, Orderline and History				
Static Space	303,805	Sum of Data+Index+5%-Dynamic Space				
Free Space	na	Total Allocated Spac - ( Dynamic + Static Space)				
Daily Growth	23,046	(Dynamic Space/(W*62.5))*tpmc				
Daily Spread	-	(Free Space -1.5*Daily Growth) Zero Assumed				
60 Day Space MB	1,686,538					
<b>60 Day Space GB</b>	<b>1,647.01</b>	<b>GB</b>				
Log Size	250,000	MB				
KB Per New Order	4.6921	KB				
8 hr log MB	144,797	MB				
<b>8 hr log GB</b>	<b>141.4029</b>	<b>GB</b>				
Space Usage	GB Needed	Disks Measured	GB Priced	Disk Size	Formatted Size	
60 Day Space DB	1,647.01	90	3075.00	36GB	34.167	
		0	0.00	9GB	8.195	
		0	0.00	4GB	3.999	
<b>Total DB</b>		<b>90.00</b>	<b>3075.00</b>	<b>9GB</b>		

## Appendix E – Price Quotations

8-hr log + mirror	282.8058	8	568.00	72GB	71.000	
OS, Swap	6	0	3.999	4GB		
<b>Total Storage</b>	<b>1,935.82</b>	<b>GB</b>	<b>3,647.00</b>	<b>GB</b>		

## Appendix E - Price Quotations

**LanAdapters.com**

Item	Options	Unit Price	Quantity	Subtotal	
 <a href="#">Cat5e 5ft Crossover Cable with molded ends 350 MHZ UL&amp;ETL Verified (backwards compatible with cat5)</a>	Select: gray	1.38	3	4.14	<a href="#">Remove</a>
<b>Subtotal for LanAdapters.com</b>				4.14	

Update Quantities      Check Out

Keep Shopping

## Appendix E – Price Quotations

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Microsoft Corporation  
One Microsoft Way  
Redmond, WA 98052-6399

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

**Microsoft**

June 16, 2006

Dell Inc.  
Dan Hambrick  
1 Dell Way  
Round Rock, TX 78680

Mr. Hambrick:

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

All pricing shown is in US Dollars (\$).

Part Number	Description	Unit Price	Quantity	Price
228-03128	<b>SQL Server 2005 Standard x64 Edition</b> <i>Per Processor License</i> <i>Discount Schedule: No Discount Applied</i>	\$5,999	1	\$5,999
P73-00295	<b>Windows Server 2003 Standard x64 Edition</b> <i>Server License Only - No CALs</i> <i>Discount Schedule: Open Program - No Level</i> <i>Unit Price reflects a 28% discount from the</i> <i>retail unit price of \$999.</i>	\$719	1	\$719
P73-00295	<b>Windows Server 2003 Standard Edition</b> <i>Server License Only - No CALs</i> <i>Discount Schedule: Open Program - No Level</i> <i>Unit Price reflects a 28% discount from the</i> <i>retail unit price of \$999.</i>	\$719	1	\$719
254-00170	<b>Visual C++ Standard Edition</b> <i>No Discounts Applied</i>	\$109	1	\$109
N/A	<b>Microsoft Problem Resolution Services</b> <i>Professional Support</i> <i>(1 Incident)</i>	\$245	1	\$245

All products are currently orderable through Microsoft's normal distribution channels.

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

This quote is valid for the next 90 days.

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

# Appendix E – Price Quotations

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Reference ID: PCdham0511103870.

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

RackSolutions.Com

**Innovation First**    Innovation First    RackSolutions    IFIRobotics    VexLabs

**Sign In** Frequent users can sign in to save time in the future.

**Current Order**

Part Number	Description	Quantity	Unit Price	Subtotal	
RACK-111-30-D	4 Post Rack 30U Dell Depth	<input type="text" value="1"/>	\$429.00	\$429.00	<a href="#">delete</a>

Call Shipping	
\$429.00	Subtotal
\$0.00	*Sales Tax
<b>\$429.00</b>	<b>Total</b>

No taxes on shipments outside the state of Texas. Call for tax exemption for Texas shipments: (903) 453-0801