RackSaver

TPC Benchmarκ™ C
Full Disclosure Report
for
QuatreX-64™
using
Microsoft SQL Server 2000
8.0 Enterprise Edition SP-3 - 32 bit
And
Microsoft Windows 2003
Enterprise Server - 32 bit

First Edition
Submitted:
April 21, 2003

First Version, April 21, 2003

RackSaver believes that the information included in this document is accurate as of the publication date. The information in this document is subject to change without notice. RackSaver is not responsible for any errors contained within this document. The pricing information in this FDR is accurate as of the publication date, April 21, 2003 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.

Table of Contents

Abstract

Overview

This report documents the methodology and results of the TPC Benchmark™ C test conducted on RackSaver QuatreX-64 Server. The tests were run in a client/server configuration using Eight RackSaver RS-1100's as clients. The operating system used for the benchmark was Microsoft Windows 2003 Enterprise Server on the database server and Microsoft Windows 2000 Server on the clients. The database was Microsoft SQL Server 2000 Enterprise Edition. Microsoft COM+ provided the database connection queues. All tests were done in compliance with Revision 5.0 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	Total Solution Availability Date
RackSaver QuatreX-64 Server	**Microsoft SQL Server 2000 Enterprise Edition** **Microsoft Windows 2003 Enterprise Server**	**$226,966**	**82,226.46**	**$2.76**	**Oct 21, 2003**

Auditor

The benchmark configuration, methodology, and results were audited by Lorna Livingtree of Performance Metrics, Inc. to validate compliance with the TPC specifications.

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

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

or

RackSaver
9449 Carroll Park Drive
San Diego, CA 92121
Phone: (858) 874-3800
www.racksaver.com

RackSaver
Leader in High-Density Servers!

QuatreX-64 Server 4P

TPC-C Rev 5.1

Report Date: April 21, 2003

Total System Cost	TPC-C Throughput	Price /Performance	Availability Date
$227,767	82,226.46	$2.76	Oct 21, 2003

Processors	Database Manager	Operating System	Other Software	Number of Users
4 AMD Opteron Processors Model 844 (3 HyperTransport Links, 1M Cache, 1.8 GHz)	Microsoft SQL Server 2000 Enterprise Edition SP3	Microsoft Server 2003, Enterprise Server	Microsoft Windows 2000 Server w/COM+ Microsoft Visual C++ Standard	66,000

Clients

Tyan RackSaver RS-1100
w/2 AMD Athlon MP 2400+ Processors, 256K Cache, 2.0 GHz, 1 GB RAM

20 RackSaver Disk Pods
270 18GB 15K SCSI Drives, 24 36 GB 15K SCSI Drives

Server

RackSaver QuatreX-64
w/4 AMD Opteron Processors Model 844, 3 HyperTransport Links, 1M Cache, 1.8 GHz, 32 GB RAM, 5 Compaq 5304/128 SMART Array Controllers

System Component	Qty	Server	Qty	Each Client
Processors	4	AMD Opteron Model 844 Processors (1.8 GHz)	2	AMD Athlon MP 2400+ Processors (2.0 GHz)
Cache		1 M		256 K
Memory	16	2 GB PC2100 DDR Reg.	2	512 MB P2100 DDR Reg.
Disk Controllers	5	Compaq 5304/128 SMART Array Controllers		
Disk Drives	270 24	18 GB SCSI Drives 15K 36 GB SCSI Drives 15K	1	80 GB EIDE
Total Storage		5.2 TB	1	80 GB

RackSaver	QuatreX-64 Server AMD Opteron 844 (4P, 1.8GHz) with 4 RackSaver RS-1100	TPC-C REV 5.1 Report Date: 21-April-2003

Description	Part Number	Third Party Brand	Third Party Pricing	Unit Price	Qty	Extended Price	3 yr. Maint. Price
Server Hardware							
Server Hardware (includes the following)			1	49,000	1	49,000	
Quatrex-64 Base System	BBAMQUATREX64				1	0	
AMD Opteron Processor Model 844 (1.8 GHz)	CPAMOP8441.8				4	0	
Compaq 5304/128 SMART Array Controller	COCO158939-B21				5	0	
DDR 2GB PC2100 ECC Reg LP	MEGEDGBERLP				16	0	
Western Digital IDE 40GB 7200 8MB	HDWE4018M72				1	0	
Slimline 24X CDROM/PANAS/BLK	24X1UCD-PANAS				1	0	
Sony 1.44, 3 1/2 Black	SONY1.44BLACK				1	0	
3 Year Warranty, 4 Hour Respone Time					1	0	
Server Storage							
Server Storage (includes the following)			1	4,440	20	88,800	
4U SCA RAID Chassis/400W black	RMC4D2-6-0S				20	0	
Seagate SCSI 18GB 15K 8MB 80P	HDSE18SAM1580				270	0	
Seagate SCSI 36GB 15K 8MB 80P	HDSE36S8M1580				24	0	
SCSI Cable/Internal Daisy Chain	HDC-23C04				40	0	
SCSI Cable/Int 68 pin W/EXT con	HDC-23C06				20	0	
Ext SCSI Cable 2M 68pin 2 VHDCI	CBRA1402-006				20	0	
SCSI Male Terminator	SCA-TERM160M				20	0	
3 Year Warranty, 4 Hour Respone Time					20	0	
Backup							
APC SMART UPS 2200VA RM-3U	UPAPSU2200RM3U		1	900	4	3,600	0
Sony DDS4-20/40 Tape Drive	SDT11000/BM		1	800	1	800	0
					Subtotal	142,200	0
Server Software							
Microsoft SQL Server 2000, Enterprise Edition	810-00846	Microsoft	2	16,541	4	66,164	5,850
Microsoft Visual C++ Standard	254-00170	Microsoft	2	109	1	109	Inc Above
Microsoft Server 2003, Enterprise Server	P72-00264	Microsoft	2	2,399	1	2,399	Inc Above
					Subtotal	68,672	5,850

Client Hardware							
Client Hardware (includes the following)			1	1,907	4	7,628	0
RackSaver RS-1100 Chassis	CHRA1100				4	0	0
Tyan S2469GN IDE AMD MP	MBTYS2469GN				4	0	0
Sony 1.44, 3 1/2 Black	SONY1.44BLACK				4	0	0
Slimline 24X CDROM/PANAS/BLK	24X1UCD-PANAS				4	0	0
RackSaver PS 1U 300W SPI	RSP-SP1300				4	0	0
AMD Athlon MP Processor 2400+ (2.0 GHz)	CPAMMP2400				8	0	0
Western Digital IDE 80GB 7200 8MB	HDWE8018M72				4	0	0
DDR 512MB PC2100 ECC Reg	MECODR21512ER				8	0	0
Copper 1U HeatSink/Fan	SRF-1UCOPPER-2				8	0	0
3 Year Warranty, 4 Hour Respone Time					4	0	0
					Subtotal	7,628	0
Client Software							
Microsoft Windows 2000 Server	C11-00821	Microsoft	2	738	4	2,952	Inc. Above
					Subtotal	2,952	0
Miscellaneous							
Linksys 10/100 Switch	CD7G9L		1	50	1	50	0
KDS 17" Monitor 1280x1024	MOKD17		1	150	1	150	0
Keytronic 104 Windows Keys LAR	7603		1	8	1	8	0
Logitec 3-button PS/2 Mouse	MILO3BUTTON		1	7	1	7	0
Belkin 8 Port Omniview PRO2	CBBEF1DA108T		1	250	1	250	0
					Subtotal	465	0
					Other Discounts*		
					Total	**$221,917**	**$5,850**

Notes:

1=RackSaver, 2=Microsoft

Audited by Performance Metrics

Three Year Cost of Ownership:	**$227,767**
tpmC Rating:	**82,226.46**
$ / tpmC:	**2.76**

MQTh, computed Maximum Qualified Throughput 82,226.46 tpmC

Response Times (in seconds)	Average	90 th	Max
- New order	0.51	1.09	28.32
- Payment	0.43	1.01	55.70
- Order Status	0.45	1.02	13.65
- Delivery (interactive)	0.10	0.11	1.11
- Delivery (deferred)	7.76	16.60	43.20
- Stock-Level	0.96	1.62	21.18
- Menu	0.10	0.11	63.10

Response time delay added for emulated components

Menu 0.1
Resp. 0.1

Transaction Mix, in percent of total transactions

- New-Order	44.90 %
- Payment	43.03 %
- Order-Status	4.03 %
- Delivery	4.02 %
- Stock-Level	4.02 %

Keying/Think Times (in seconds),

	Min		Average		Max	
- New-Order	18.02	0.0	18.03	12.05	18.12	120.41
- Payment	3.01	0.0	3.03	12.04	3.11	120.41
- Order-Status	2.01	0.0	2.03	10.02	2.10	100.41
- Delivery	2.01	0.0	2.03	5.05	2.10	50.41
- Stock-Level	2.01	0.0	2.03	5.03	2.07	50.41

Test Duration

- Ramp-up time	31 minutes
- Measurement interval	120 minutes
- Number of checkpoints	4
- Checkpoint interval	29.9 minutes
- Number of transactions (all types) Completed in measurement interval	22,859,999

Preface

The Transaction Processing Performance Council (TPC) developed The TPC Benchmark™ C. The TPC was founded to define transaction processing benchmarks and to disseminate objective, verifiable performance data to the industry. This full disclosure report is based on the TPC Benchmark C Standard Specification Version 5.1.

The TPC describes this benchmark in Clause 0.1 of the specification as follows:

Introduction

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.

General Items

Benchmark Sponsor

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

RackSaver was the benchmark sponsor for this TPC Benchmark™ C.

Application Code and Definition Statements

The application program (as defined in clause 2.1.7) must be disclosed. This includes, but is not limited to, the code implementing the five transactions and the terminal input output functions.

Appendix A contains all source code implemented in this benchmark.

Parameter Settings

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

- *Database tuning options.*
- *Recovery/commit options.*
- *Consistency/locking options.*
- *Operating system and application configuration parameters.*
- *Compilation and linkage options and run-time optimizations used to create/install applications, OS, and/or databases.*

Appendix C contains the tunable parameters to for the database, the operating system, and the transaction monitor.

Configuration Diagrams

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

The following pages contain the diagrams for both the tested and priced configurations.

Figure 1.1: Measured Configuration:

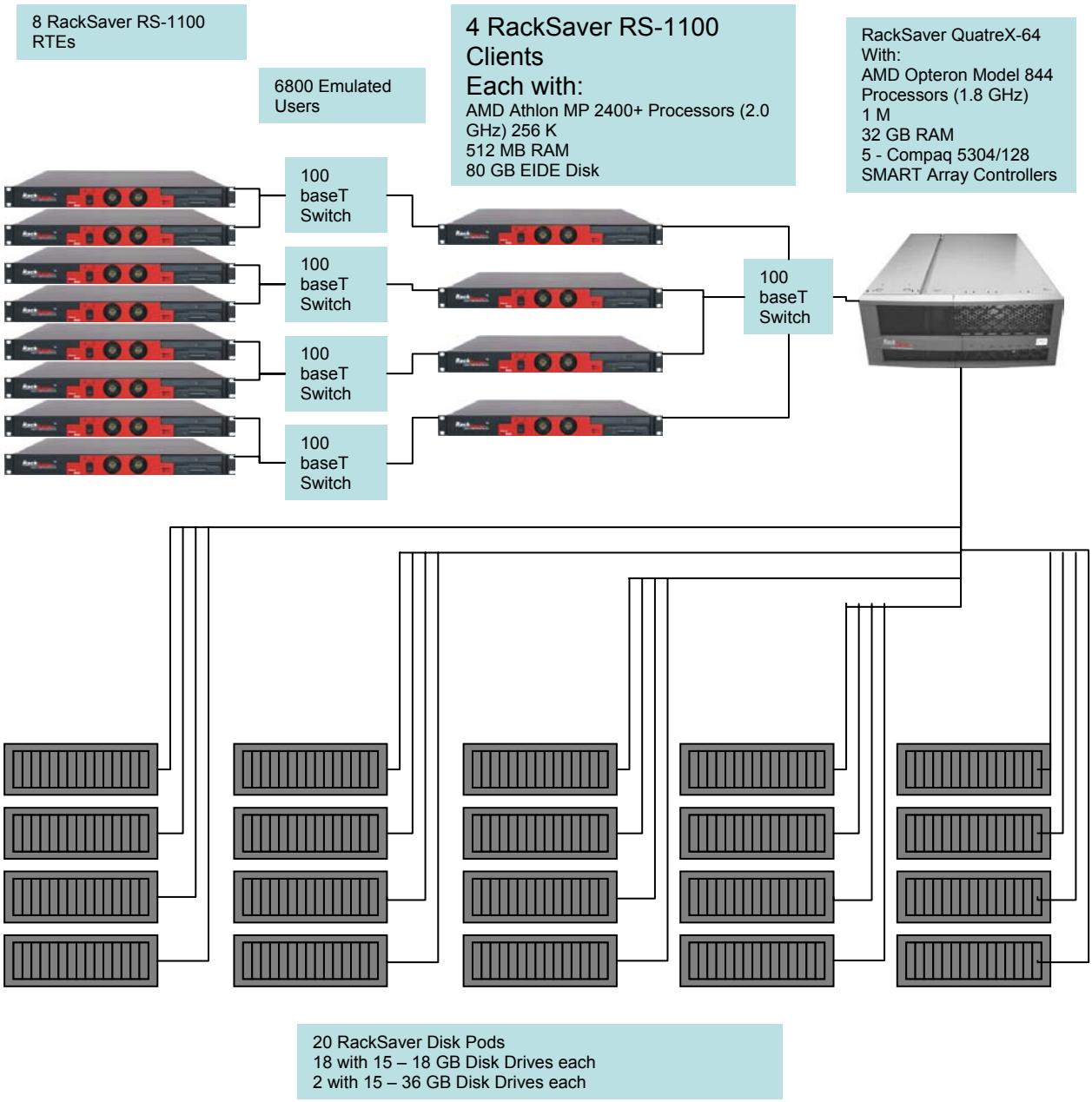
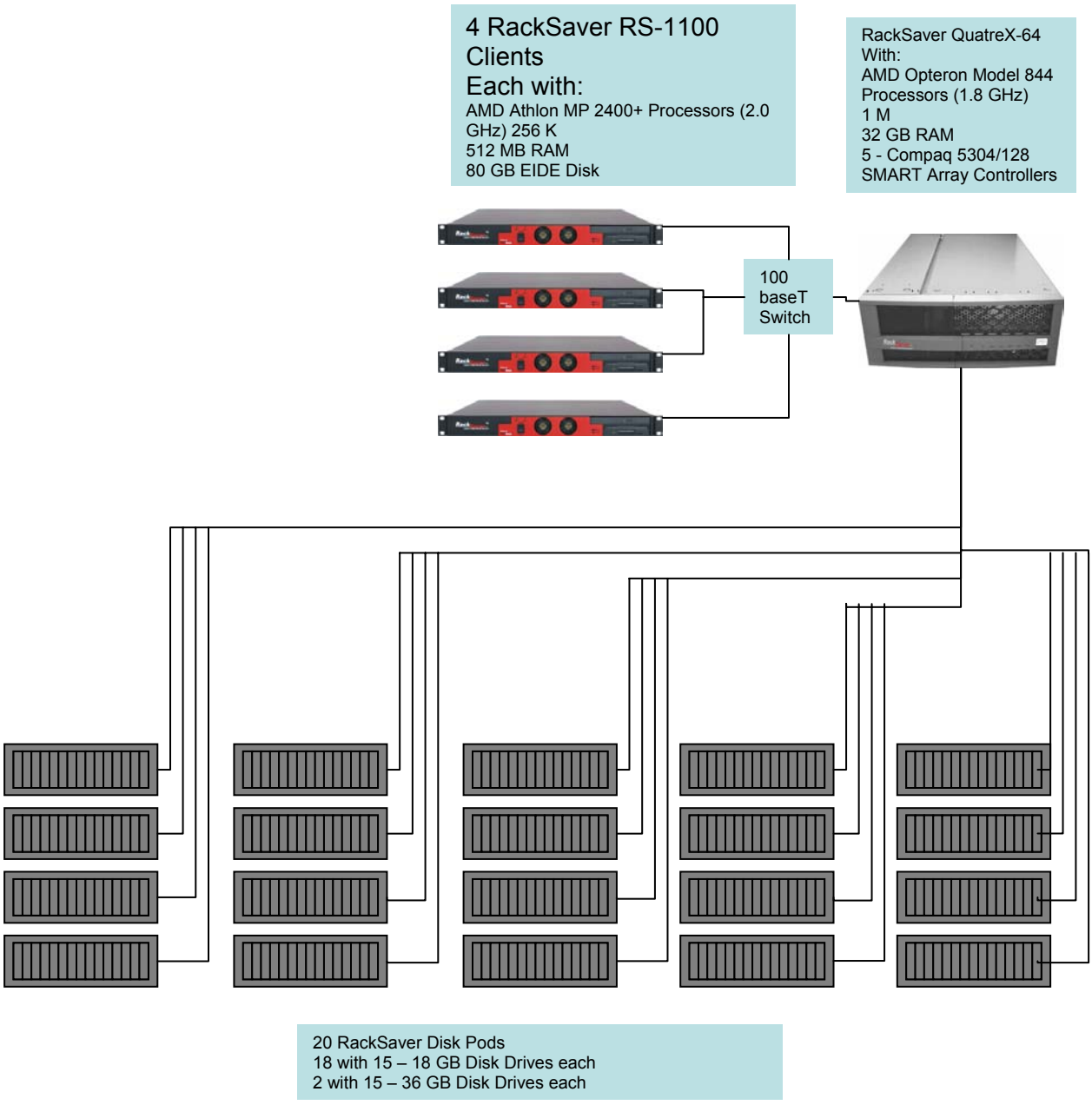


Figure 1.2: Priced Configuration:



Clause 1 - Logical Database Design Related Items

Table Definitions

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

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.

The tested database configuration used 180 disk drives. The physical organization is documented 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 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.

Insert and delete functions were fully operational during the running of the benchmark.

Horizontal or Vertical Partitioning

While there are 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.

Partitioning was not used in this benchmark.

Replication

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

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).

No additional attributes were used in this benchmark.

Clause 2 - Transaction and Terminal Profiles Related Items

Random Number Generation

The method of verification for the random number generation must be disclosed.

The random number generation was handled internally in the Microsoft BenchCraft RTE program. The independent auditing process verified this.

Screen Layout

The actual layouts of the terminal input/output screens must be disclosed.

All screen layouts followed the Standard Specifications.

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).

The auditor with a thorough execution of the five transaction types, using Microsoft Internet Explorer, verified the terminal features.

Intelligent Terminals

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

The application code responsible for processing the data was executed on the clients. HTML Screen manipulation commands were downloaded to the web browser, which controlled the input and output graphics. This code is documented in Appendix A. IIS (Microsoft Internet Information Server) was involved in processing and presenting this data.

Transaction Profiles

The percentage of home and remote order-lines in the New-Order transactions must be disclosed.
The percentage of New-Order transactions that were rolled back as a result of an unused item number must be disclosed.
The number of items per orders entered by New-Order transactions must be disclosed.
The percentage of home and remote Payment transactions must be disclosed.
The percentage of Payment and Order-Status transactions that used non-primary key (C_LAST) access to the

database must be disclosed.
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.

Table 2.1: Transaction Statistics

Transaction	Function	Value
New Order	**Home Warehouse Order Lines**	99%
	Remote Warehouse Order Lines	1%
	Rolled Back Transactions	1%
	Average Lineitems Per Order	10
Payment	**Home Warehouse Transactions**	85%
	Remote Warehouse Transactions	15.01%
	Non-Primary Key Access	59.98%
Order Status	**Non-Primary Key Access**	60.04%
Delivery	**Delivery Transactions Skipped**	0.0

Transaction Mix

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

Table 2.2: Transaction Mix

Transaction	Percentage
New Order	44.90%
Payment	43.03%
Delivery	4.02%
Stock Level	4.02%
Order Status	4.03%

Deferred Delivery Mechanism

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

The application creates a semaphore-base thread pool consisting of a user-specified number of threads, which open ODBC 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.

Clause 3 - Transaction and System Properties Related Items

The results of the ACID test 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.

All ACID tests were conducted successfully according to specification.

Atomicity

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

Completed Transaction

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 Transaction

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 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 two hours and including several checkpoints. The script was re-executed and 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 nine 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 auditor to demonstrate the required isolation had been met reviewed and verified the captured files.

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

For Isolation test seven, case A was followed.

Durability

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

Loss of Data

Loss of data was verified on a 200 Warehouse database. The RTEs were used to generate the transaction load of 2000 users for the test. To demonstrate recovery from a permanent failure of durable media containing TPC-C tables, the following steps were executed:

1) A 720 Warehouse database was generated with similar characteristics to the large database.
2) The database was backed up using SQL scripts.
3) A sum of D_NEXT_O_ID was recorded.
4) 7200 users were started via the RTEs.
5) The system was run in steady state for 5 minutes.
6) A checkpoint was completed and execution was continued for a additional minute.
7) Two disk drives in the data array were removed causing SQL Server errors.
8) The RTE was paused and allowed to finish processing.
9) The RTE was stopped.
10) SQL Server was stopped and restarted and a dump of the transaction log was saved.
11) SQL Server was stopped and the system was shutdown.
12) The failed disks were swapped.
13) The machine was booted and SQL Server was started.
14) The TPC-C database was dropped and restored from backup with norecovery.
15) The transaction log was restored and the database was allowed to recover.
16) A new count of D_NEXT_O_ID was taken.
17) This number was compared with the number of new orders reported by the RTE.
18) Consistency test #3 was executed and verified.

Combined Loss of System Test (Instantaneous Interruption and Loss of Memory) and Loss of Log

Loss of System Test and Loss of Log were performed on the full database with 6,800 warehouses in a combined test. The RTEs were used to generate a transaction load of 68,000 users for the test. To validate system recovery an instantaneous interruption was caused by removing power to the Server, the following steps were executed:

1) A sum of D_NEXT_O_ID was taken.
2) 68,000 users were started via the RTEs.
3) The system was run is steady state for 5 minutes
4) One transaction log disk drive was removed with no effect on the database server operations.
5) The system ran for an additional 5 minutes.
6) A checkpoint was completed and execution was continued for 30 seconds.
7) Power was removed from the server causing instantaneous interruption.
8) The RTE's were paused and allowed to complete transactions received via the clients.
9) The RTE's were stopped.
10) Power was reconnected and the system was rebooted.
11) SQL Server was started and recovery completed.
12) A new count of D_NEXT_O_ID was taken.
13) This number was validated against the calculated number reported by the RTEs.

Clause 4: Scaling and Database Population Related Items

Cardinality of the Tables

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.

The database was generated with 7,200 warehouses, and the audited performance run used 6,800 warehouses.

Table 4.1: Table Cardinality

Table	Initial Cardinality
Warehouse	**7,200**
District	**72,000**
Customer	**216,000,000**
New Order	**216,000,000**
Orders	**216,000,000**
History	**216,000,000**
Order Line	**2,147,483,647**
Item	**100,000**
Stock	**720,000,000**
Deleted Warehouses	**0**

Distribution of Database Tables and Logs

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

The system was configured with 270 18GB 15k SCSI disks to be used by the database. There were 270 data drives connected to 5 Compaq SMART Array Controllers configured as RAID 0 (60 each on 4 controllers and 30 on the remaining controller). Most logical data drive contained 3 partitions for miscellaneous, customer and stock, and backup data. Raw file systems were used except for the NTFS formatted backup partitions. The Log Drives used 24 36GB 15k disks and were mirrored with RAID 1/0. The configuration is further detailed below in Table 4.2.

Table 4.2: Data Distribution

Controller	DB Components	Partition	Size	Disks
0	Miscellaneous Customer and Stock Backup	F: M:	43,620 MB 80,340 MB 903 GB	60 – 18 GB 15K
1	Miscellaneous Customer and Stock Backup	G: N:	56,460 MB 103,980 MB 867 GB	60 – 18 GB 15K
2	Miscellaneous Customer and Stock Backup	H: O: T:	56,460 MB 34,816 MB 867 GB	60 – 18 GB 15K
3	Miscellaneous Customer and Stock Backup	I: P: U:	43,620 MB 80,340 MB 903 GB	60 – 18 GB 15K
4 (Array A)	Transaction Log	E:	204,720 MB	24 – 36 GB 15K
4 (Array B)	Miscellaneous Customer and Stock	J: Q:	30,780 MB 56,700 MB	30 – 18 GB 15K

Database Model

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 2000 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 ODBC interface.

Mapping Partitions/Replications

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

The database was not replicated.

60-Day Space

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).

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 was recorded by running *dbcc sqlperf(logspace)*
2. Transactions were run against the database with a full user load.
3. The final log space usage was recorded by running *dbcc sqlperf(logspace)*
4. The space used was calculated as the difference between the first and second queries.
5. The number of NEW-ORDERS was retrieved from the RTE report generated for the entire run.
6. The total space used was divided by the number of NEW-ORDERS producing a size per NEW-ORDER.

7. The NEW-ORDER size was multiplied by the measured tpmC rate and multiplied by 480 minutes.

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

The details of the 8-hour transaction log space and the 60-day space requirements are shown in Appendix D.

Clause 5: Performance Metrics and Response Time Related Items

Measured tpmC

Measured tpmC must be reported.

Measured tpmC: 82.226.46 tpmC
Price per tpmC: $2.76 per tpmC

Response Times

Ninetieth percentile, maximum and average response times must be reported for all transaction types as well as for the menu response time.

Table 5.1: Response Times

Transaction	Average	Maximum	90 %
New Order	0.51	28.32	1.09
Payment	0.43	55.70	1.01
Delivery	0.10	1.11	0.11
Stock Level	0.96	21.18	1.62
Order Status	0.45	13.65	1.02
Deferred Delivery	7.76	43.20	16.60
Menu	0.10	63.10	0.11

Keying and Think Times

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

Table 5.2: Keying Times

Transaction	Average	Minimum	Maximum
New Order	18.03	18.02	18.12
Payment	3.03	3.01	3.11
Delivery	2.03	2.01	2.10
Stock Level	2.03	2.01	2.07
Order Status	2.03	2.01	2.10

Table 5.3: Think Times

Transaction	Average	Minimum	Maximum
New Order	12.05	0.00	120.41
Payment	12.04	0.00	120.41
Delivery	5.05	0.00	50.41
Stock Level	5.03	0.00	50.41
Order Status	10.02	0.00	100.41

Response Time Distribution Curves

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

Figure 5.1 - New-Order Transaction Response Time Distribution

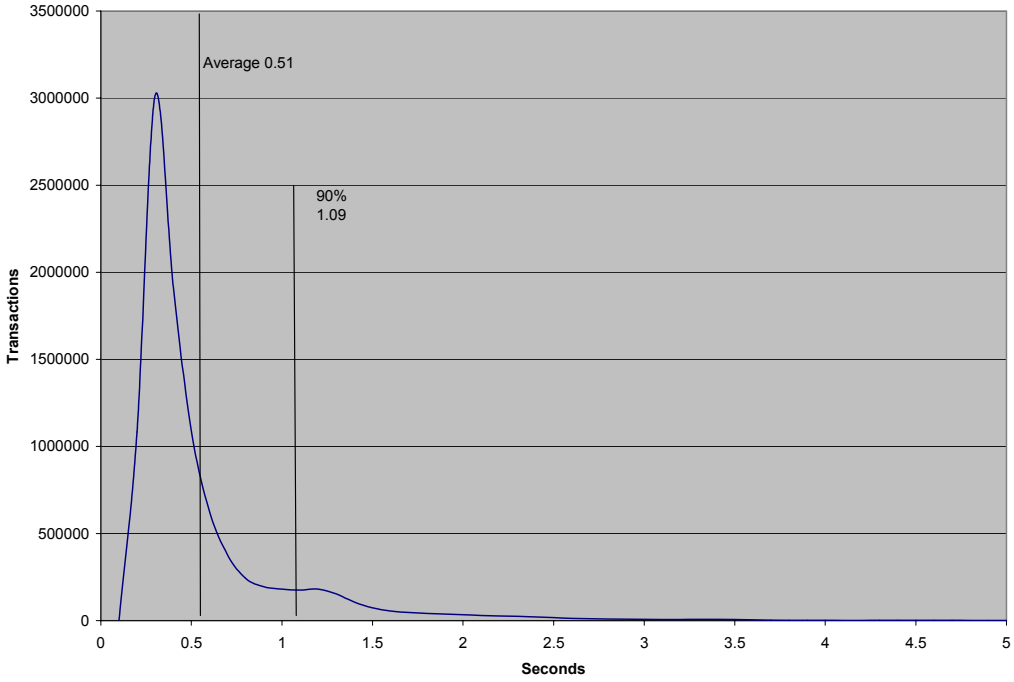


Figure 5.2 - Payment Transaction Response Time Distribution

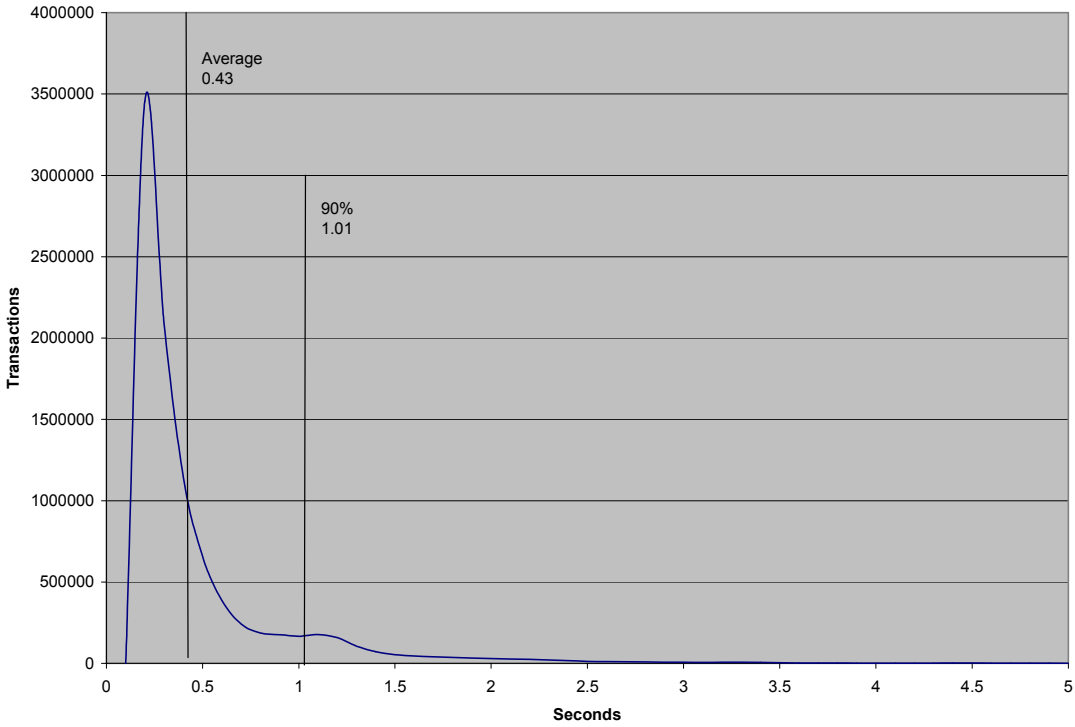


Figure 5.3 – Stock Level Transaction Response Time Distribution

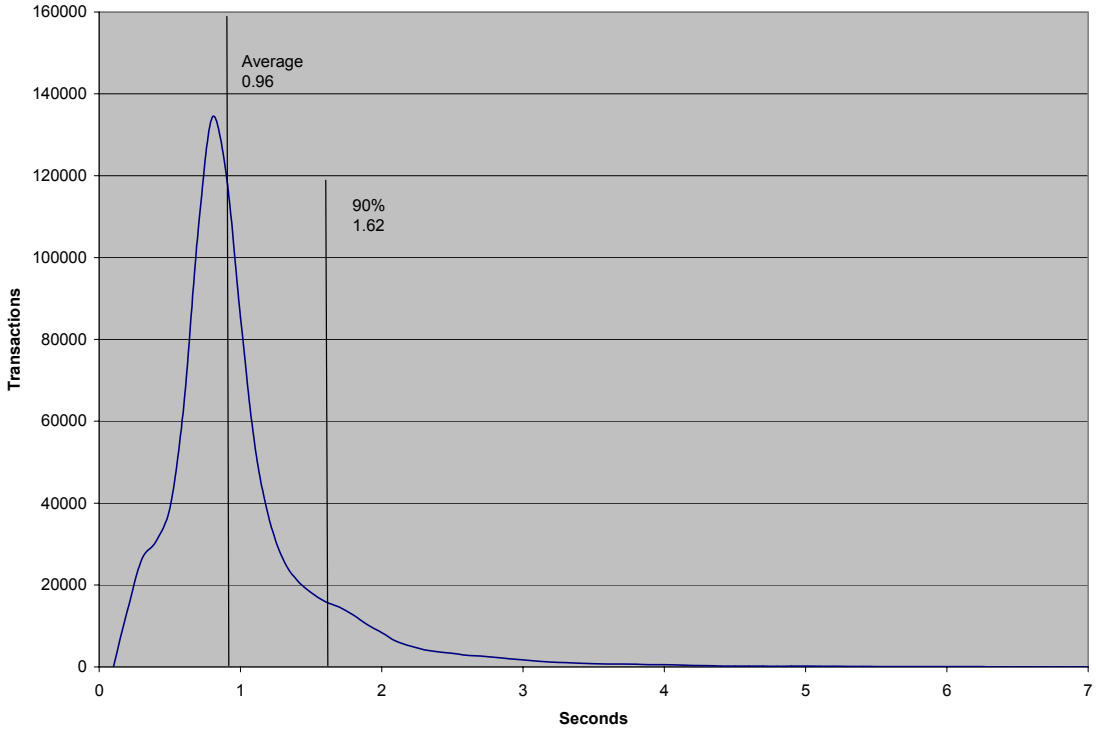


Figure 5.4 – Order Status Transaction Response Time Distribution

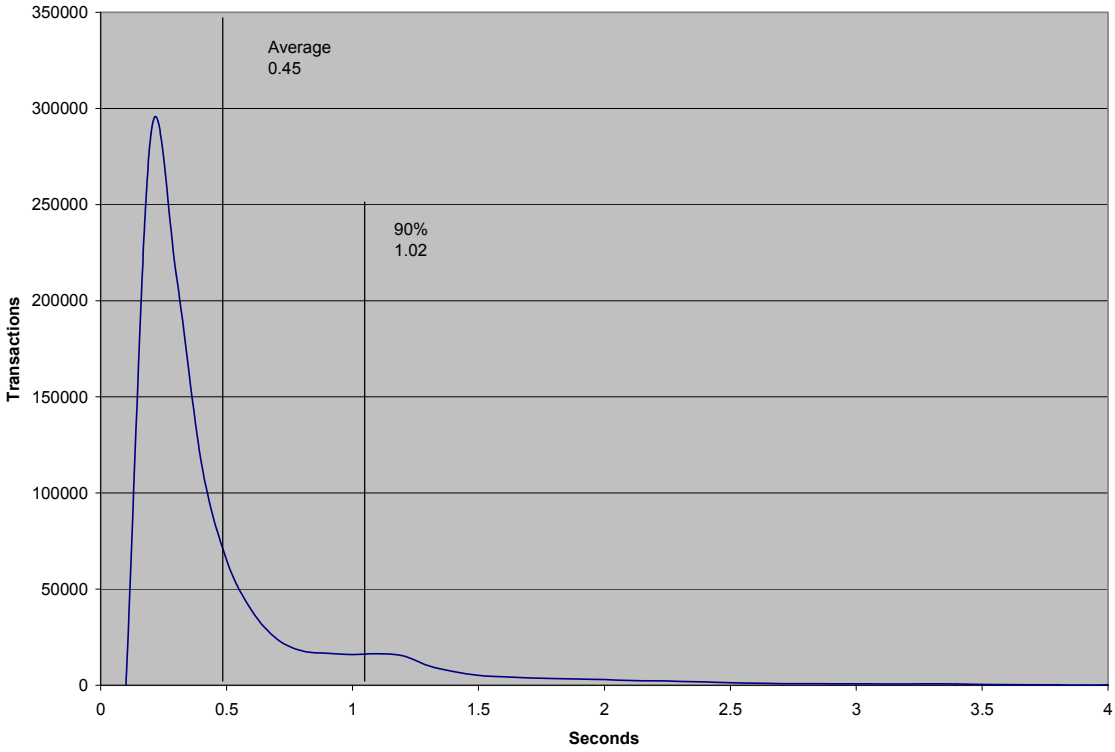
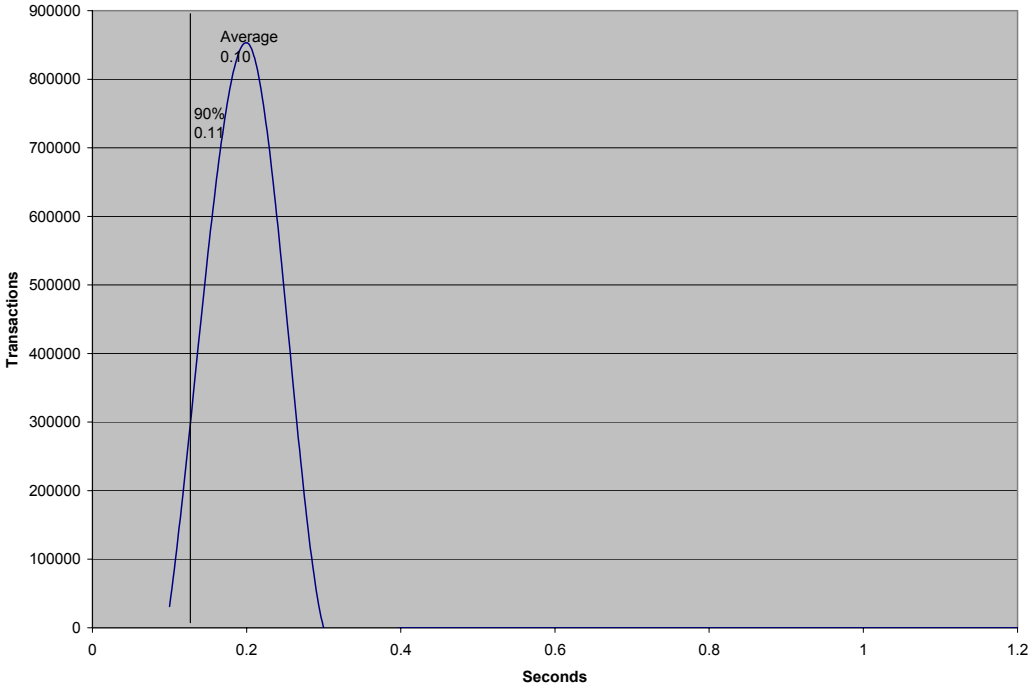


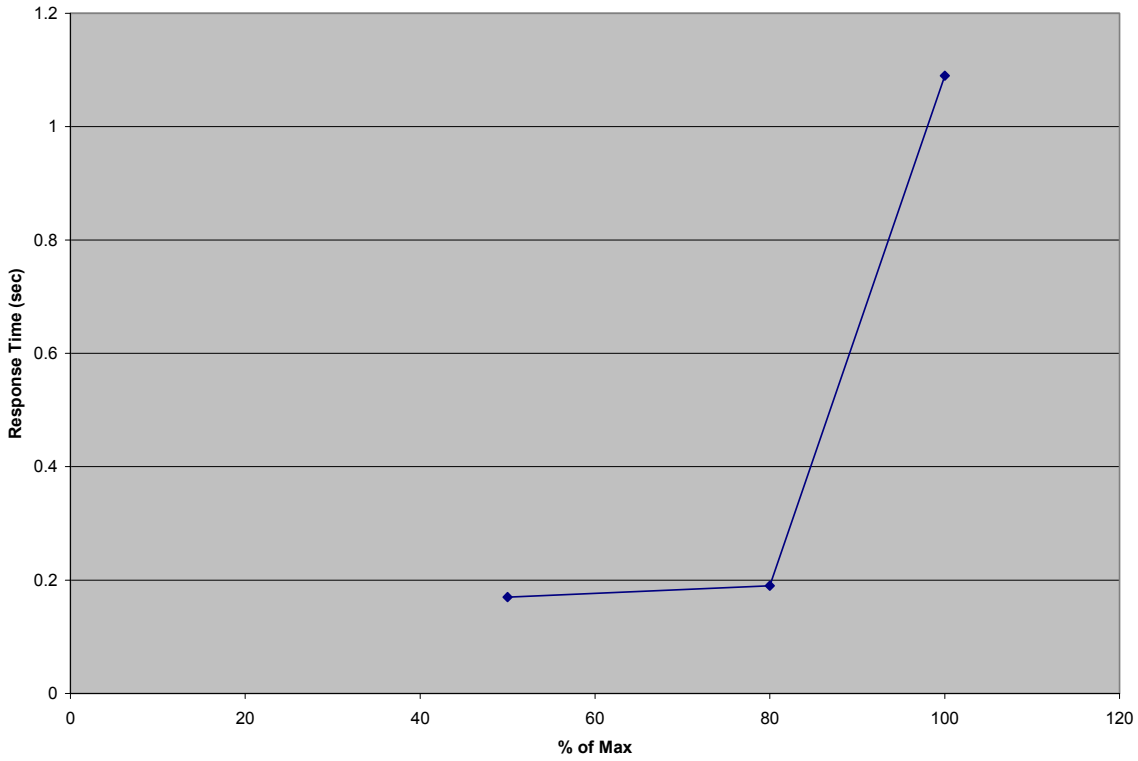
Figure 5.5 – Delivery Transaction Response Time Distribution



New Order Response Time vs. Throughput Performance

The performance curve for response time vs. throughput (see Clause 5.6.2) must be reported for the New-Order transaction.

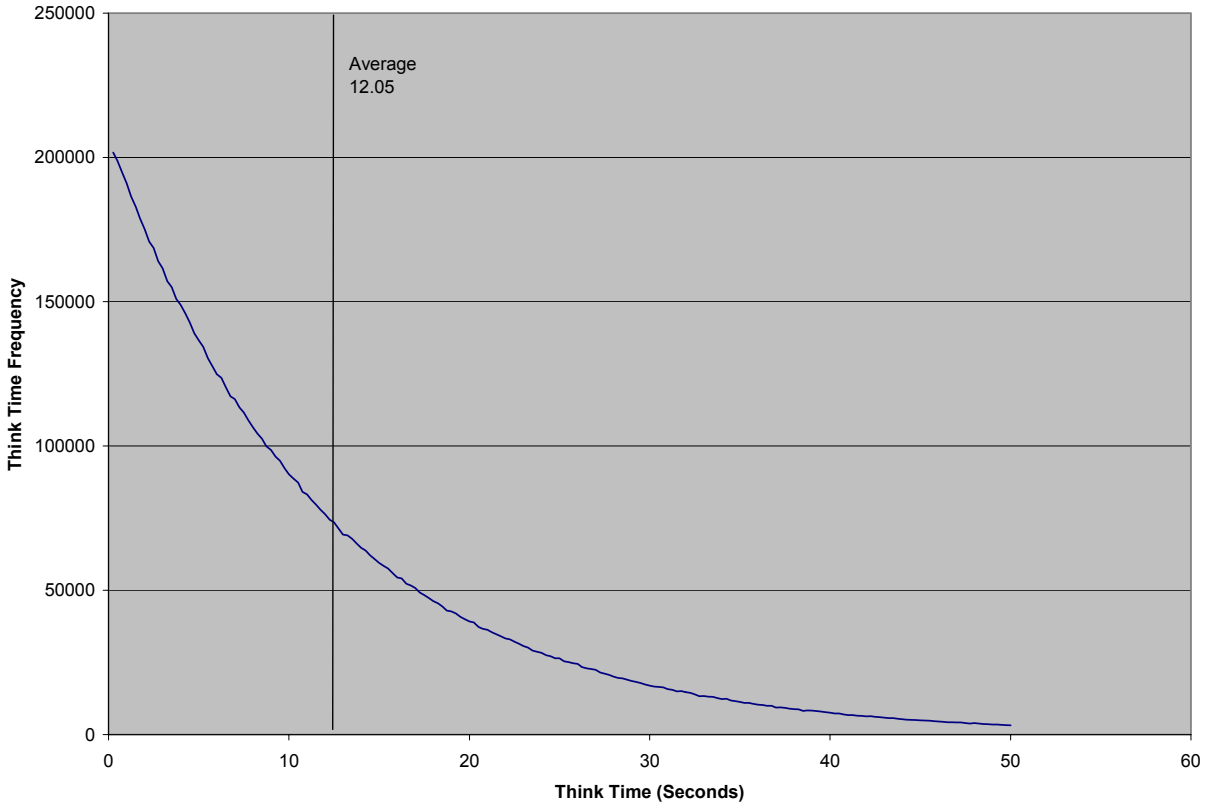
Figure 5.6 – New Order Response Time vs. Throughput



New Order Think Time Distribution

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

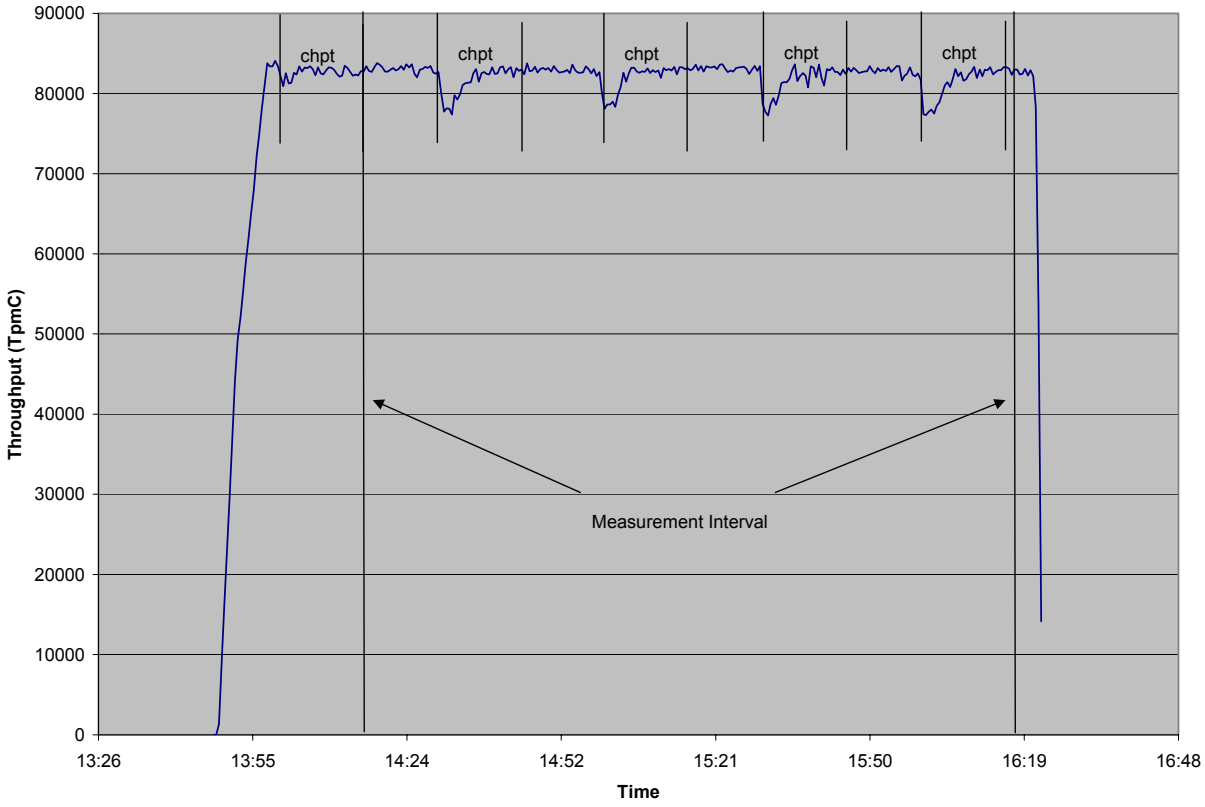
Figure 5.7 – New Order Think Time Distribution



New Order Throughput vs. Elapsed Time

A graph of throughput versus elapsed time (see Clause 5.6.4) must be reported for the New-Order transaction

Figure 5.8 – New Order Throughput vs. Time



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.

By using the monitoring tools on the RTE, a steady state was determined. Figure 5.8 further supports the level chosen by the utilities used.

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.

The RTE generated the required input data to choose a transaction from the menu. This data was timestamped. The input screen for the requested transaction was returned and timestamped. The difference between these two timestamps was the menu response time. The RTE writes to the log file once per transaction on selective fields such as order id. There is one log file per driver engine.

The RTE generated the required input data for the chosen transaction. It waited to complete the minimum required key time before transmitting the input screen. 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.

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

The RTE transmissions were sent to application processes running on the client machines through Ethernet LANs. These client application processes handled all screen I/O as well as all requests to the database on the server. The applications communicated with the database server over the Ethernet LAN using ODBC and RPC calls.
To perform checkpoints at specific intervals, we set SQL Server *recovery interval* to 300 and wrote a script to schedule multiple checkpoints at specific intervals. The script included a wait time between each checkpoint equal of 29.9 minutes so that the checkpoint interval was an integral multiple of the measurement interval, which was 120 minutes. The checkpoint script was started manually after the RTE had all users logged in and the database had achieved steady state.

At each checkpoint, Microsoft SQL Server wrote to disk all memory pages that had been updated but not yet physically written to disk. The positioning of the measurement interval was verified to be clear of the guard zones and is depicted on the graph in Figure 8.

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)

	Start	**End**	**Duration**
Measurement Interval	14:16:32	16:16:32	7,200
Checkpoint 1	14:30:27	14:45:27	900
Checkpoint 2	15:00:22	15:15:22	900
Checkpoint 3	15:30:17	15:45:17	900
Checkpoint 4	16:00:12	16:15:13	901

Clause 6: Performance Metrics and Response Time Related Items

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 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 1.1 & 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:

- 10 BaseT (10 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.

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

The total 3-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: Oct 21, 2003
Software Availability Date: Oct 21, 2003

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: 82,226.46 tpmC
Price Performance Metric: $2.76

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 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:

- 4 Microsoft Windows 2000 Server Licenses
- 1 Microsoft Windows 2003 Enterprise Server License
- 1 Microsoft SQL Server 2000 Enterprise Edition License.
- 1 Microsoft Visual C++ 32 bit 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 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 Adminstrator, TPC
Presidio of San Francisco
Bldg 572B Ruger St.
San Francisco, CA 94129-0920
Phone: (415) 561-6272, fax 415-561 6120
www.tpc.org

or:

RackSaver
9449 Carroll Park Drive
San Diego, CA 92121
Phone: (858) 874-3800
www.racksaver.com

Auditor's Attestation Letter
On following Page

PERFORMANCE METRICS INC.
TPC Certified Auditors

April 16, 2003

Mr. David Driggers
CEO RackSaver®
9449 Carroll Park Dr.
San Diego, CA 92121

I have verified the TPC Benchmark™ C client/server for the following configuration:

Platform:	QuatreX-64™
Database Manager:	Microsoft SQL Server 2000 Enterprise Edition
Operating System:	Microsoft Windows 2003 Server, Enterprise Edition
Transaction Manager:	Microsoft COM+

Server: RackServer QuatreX-64™				
CPUs	Memory	Disks	90% Response	tpmC
4 AMD Opteron™ Processors Model 844 @ 1.8 GHz	Main: 32 GB Cache: 1 MB each	270 18GB 24 36GB 1 40GB	**1.09**	**82,226.46**

4 RackServer RS-1100 clients		
CPUs (2 each)	Memory	Disks
AMD Athlon™ MP Processor 2400+ @ 2.0 GHz	Main: 1.0 GB Cache: 256KB	1 @ 80GB

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 was properly sized and populated.
- The database was properly scaled with 7,200 warehouses of which 6,600 were used in the measurement – see auditor's notes.
- The ACID properties were met.
- The durability data loss and log loss tests were performed on a 720-warehouse system. Both log and data were stripped across all disks and all log disks were mirrored. One drive was removed and the system continued to run until shut down after 5 minutes. The tpmC rate on the 720-warehouse system exceeded 9,000.
- Input data was generated according to the specified percentages.
- Eight hours of mirrored log space was configured on the measured system.
- Eight hours of dynamic table growth space was configured on the measured system.
- The 60-day space calculation was verified; the measured system had sufficient storage.
- Measurement cycle times included a delay of 0.1 seconds.
- There were 66,000 user contexts present on the system.
- Each group of emulated users started with a different random number seed.
- The NURand constants used for database load and at run time were 123 and 233.
- The steady state portion of the test was 2 hours.
- One checkpoint was taken before the measured interval.
- Four checkpoints were taken during the measured interval.
- The system pricing was checked for major components and maintenance.

Auditor Notes:

There had been a test run made using 6,800 warehouses before the measurement. I verified that the warehouses between 6,601 and 6,800 had significantly lower values than those below 6,601. I also verified that the Benchcraft RTE started only 66,000 users and assigned them to warehouses below 6,601. This in addition to observing the performance run and its associated number of users.

Sincerely,

Lorna Livingtree
Auditor

Appendix A:
Source Code

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_WEBDLL
                                       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
#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_BCCONN
                                                 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
// 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_TPCW_ODBC
                                       56
#define ERR_TYPE_SCHANNEL
                                       57

#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 recieve HTML pages."



class CBaseErr
{
public:

          CBaseErr(LPCTSTR szLoc = NULL)
          {
                    m_idMsg             =
INV_ERROR_CODE;


                    if (szLoc)
```

```
                    {
                              m_szLoc = new
char[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[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);
          }

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

                    j += wsprintf(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,
                    eWSASendImage,
                    eWSAGetOverlappedResult,
                    eWSARecv,
                    eWSARecvImage,
                    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
          {
                    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,
                    eFSeek,
                    eFRead,
                    eFWrite,
                    eTmpFile,
                    eSetFilePointer,
                    eNew,
          };

                              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;}
};
```

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
        pReg->eDB_Protocol = Unspecified;
        size = sizeof(szTmp);
        if ( RegQueryValueEx(hKey, "DB_Protocol", 0,
&type, (BYTE *)&szTmp, &size) == ERROR_SUCCESS )
        {
                  if ( !stricmp(szTmp,
szDBNames[ODBC]) )
                            pReg->eDB_Protocol =
ODBC;
                  else if ( !stricmp(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 ( !stricmp(szTmp,
szTxnMonNames[TUXEDO]) )
                            pReg->eTxnMon = TUXEDO;
                  else if ( !stricmp(szTmp,
szTxnMonNames[ENCINA]) )
                            pReg->eTxnMon = ENCINA;
                  else if ( !stricmp(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 ( !stricmp(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;

        RegCloseKey(hKey);

        return FALSE;
}
```

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:
 *                  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];
} TPCCREGISTRYDATA, *PTPCCREGISTRYDATA;

BOOL ReadTPCCRegistrySettings( TPCCREGISTRYDATA *pReg
);
```

Trans.h

```
/*        FILE:               TRANS.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 structure
templates.
 *
 *  Change history:
 *                  4.20.000 - updated rev number to
match kit
 */
#pragma once

// 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
#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 dblib, 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       /*
SQLUINTEGER */      fraction;
          } TIMESTAMP_STRUCT;
#endif

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

// transaction structures
typedef struct
{
          // input params
          short
          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
          short               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
{         // input params
          short
w_id;
          short
d_id;
          long
c_id;
```

```
          short
c_d_id;
          short
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;
          short
          ol_supply_w_id;
          short
          ol_quantity;
          double
          ol_amount;
          TIMESTAMP_STRUCT    ol_delivery_d;
} OL_ORDER_STATUS_DATA;

typedef struct
{         // input params
          short                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
          short                          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
          short               w_id;
          //delivery warehouse
          short               o_carrier_id;
          //carrier id
} DELIVERY_TRANSACTION;

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

          // output params
          EXEC_STATUS
          exec_status_code;
          long
          low_stock;
} STOCK_LEVEL_DATA, *PSTOCK_LEVEL_DATA;
```

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;
};
```

Tpcc_dblib.cpp

```
/*        FILE:               TPCC_DBLIB.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:  Implements dblib calls for TPC-C
txns.
 *        Contact:  Charles Levine
(clevine@microsoft.com)
 *
 *  Change history:
 *                  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"
#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                       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 APIENTRY 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
 *                                       DBINT
                     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
 *
                              INT_CANCEL
          cancel 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
 *                                  int
                           n
        number of characters to copy
 *
 * 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();
          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 dblib 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 (dbsqlexec(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);

          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
// 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, SQLINT2, -1, -1, (BYTE *)
&m_txn.StockLevel.w_id);               // @w_id
smallint
                              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);   // @threshhold
smallint

                              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);

                              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;
          DBDATEREC daterec;
          int                              iTryCount = 0;
          const BYTE          *pData;

          ResetError();

          while (TRUE)
          {
                    try
                    {
                              dbrpcinit(m_dbproc,
"tpcc_neworder", 0);

                              dbrpcparam(m_dbproc,
NULL, 0, SQLINT2, -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, SQLINT2, -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_gen
eric, 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))



          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;
          DBDATEREC daterec;

          int                           iTryCount = 0;
          const BYTE          *pData;

          ResetError();

          while (TRUE)
          {
                    try
                    {
                              dbrpcinit(m_dbproc,
"tpcc_payment", 0);
```

```
                              dbrpcparam(m_dbproc,
NULL, 0, SQLINT2, -1, -1, (BYTE *)
&m_txn.Payment.w_id);
                              dbrpcparam(m_dbproc,
NULL, 0, SQLINT2, -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);


                              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);

                              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)
                                        throw new
CTPCC_DBLIB_ERR( CTPCC_DBLIB_ERR::ERR_INVALID_CUST );
                              else

          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;
          DBDATEREC daterec;

          int                         iTryCount = 0;
          RETCODE             rc;
          const BYTE          *pData;

          ResetError();

          while (TRUE)
          {
                    try
                    {
                              dbrpcinit(m_dbproc,
"tpcc_orderstatus", 0);

                              dbrpcparam(m_dbproc,
NULL, 0, SQLINT2, -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);

          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)
!= 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))

          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)
          {
                    try
                    {
                              dbrpcinit(m_dbproc,
"tpcc_delivery", 0);

                              dbrpcparam(m_dbproc,
NULL, 0, SQLINT2, -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)
!= SUCCEED)

          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;
}
```

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
// 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 dbsqlexec
                              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."
                              ERR_RETRIED_TRANS,
                    // "Retries before transaction
succeeded."
                    };

                    CTPCC_DBLIB_ERR( int iErr ) {
m_errno = iErr; m_iTryCount = 0; };

                    CTPCC_DBLIB_ERR( int iErr, int
iTryCount ) { m_errno = iErr; m_iTryCount = iTryCount;
};

                    int                m_errno;
                    int                m_iTryCount;

                    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 dblib 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);
```

Tpcc_odbc.cpp

```
/*        FILE:               TPCC_ODBC.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:  Implements ODBC calls for TPC-C
txns.
 *        Contact:  Charles Levine
(clevine@microsoft.com)
 *
 *  Change history:
 *                  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
 */

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

#define DBNTWIN32
#include <sqltypes.h>
#include <sql.h>
#include <sqlext.h>
#include <odbcss.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"
#include "..\..\common\src\txn_base.h"
#include "tpcc_odbc.h"

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

const iMaxRetries = 10;                // how many
retries on deadlock
```

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

static SQLHENV henv = SQL_NULL_HENV;
                    // ODBC environment handle

BOOL APIENTRY DllMain(HMODULE hModule, DWORD
ul_reason_for_call, LPVOID lpReserved)
{
          switch( ul_reason_for_call )
          {
                    case DLL_PROCESS_ATTACH:

          DisableThreadLibraryCalls(hModule);
                              if (
SQLAllocHandleStd(SQL_HANDLE_ENV, SQL_NULL_HANDLE,
&henv) != SQL_SUCCESS )
                                        return FALSE;
                              break;

                    case DLL_PROCESS_DETACH:
                              if (henv != NULL)

          SQLFreeEnv(henv);
                              break;

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

/* FUNCTION: CTPCC_ODBC_ERR::ErrorText
 *
 */

char* CTPCC_ODBC_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_ODBC* CTPCC_ODBC_new(
          LPCSTR szServer,              // name of SQL
server
          LPCSTR szUser,                          //
user name for login
          LPCSTR szPassword,            // password
for login
          LPCSTR szHost,                          //
not used
          LPCSTR szDatabase )           // name of
database to use
{
          return new CTPCC_ODBC( szServer, szUser,
szPassword, szHost, szDatabase );
}

CTPCC_ODBC::CTPCC_ODBC (
          LPCSTR szServer,
          // name of SQL server
          LPCSTR szUser,
                    // user name for login
          LPCSTR szPassword,
          // password for login
          LPCSTR szHost,
                    // not used
          LPCSTR szDatabase
          // name of database to use
          )
{
          RETCODE             rc;

          // initialization
          m_hdbc = SQL_NULL_HDBC;
          m_hstmt = SQL_NULL_HSTMT;

          m_hstmtNewOrder = SQL_NULL_HSTMT;
          m_hstmtPayment = SQL_NULL_HSTMT;
          m_hstmtDelivery = SQL_NULL_HSTMT;
          m_hstmtOrderStatus = SQL_NULL_HSTMT;
          m_hstmtStockLevel = SQL_NULL_HSTMT;

          m_descNewOrderCols1 = SQL_NULL_HDESC;
          m_descNewOrderCols2 = SQL_NULL_HDESC;
          m_descOrderStatusCols1 = SQL_NULL_HDESC;
          m_descOrderStatusCols2 = SQL_NULL_HDESC;


          if ( SQLAllocHandle(SQL_HANDLE_DBC, henv,
&m_hdbc) != SQL_SUCCESS )

          ThrowError(CODBCERR::eAllocHandle);

          if ( SQLSetConnectOption(m_hdbc,
SQL_PACKET_SIZE, 4096) != SQL_SUCCESS )
                    ThrowError(CODBCERR::eConnOption);

          {
                    char
          szConnectStr[256];
                    char
          szOutStr[1024];
                    SQLSMALLINT
          iOutStrLen;

                    sprintf( szConnectStr, "DRIVER=SQL
Server;SERVER=%s;UID=%s;PWD=%s;DATABASE=%s",
                              szServer, szUser,
szPassword, szDatabase );

                    rc = SQLDriverConnect(m_hdbc,
NULL, (SQLCHAR*)szConnectStr, sizeof(szConnectStr),
                              (SQLCHAR*)szOutStr,
sizeof(szOutStr), &iOutStrLen, SQL_DRIVER_NOPROMPT );

                    if (rc != SQL_SUCCESS && rc !=
SQL_SUCCESS_WITH_INFO)

          ThrowError(CODBCERR::eConnect);
          }

          if (SQLAllocHandle(SQL_HANDLE_STMT, m_hdbc,
&m_hstmt) != SQL_SUCCESS)

          ThrowError(CODBCERR::eAllocHandle);

          {
                    char                buffer[128];

                    // set some options affecting
connection behavior
                    strcpy(buffer, "set nocount on set
XACT_ABORT ON");
                    rc = SQLExecDirect(m_hstmt,
(unsigned char *)buffer, SQL_NTS);
                    if (rc != SQL_SUCCESS && rc !=
SQL_SUCCESS_WITH_INFO)

          ThrowError(CODBCERR::eExecDirect);

                    // verify that version of stored
procs on server is correct
                    char db_sp_version[10];
                    strcpy(buffer, "{call
tpcc_version}");
                    rc = SQLExecDirect(m_hstmt,
(unsigned char *)buffer, SQL_NTS);
                    if (rc != SQL_SUCCESS && rc !=
SQL_SUCCESS_WITH_INFO)

          ThrowError(CODBCERR::eExecDirect);
```

```
                    if ( SQLBindCol(m_hstmt, 1,
SQL_C_CHAR, &db_sp_version, sizeof(db_sp_version),
NULL) != SQL_SUCCESS )

          ThrowError(CODBCERR::eBindCol);

                    if ( SQLFetch(m_hstmt) ==
SQL_ERROR )

          ThrowError(CODBCERR::eFetch);
                    if
(strcmp(db_sp_version,sVersion))
                              throw new
CTPCC_ODBC_ERR( CTPCC_ODBC_ERR::ERR_WRONG_SP_VERSION
);

                    SQLFreeHandle(SQL_HANDLE_STMT,
m_hstmt);
          }

          // Bind parameters for each of the
transactions
          InitNewOrderParams();
          InitPaymentParams();
          InitOrderStatusParams();
          InitDeliveryParams();
          InitStockLevelParams();
}

CTPCC_ODBC::~CTPCC_ODBC( void )
{
          // note: descriptors are automatically
released when the connection is dropped
          SQLFreeHandle(SQL_HANDLE_STMT,
m_hstmtNewOrder);
          SQLFreeHandle(SQL_HANDLE_STMT,
m_hstmtPayment);
          SQLFreeHandle(SQL_HANDLE_STMT,
m_hstmtDelivery);
          SQLFreeHandle(SQL_HANDLE_STMT,
m_hstmtOrderStatus);
          SQLFreeHandle(SQL_HANDLE_STMT,
m_hstmtStockLevel);

          SQLDisconnect(m_hdbc);
          SQLFreeHandle(SQL_HANDLE_DBC, m_hdbc);
}

void CTPCC_ODBC::ThrowError( CODBCERR::ACTION eAction
)
{
          RETCODE             rc;
          SDWORD              lNativeError;
          char                szState[6];
          char
          szMsg[SQL_MAX_MESSAGE_LENGTH];
          char
          szTmp[6*SQL_MAX_MESSAGE_LENGTH];
          CODBCERR   *pODBCErr;
          // not allocated until needed (maybe never)

          pODBCErr = new CODBCERR();

          pODBCErr->m_NativeError = 0;
          pODBCErr->m_eAction = eAction;
          pODBCErr->m_bDeadLock = FALSE;

          szTmp[0] = 0;
          while (TRUE)
          {
                    rc = SQLError(henv, m_hdbc,
m_hstmt, (BYTE *)&szState, &lNativeError,

(BYTE *)&szMsg, sizeof(szMsg), NULL);
                    if (rc == SQL_NO_DATA)
                              break;

                    // check for deadlock
                    if (lNativeError == 1205 ||
(lNativeError == iErrOleDbProvider &&
                              strstr(szMsg,
sErrTimeoutExpired) != NULL))
                              pODBCErr->m_bDeadLock =
TRUE;

                    // capture the (first) database
error
                    if (pODBCErr->m_NativeError == 0
&& lNativeError != 0)
                              pODBCErr->m_NativeError
= lNativeError;

                    // quit if there isn't enough room
to concatenate error text
                    if ( (strlen(szMsg) + 2) >
(sizeof(szTmp) - strlen(szTmp)) )
                              break;

                    // include line break after first
error msg
                    if (szTmp[0] != 0)
                              strcat( szTmp, "\n");
                    strcat( szTmp, szMsg );
          }

          if (pODBCErr->m_odbcerrstr != NULL)
          {
                    delete [] pODBCErr->m_odbcerrstr;
                    pODBCErr->m_odbcerrstr = NULL;
          }

          if (strlen(szTmp) > 0)
          {
                    pODBCErr->m_odbcerrstr = new char[
strlen(szTmp)+1 ];
                    strcpy( pODBCErr->m_odbcerrstr,
szTmp );
          }

          SQLFreeStmt(m_hstmt, SQL_CLOSE);
          throw pODBCErr;
}

void CTPCC_ODBC::InitStockLevelParams()
{
          if (   SQLAllocHandle(SQL_HANDLE_STMT,
m_hdbc, &m_hstmtStockLevel) != SQL_SUCCESS )

          ThrowError(CODBCERR::eAllocHandle);

          m_hstmt = m_hstmtStockLevel;

          int i = 0;
          if (   SQLBindParameter(m_hstmt, ++i,
SQL_PARAM_INPUT, SQL_C_SSHORT, SQL_SMALLINT, 0, 0,
&m_txn.StockLevel.w_id, 0, NULL) != SQL_SUCCESS
                    || SQLBindParameter(m_hstmt, ++i,
SQL_PARAM_INPUT, SQL_C_UTINYINT, SQL_TINYINT, 0, 0,
&m_txn.StockLevel.d_id, 0, NULL) != SQL_SUCCESS
                    || SQLBindParameter(m_hstmt, ++i,
SQL_PARAM_INPUT, SQL_C_SSHORT, SQL_SMALLINT, 0, 0,
&m_txn.StockLevel.threshold, 0, NULL) != SQL_SUCCESS
                    )
                    ThrowError(CODBCERR::eBindParam);

          if ( SQLBindCol(m_hstmt, 1, SQL_C_SLONG,
&m_txn.StockLevel.low_stock, 0, NULL) != SQL_SUCCESS )
                    ThrowError(CODBCERR::eBindCol);
}

void CTPCC_ODBC::StockLevel()
{
          RETCODE             rc;
          int                           iTryCount = 0;

          m_hstmt = m_hstmtStockLevel;

          while (TRUE)
          {
                    try
                    {
                              rc =
SQLExecDirectW(m_hstmt, (SQLWCHAR*)L"{call
tpcc_stocklevel(?,?,?)}", SQL_NTS);
                              if (rc != SQL_SUCCESS &&
rc != SQL_SUCCESS_WITH_INFO)

          ThrowError(CODBCERR::eExecDirect);

                              if ( SQLFetch(m_hstmt)
== SQL_ERROR )

          ThrowError(CODBCERR::eFetch);

                              SQLFreeStmt(m_hstmt,
SQL_CLOSE);


          m_txn.StockLevel.exec_status_code = eOK;
                              break;
                    }
                    catch (CODBCERR *e)
                    {
                              if ((!e->m_bDeadLock) ||
(++iTryCount > iMaxRetries))
                                        throw;

                              // hit deadlock; backoff
for increasingly longer period
```

```
                        delete e;
                        Sleep(10 * iTryCount);
                }
        }

//      if (iTryCount)
//              throw new
CTPCC_ODBC_ERR(CTPCC_ODBC_ERR::ERR_RETRIED_TRANS,
iTryCount);
}

void CTPCC_ODBC::InitNewOrderParams()
{
        if (   SQLAllocHandle(SQL_HANDLE_STMT,
m_hdbc, &m_hstmtNewOrder) != SQL_SUCCESS
                || SQLAllocHandle(SQL_HANDLE_DESC,
m_hdbc, &m_descNewOrderCols1) != SQL_SUCCESS
                || SQLAllocHandle(SQL_HANDLE_DESC,
m_hdbc, &m_descNewOrderCols2) != SQL_SUCCESS
                )

        ThrowError(CODBCERR::eAllocHandle);

        m_hstmt = m_hstmtNewOrder;

        if ( SQLSetStmtAttrW( m_hstmt,
SQL_ATTR_APP_ROW_DESC, m_descNewOrderCols1,
SQL_IS_POINTER ) != SQL_SUCCESS )

        ThrowError(CODBCERR::eSetStmtAttr);

        int i = 0;
        if (   SQLBindParameter(m_hstmt, ++i,
SQL_PARAM_INPUT, SQL_C_SSHORT, SQL_SMALLINT, 0, 0,
&m_txn.NewOrder.w_id, 0, NULL) != SQL_SUCCESS
                || SQLBindParameter(m_hstmt, ++i,
SQL_PARAM_INPUT, SQL_C_UTINYINT, SQL_TINYINT, 0, 0,
&m_txn.NewOrder.d_id, 0, NULL) != SQL_SUCCESS
                || SQLBindParameter(m_hstmt, ++i,
SQL_PARAM_INPUT, SQL_C_SLONG, SQL_INTEGER, 0, 0,
&m_txn.NewOrder.c_id, 0, NULL) != SQL_SUCCESS
                || SQLBindParameter(m_hstmt, ++i,
SQL_PARAM_INPUT, SQL_C_UTINYINT, SQL_TINYINT, 0, 0,
&m_txn.NewOrder.o_ol_cnt, 0, NULL) != SQL_SUCCESS
                || SQLBindParameter(m_hstmt, ++i,
SQL_PARAM_INPUT, SQL_C_UTINYINT, SQL_TINYINT, 0, 0,
&m_txn.NewOrder.o_all_local, 0, NULL) != SQL_SUCCESS
                )
                ThrowError(CODBCERR::eBindParam);

        for (int j=0; j<MAX_OL_NEW_ORDER_ITEMS; j++)
        {
                if (   SQLBindParameter(m_hstmt,
++i, SQL_PARAM_INPUT, SQL_C_SLONG, SQL_INTEGER, 0, 0,
&m_txn.NewOrder.OL[j].ol_i_id, 0, NULL) != SQL_SUCCESS
                        ||
SQLBindParameter(m_hstmt, ++i, SQL_PARAM_INPUT,
SQL_C_SSHORT, SQL_SMALLINT, 0, 0,
&m_txn.NewOrder.OL[j].ol_supply_w_id, 0, NULL) !=
SQL_SUCCESS
                        ||
SQLBindParameter(m_hstmt, ++i, SQL_PARAM_INPUT,
SQL_C_SSHORT, SQL_SMALLINT, 0, 0,
&m_txn.NewOrder.OL[j].ol_quantity, 0, NULL) !=
SQL_SUCCESS
                        )

        ThrowError(CODBCERR::eBindParam);
        }

        // set the bind offset pointer
        if ( SQLSetStmtAttrW( m_hstmt,
SQL_ATTR_ROW_BIND_OFFSET_PTR, &m_BindOffset,
SQL_IS_POINTER ) != SQL_SUCCESS )

        ThrowError(CODBCERR::eSetStmtAttr);

        i = 0;
        if (   SQLBindCol(m_hstmt, ++i, SQL_C_CHAR,
&m_txn.NewOrder.OL[0].ol_i_name,
sizeof(m_txn.NewOrder.OL[0].ol_i_name), NULL) !=
SQL_SUCCESS
                || SQLBindCol(m_hstmt, ++i,
SQL_C_SSHORT, &m_txn.NewOrder.OL[0].ol_stock, 0, NULL)
!= SQL_SUCCESS
                || SQLBindCol(m_hstmt, ++i,
SQL_C_CHAR,   &m_txn.NewOrder.OL[0].ol_brand_generic,
sizeof(m_txn.NewOrder.OL[0].ol_brand_generic), NULL)
!= SQL_SUCCESS
                || SQLBindCol(m_hstmt, ++i,
SQL_C_DOUBLE, &m_txn.NewOrder.OL[0].ol_i_price, 0,
NULL) != SQL_SUCCESS
                || SQLBindCol(m_hstmt, ++i,
SQL_C_DOUBLE, &m_txn.NewOrder.OL[0].ol_amount, 0,
NULL) != SQL_SUCCESS
                )
                ThrowError(CODBCERR::eBindCol);

        // associate the column bindings for the
second result set
        if ( SQLSetStmtAttrW( m_hstmt,
SQL_ATTR_APP_ROW_DESC, m_descNewOrderCols2,
SQL_IS_POINTER ) != SQL_SUCCESS )

        ThrowError(CODBCERR::eSetStmtAttr);

        i = 0;
        if (   SQLBindCol(m_hstmt, ++i,
SQL_C_DOUBLE,    &m_txn.NewOrder.w_tax, 0, NULL) !=
SQL_SUCCESS
                || SQLBindCol(m_hstmt, ++i,
SQL_C_DOUBLE,    &m_txn.NewOrder.d_tax, 0, NULL) !=
SQL_SUCCESS
                || SQLBindCol(m_hstmt, ++i,
SQL_C_SLONG,     &m_txn.NewOrder.o_id, 0, NULL) !=
SQL_SUCCESS
                || SQLBindCol(m_hstmt, ++i,
SQL_C_CHAR,      &m_txn.NewOrder.c_last,
sizeof(m_txn.NewOrder.c_last), NULL) != SQL_SUCCESS
                || SQLBindCol(m_hstmt, ++i,
SQL_C_DOUBLE,    &m_txn.NewOrder.c_discount, 0, NULL)
!= SQL_SUCCESS
                || SQLBindCol(m_hstmt, ++i,
SQL_C_CHAR,      &m_txn.NewOrder.c_credit,
sizeof(m_txn.NewOrder.c_credit), NULL) != SQL_SUCCESS
                || SQLBindCol(m_hstmt, ++i,
SQL_C_TYPE_TIMESTAMP, &m_txn.NewOrder.o_entry_d, 0,
NULL) != SQL_SUCCESS
                || SQLBindCol(m_hstmt, ++i,
SQL_C_SLONG,     &m_no_commit_flag, 0, NULL) !=
SQL_SUCCESS
            )
                ThrowError(CODBCERR::eBindCol);
}

void CTPCC_ODBC::NewOrder()
{
        int
        i;
        RETCODE                                 rc;
        int
        iTryCount = 0;

                                                //
0       1       2
                                                //
01234567890123456789012345678 9
        wchar_t
        szSqlTemplate[] = L"{call
tpcc_neworder(?,?,?,?,?,"


L"?,?,?,?,?,?,?,?,?,?,?,?,?,?,"


L"?,?,?,?,?,?,?,?,?,?,?,?,?,?,"


L"?,?,?,?,?,?,?,?,?,?,?,?,?,?)}";

        m_hstmt = m_hstmtNewOrder;

        // associate the parameter and column
bindings for this transaction
        if ( SQLSetStmtAttrW( m_hstmt,
SQL_ATTR_APP_ROW_DESC, m_descNewOrderCols1,
SQL_IS_POINTER ) != SQL_SUCCESS )

        ThrowError(CODBCERR::eSetStmtAttr);

        // clip statement buffer based on number of
parameters
        // fixed part is 29 chars and variable part
is 6 chars per line item
        i = 29 + m_txn.NewOrder.o_ol_cnt*6;
        wcscpy( &szSqlTemplate[i], L")}" );

        // 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;
                    }
          }

          while (TRUE)
          {
                    try
                    {
                              m_BindOffset = 0;
                              rc =
SQLExecDirectW(m_hstmt, (SQLWCHAR*)szSqlTemplate,
SQL_NTS);
                              if (rc != SQL_SUCCESS &&
rc != SQL_SUCCESS_WITH_INFO)

          ThrowError(CODBCERR::eExecDirect);

                              // Get order line
results

          m_txn.NewOrder.total_amount = 0;
                              for (i = 0;
i<m_txn.NewOrder.o_ol_cnt; i++)
                              {
                                        // set the
bind offset value...
                                        m_BindOffset =
i * sizeof(m_txn.NewOrder.OL[0]);

                                        if (
SQLFetch(m_hstmt) == SQL_ERROR)

          ThrowError(CODBCERR::eFetch);

                                        // move to the
next resultset
                                        if (
SQLMoreResults(m_hstmt) == SQL_ERROR )

          ThrowError(CODBCERR::eMoreResults);


          m_txn.NewOrder.total_amount +=
m_txn.NewOrder.OL[i].ol_amount;
                              }

                              // associate the column
bindings for the second result set
                              if ( SQLSetStmtAttrW(
m_hstmt, SQL_ATTR_APP_ROW_DESC, m_descNewOrderCols2,
SQL_IS_POINTER ) != SQL_SUCCESS )

          ThrowError(CODBCERR::eSetStmtAttr);

                              if ( SQLFetch(m_hstmt)
== SQL_ERROR)

          ThrowError(CODBCERR::eFetch);

                              SQLFreeStmt(m_hstmt,
SQL_CLOSE);

                              if (m_no_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;

                              break;
                    }
                    catch (CODBCERR *e)
                    {
                              if ((!e->m_bDeadLock) ||
(++iTryCount > iMaxRetries))
                                        throw;

                              // hit deadlock; backoff
for increasingly longer period
                              delete e;
                              Sleep(10 * iTryCount);
                    }
          }
//        if (iTryCount)
//                  throw new
CTPCC_ODBC_ERR(CTPCC_ODBC_ERR::ERR_RETRIED_TRANS,
iTryCount);
}

void CTPCC_ODBC::InitPaymentParams()
{
          if (   SQLAllocHandle(SQL_HANDLE_STMT,
m_hdbc, &m_hstmtPayment) != SQL_SUCCESS )

          ThrowError(CODBCERR::eAllocHandle);

          m_hstmt = m_hstmtPayment;

          int i = 0;
          if (   SQLBindParameter(m_hstmt, ++i,
SQL_PARAM_INPUT, SQL_C_SSHORT, SQL_SMALLINT, 0, 0,
&m_txn.Payment.w_id, 0, NULL) != SQL_SUCCESS
                    || SQLBindParameter(m_hstmt, ++i,
SQL_PARAM_INPUT, SQL_C_SSHORT, SQL_SMALLINT, 0, 0,
&m_txn.Payment.c_w_id, 0, NULL) != SQL_SUCCESS
                    || SQLBindParameter(m_hstmt, ++i,
SQL_PARAM_INPUT, SQL_C_DOUBLE, SQL_NUMERIC, 6, 2,
&m_txn.Payment.h_amount, 0, NULL) != SQL_SUCCESS
                    || SQLBindParameter(m_hstmt, ++i,
SQL_PARAM_INPUT, SQL_C_UTINYINT, SQL_TINYINT, 0, 0,
&m_txn.Payment.d_id, 0, NULL) != SQL_SUCCESS
                    || SQLBindParameter(m_hstmt, ++i,
SQL_PARAM_INPUT, SQL_C_UTINYINT, SQL_TINYINT, 0, 0,
&m_txn.Payment.c_d_id, 0, NULL) != SQL_SUCCESS
                    || SQLBindParameter(m_hstmt, ++i,
SQL_PARAM_INPUT, SQL_C_SLONG, SQL_INTEGER, 0, 0,
&m_txn.Payment.c_id, 0, NULL) != SQL_SUCCESS
                    || SQLBindParameter(m_hstmt, ++i,
SQL_PARAM_INPUT, SQL_C_CHAR, SQL_CHAR,
sizeof(m_txn.Payment.c_last), 0,
&m_txn.Payment.c_last, sizeof(m_txn.Payment.c_last),
NULL) != SQL_SUCCESS
                    )
                    ThrowError(CODBCERR::eBindParam);

          i = 0;
          if (   SQLBindCol(m_hstmt, ++i, SQL_C_SLONG,
&m_txn.Payment.c_id,                    0, NULL) !=
SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_CHAR,      &m_txn.Payment.c_last,
          sizeof(m_txn.Payment.c_last), NULL) !=
SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_TYPE_TIMESTAMP, &m_txn.Payment.h_date,
          0, NULL) != SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_CHAR,      &m_txn.Payment.w_street_1,
          sizeof(m_txn.Payment.w_street_1), NULL) !=
SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_CHAR,      &m_txn.Payment.w_street_2,
          sizeof(m_txn.Payment.w_street_2), NULL) !=
SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_CHAR,      &m_txn.Payment.w_city,
          sizeof(m_txn.Payment.w_city), NULL) !=
SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_CHAR,      &m_txn.Payment.w_state,
          sizeof(m_txn.Payment.w_state), NULL) !=
SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_CHAR,      &m_txn.Payment.w_zip,
          sizeof(m_txn.Payment.w_zip), NULL) !=
SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_CHAR,      &m_txn.Payment.d_street_1,
          sizeof(m_txn.Payment.d_street_1), NULL) !=
SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_CHAR,      &m_txn.Payment.d_street_2,
          sizeof(m_txn.Payment.d_street_2), NULL) !=
SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_CHAR,      &m_txn.Payment.d_city,
          sizeof(m_txn.Payment.d_city), NULL) !=
SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_CHAR,      &m_txn.Payment.d_state,
          sizeof(m_txn.Payment.d_state), NULL) !=
SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_CHAR,      &m_txn.Payment.d_zip,
          sizeof(m_txn.Payment.d_zip), NULL) !=
SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_CHAR,      &m_txn.Payment.c_first,
```

```
          sizeof(m_txn.Payment.c_first), NULL) !=
SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_CHAR,      &m_txn.Payment.c_middle,
          sizeof(m_txn.Payment.c_middle), NULL) !=
SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_CHAR,      &m_txn.Payment.c_street_1,
          sizeof(m_txn.Payment.c_street_1), NULL) !=
SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_CHAR,      &m_txn.Payment.c_street_2,
          sizeof(m_txn.Payment.c_street_2), NULL) !=
SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_CHAR,      &m_txn.Payment.c_city,
          sizeof(m_txn.Payment.c_city), NULL) !=
SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_CHAR,      &m_txn.Payment.c_state,
          sizeof(m_txn.Payment.c_state), NULL) !=
SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_CHAR,      &m_txn.Payment.c_zip,
          sizeof(m_txn.Payment.c_zip), NULL) !=
SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_CHAR,      &m_txn.Payment.c_phone,
          sizeof(m_txn.Payment.c_phone), NULL) !=
SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_TYPE_TIMESTAMP, &m_txn.Payment.c_since,
          0, NULL) != SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_CHAR,      &m_txn.Payment.c_credit,
          sizeof(m_txn.Payment.c_credit), NULL) !=
SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_DOUBLE,    &m_txn.Payment.c_credit_lim,0, NULL)
!= SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_DOUBLE,    &m_txn.Payment.c_discount,       0,
NULL) != SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_DOUBLE,    &m_txn.Payment.c_balance,        0,
NULL) != SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_CHAR,      &m_txn.Payment.c_data,
          sizeof(m_txn.Payment.c_data), NULL) !=
SQL_SUCCESS
                    )
                    ThrowError(CODBCERR::eBindCol);
}

void CTPCC_ODBC::Payment()
{
          RETCODE             rc;
          int                           iTryCount = 0;

          m_hstmt = m_hstmtPayment;

          if (m_txn.Payment.c_id != 0)
                    m_txn.Payment.c_last[0] = 0;

          while (TRUE)
          {
                    try
                    {
                              rc =
SQLExecDirectW(m_hstmt, (SQLWCHAR*)L"{call
tpcc_payment(?,?,?,?,?,?,?)}", SQL_NTS);
                              if (rc != SQL_SUCCESS &&
rc != SQL_SUCCESS_WITH_INFO)

          ThrowError(CODBCERR::eExecDirect);

                              if ( SQLFetch(m_hstmt)
== SQL_ERROR)

          ThrowError(CODBCERR::eFetch);

                              SQLFreeStmt(m_hstmt,
SQL_CLOSE);

                              if (m_txn.Payment.c_id
== 0)
                                        throw new
CTPCC_ODBC_ERR( CTPCC_ODBC_ERR::ERR_INVALID_CUST );
                              else

          m_txn.Payment.exec_status_code = eOK;

                              break;
                    }
                    catch (CODBCERR *e)
                    {
                              if ((!e->m_bDeadLock) ||
(++iTryCount > iMaxRetries))
                                        throw;

                              // hit deadlock; backoff
for increasingly longer period
                              delete e;
                              Sleep(10 * iTryCount);
                    }
          }

//        if (iTryCount)
//                  throw new
CTPCC_ODBC_ERR(CTPCC_ODBC_ERR::ERR_RETRIED_TRANS,
iTryCount);
}

void CTPCC_ODBC::InitOrderStatusParams()
{
          if (   SQLAllocHandle(SQL_HANDLE_STMT,
m_hdbc, &m_hstmtOrderStatus) != SQL_SUCCESS
                    || SQLAllocHandle(SQL_HANDLE_DESC,
m_hdbc, &m_descOrderStatusCols1) != SQL_SUCCESS
                    || SQLAllocHandle(SQL_HANDLE_DESC,
m_hdbc, &m_descOrderStatusCols2) != SQL_SUCCESS
                    )

          ThrowError(CODBCERR::eAllocHandle);

          m_hstmt = m_hstmtOrderStatus;

          if (   SQLSetStmtAttrW( m_hstmt,
SQL_ATTR_APP_ROW_DESC, m_descOrderStatusCols1,
SQL_IS_POINTER ) != SQL_SUCCESS )

          ThrowError(CODBCERR::eSetStmtAttr);


          int i = 0;
          if (   SQLBindParameter(m_hstmt, ++i,
SQL_PARAM_INPUT, SQL_C_SSHORT, SQL_SMALLINT, 0, 0,
&m_txn.OrderStatus.w_id, 0, NULL) != SQL_SUCCESS
                    || SQLBindParameter(m_hstmt, ++i,
SQL_PARAM_INPUT, SQL_C_UTINYINT, SQL_TINYINT, 0, 0,
&m_txn.OrderStatus.d_id, 0, NULL) != SQL_SUCCESS
                    || SQLBindParameter(m_hstmt, ++i,
SQL_PARAM_INPUT, SQL_C_SLONG, SQL_INTEGER, 0, 0,
&m_txn.OrderStatus.c_id, 0, NULL) != SQL_SUCCESS
                    || SQLBindParameter(m_hstmt, ++i,
SQL_PARAM_INPUT, SQL_C_CHAR, SQL_CHAR,
sizeof(m_txn.OrderStatus.c_last), 0,
&m_txn.OrderStatus.c_last,
sizeof(m_txn.OrderStatus.c_last), NULL) != SQL_SUCCESS
                    )
                    ThrowError(CODBCERR::eBindParam);

          // configure block cursor
          if (   SQLSetStmtAttrW(m_hstmt,
SQL_ATTR_ROW_BIND_TYPE,
(SQLPOINTER)sizeof(m_txn.OrderStatus.OL[0]), 0) !=
SQL_SUCCESS
                    || SQLSetStmtAttrW(m_hstmt,
SQL_ATTR_ROWS_FETCHED_PTR, &m_RowsFetched, 0) !=
SQL_SUCCESS
                    )

          ThrowError(CODBCERR::eSetStmtAttr);

          i = 0;
          if (   SQLBindCol(m_hstmt, ++i,
SQL_C_SSHORT, &m_txn.OrderStatus.OL[0].ol_supply_w_id,
0, NULL) != SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_SLONG, &m_txn.OrderStatus.OL[0].ol_i_id, 0,
NULL) != SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_SSHORT, &m_txn.OrderStatus.OL[0].ol_quantity, 0,
NULL) != SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_DOUBLE, &m_txn.OrderStatus.OL[0].ol_amount, 0,
NULL) != SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_TYPE_TIMESTAMP,
&m_txn.OrderStatus.OL[0].ol_delivery_d, 0, NULL) !=
SQL_SUCCESS
                    )
                    ThrowError(CODBCERR::eBindCol);


          if ( SQLSetStmtAttrW( m_hstmt,
SQL_ATTR_APP_ROW_DESC, m_descOrderStatusCols2,
SQL_IS_POINTER ) != SQL_SUCCESS )

          ThrowError(CODBCERR::eSetStmtAttr);
```

```
          i = 0;
          if (   SQLBindCol(m_hstmt, ++i, SQL_C_SLONG,
&m_txn.OrderStatus.c_id, 0, NULL) != SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_CHAR, &m_txn.OrderStatus.c_last,
sizeof(m_txn.OrderStatus.c_last), NULL) != SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_CHAR, &m_txn.OrderStatus.c_first,
sizeof(m_txn.OrderStatus.c_first), NULL) !=
SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_CHAR, &m_txn.OrderStatus.c_middle,
sizeof(m_txn.OrderStatus.c_middle), NULL) !=
SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_TYPE_TIMESTAMP, &m_txn.OrderStatus.o_entry_d, 0,
NULL) != SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_SSHORT, &m_txn.OrderStatus.o_carrier_id, 0,
NULL) != SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_DOUBLE, &m_txn.OrderStatus.c_balance, 0, NULL)
!= SQL_SUCCESS
                    || SQLBindCol(m_hstmt, ++i,
SQL_C_SLONG, &m_txn.OrderStatus.o_id, 0, NULL) !=
SQL_SUCCESS
                    )
                    ThrowError(CODBCERR::eBindCol);
}

void CTPCC_ODBC::OrderStatus()
{
          int
                    iTryCount = 0;
          RETCODE
          rc;

          m_hstmt = m_hstmtOrderStatus;

          if ( SQLSetStmtAttrW( m_hstmt,
SQL_ATTR_APP_ROW_DESC, m_descOrderStatusCols1,
SQL_IS_POINTER ) != SQL_SUCCESS )

          ThrowError(CODBCERR::eSetStmtAttr);

          if (m_txn.OrderStatus.c_id != 0)
                    m_txn.OrderStatus.c_last[0] = 0;

          while (TRUE)
          {
                    try
                    {
                              // configure block
cursor
                              if (
SQLSetStmtAttrW(m_hstmt, SQL_ATTR_ROW_ARRAY_SIZE,
(SQLPOINTER)1, 0) != SQL_SUCCESS )

          ThrowError(CODBCERR::eSetStmtAttr);

                              rc =
SQLExecDirectW(m_hstmt, (SQLWCHAR*)L"{call
tpcc_orderstatus(?,?,?,?)}", SQL_NTS);
                              if ( ((rc ==
SQL_SUCCESS_WITH_INFO) && (m_RowsFetched != 0)) || (rc
== SQL_ERROR) )

          ThrowError(CODBCERR::eExecDirect);

                              // configure block
cursor
                              if (
SQLSetStmtAttrW(m_hstmt, SQL_ATTR_ROW_ARRAY_SIZE,
(SQLPOINTER)MAX_OL_ORDER_STATUS_ITEMS, 0) !=
SQL_SUCCESS )

          ThrowError(CODBCERR::eSetStmtAttr);

                              rc = SQLFetchScroll(
m_hstmt, SQL_FETCH_NEXT, 0 );
                              if ( ((rc ==
SQL_SUCCESS_WITH_INFO) && (m_RowsFetched != 0)) || (rc
== SQL_ERROR) )

          ThrowError(CODBCERR::eFetchScroll);


          m_txn.OrderStatus.o_ol_cnt =
(short)m_RowsFetched;

                              if
(m_txn.OrderStatus.o_ol_cnt != 0)
                              {
                                        if (
SQLSetStmtAttrW( m_hstmt, SQL_ATTR_APP_ROW_DESC,
m_descOrderStatusCols2, SQL_IS_POINTER ) !=
SQL_SUCCESS )

          ThrowError(CODBCERR::eSetStmtAttr);

                                        if (
SQLMoreResults(m_hstmt) == SQL_ERROR )

          ThrowError(CODBCERR::eMoreResults);

                                        if ( (rc =
SQLFetch(m_hstmt)) == SQL_ERROR)

          ThrowError(CODBCERR::eFetch);
                                        }

                                        SQLFreeStmt(m_hstmt,
SQL_CLOSE);

                                        if
(m_txn.OrderStatus.o_ol_cnt == 0)
                                        throw new
CTPCC_ODBC_ERR( CTPCC_ODBC_ERR::ERR_NO_SUCH_ORDER );
                                        else if
(m_txn.OrderStatus.c_id == 0 &&
m_txn.OrderStatus.c_last[0] == 0)
                                        throw new
CTPCC_ODBC_ERR( CTPCC_ODBC_ERR::ERR_INVALID_CUST );
                                        else

          m_txn.OrderStatus.exec_status_code = eOK;

                                        break;
                              }
                              catch (CODBCERR *e)
                              {
                                        if ((!e->m_bDeadLock) ||
(++iTryCount > iMaxRetries))
                                        throw;

                                        // hit deadlock; backoff
for increasingly longer period
                                        delete e;
                                        Sleep(10 * iTryCount);
                              }
          }

//        if (iTryCount)
//                  throw new
CTPCC_ODBC_ERR(CTPCC_ODBC_ERR::ERR_RETRIED_TRANS,
iTryCount);
}

void CTPCC_ODBC::InitDeliveryParams()
{
          if (   SQLAllocHandle(SQL_HANDLE_STMT,
m_hdbc, &m_hstmtDelivery) != SQL_SUCCESS )

          ThrowError(CODBCERR::eAllocHandle);

          m_hstmt = m_hstmtDelivery;


          int i = 0;
          if (   SQLBindParameter(m_hstmt, ++i,
SQL_PARAM_INPUT, SQL_C_SSHORT, SQL_SMALLINT, 0, 0,
&m_txn.Delivery.w_id, 0, NULL) != SQL_SUCCESS
                    || SQLBindParameter(m_hstmt, ++i,
SQL_PARAM_INPUT, SQL_C_SSHORT, SQL_SMALLINT, 0, 0,
&m_txn.Delivery.o_carrier_id, 0, NULL) != SQL_SUCCESS
                    )
                    ThrowError(CODBCERR::eBindParam);

          for (i=0;i<10;i++)
          {
                    if ( SQLBindCol(m_hstmt,
(UWORD)(i+1), SQL_C_SLONG, &m_txn.Delivery.o_id[i], 0,
NULL) != SQL_SUCCESS )

          ThrowError(CODBCERR::eBindCol);
          }
}

void CTPCC_ODBC::Delivery()
{
          RETCODE             rc;
          int                 iTryCount = 0;

          m_hstmt = m_hstmtDelivery;

          while (TRUE)
          {
                    try
```

```
                    {
                              rc =
SQLExecDirectW(m_hstmt, (SQLWCHAR*)L"{call
tpcc_delivery(?,?)}", SQL_NTS);
                              if (rc != SQL_SUCCESS &&
rc != SQL_SUCCESS_WITH_INFO)

          ThrowError(CODBCERR::eExecDirect);

                              if ( SQLFetch(m_hstmt)
== SQL_ERROR )

          ThrowError(CODBCERR::eFetch);

                              SQLFreeStmt(m_hstmt,
SQL_CLOSE);

          m_txn.Delivery.exec_status_code = eOK;
                              break;
                    }
                    catch (CODBCERR *e)
                    {
                              if ((!e->m_bDeadLock) ||
(++iTryCount > iMaxRetries))
                                        throw;

                              // hit deadlock; backoff
for increasingly longer period
                              delete e;
                              Sleep(10 * iTryCount);
                    }
          }

//        if (iTryCount)
//                  throw new
CTPCC_ODBC_ERR(CTPCC_ODBC_ERR::ERR_RETRIED_TRANS,
iTryCount);
}
```

Tpcc_odbc.h

```
/*        FILE:               TPCC_ODBC.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 CODBCERR : public CBaseErr
{
          public:
                    enum ACTION
                    {
                              eNone,
                              eUnknown,
                              eAllocConn,
                    // error from SQLAllocConnect
                              eAllocHandle,
          // error from SQLAllocHandle
                              eConnOption,
          // error from SQLSetConnectOption
                              eConnect,
          // error from SQLConnect
                              eAllocStmt,
                    // error from SQLAllocStmt
                              eExecDirect,
          // error from SQLExecDirect
                              eBindParam,
                    // error from SQLBindParameter
                              eBindCol,
          // error from SQLBindCol
                              eFetch,
                    // error from SQLFetch
                              eFetchScroll,
          // error from SQLFetchScroll
                              eMoreResults,
          // error from SQLMoreResults
                              ePrepare,
          // error from SQLPrepare
                              eExecute,
          // error from SQLExecute
                              eSetEnvAttr,
          // error from SQLSetEnvAttr
                              eSetStmtAttr
          // error from SQLSetStmtAttr
                    };

                    CODBCERR(void)
                    {
                              m_eAction = eNone;
                              m_NativeError = 0;
                              m_bDeadLock = FALSE;
                              m_odbcerrstr = NULL;
                    };

                    ~CODBCERR()
                    {
                              if (m_odbcerrstr !=
NULL)
                                        delete []
m_odbcerrstr;
                    };

                    ACTION    m_eAction;
                    int                 m_NativeError;
                    BOOL      m_bDeadLock;
                    char   *m_odbcerrstr;

                    int ErrorType() {return
ERR_TYPE_ODBC;};
                    int ErrorNum() {return
m_NativeError;};
                    char *ErrorText() {return
m_odbcerrstr;};

};


class CTPCC_ODBC_ERR : public CBaseErr
{
          public:
                    enum TPCC_ODBC_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."
                              ERR_RETRIED_TRANS,
                    // "Retries before transaction
succeeded."
                    };

                    CTPCC_ODBC_ERR( int iErr ) {
m_errno = iErr; m_iTryCount = 0; };

                    CTPCC_ODBC_ERR( int iErr, int
iTryCount ) { m_errno = iErr; m_iTryCount = iTryCount;
};

                    int                 m_errno;
                    int                 m_iTryCount;

                    int ErrorType() {return
ERR_TYPE_TPCC_ODBC;};
                    int ErrorNum() {return m_errno;};

                    char *ErrorText();
};

class DllDecl CTPCC_ODBC : public CTPCC_BASE
{
          private:
                    // declare variables and private
functions here...
                    BOOL                m_bDeadlock;
                    // transaction was selected as
deadlock victim
                    int
          m_MaxRetries;                 // retry count
on deadlock
```

```
                    SQLHENV             m_henv;
                              // ODBC environment
handle
                    SQLHDBC             m_hdbc;
                    SQLHSTMT  m_hstmt;
          // the current hstmt

                    SQLHSTMT  m_hstmtNewOrder;
                    SQLHSTMT  m_hstmtPayment;
                    SQLHSTMT  m_hstmtDelivery;
                    SQLHSTMT  m_hstmtOrderStatus;
                    SQLHSTMT  m_hstmtStockLevel;

                    SQLHDESC  m_descNewOrderCols1;
                    SQLHDESC  m_descNewOrderCols2;
                    SQLHDESC  m_descOrderStatusCols1;
                    SQLHDESC  m_descOrderStatusCols2;

                    // new-order specific fields
                    SQLUINTEGER         m_BindOffset;
                    SQLUINTEGER         m_RowsFetched;
                    int
          m_no_commit_flag;

                    void ThrowError( CODBCERR::ACTION
eAction );

                    void InitNewOrderParams();
                    void InitPaymentParams();
                    void InitDeliveryParams();
                    void InitStockLevelParams();
                    void InitOrderStatusParams();

                    union
                    {
                              NEW_ORDER_DATA
          NewOrder;
                              PAYMENT_DATA
          Payment;
                              DELIVERY_DATA
          Delivery;
                              STOCK_LEVEL_DATA
          StockLevel;
                              ORDER_STATUS_DATA
          OrderStatus;
                    }
          m_txn;

          public:
                    CTPCC_ODBC(LPCSTR szServer, LPCSTR
szUser, LPCSTR szPassword, LPCSTR szHost, LPCSTR
szDatabase);
                    ~CTPCC_ODBC(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    ();

};


// wrapper routine for class constructor
extern "C" DllDecl CTPCC_ODBC* CTPCC_ODBC_new
          ( LPCSTR szServer, LPCSTR szUser, LPCSTR
szPassword, LPCSTR szHost, LPCSTR szDatabase );

typedef CTPCC_ODBC* (TYPE_CTPCC_ODBC)(LPCSTR, LPCSTR,
LPCSTR, LPCSTR, LPCSTR);
```

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
#ifndef 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
```

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
definations 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 };

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

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 occured in
initialization
 *
          TRUE                                    DLL
successfully initialized
 */

BOOL APIENTRY 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(&TermCriticalSecti
on);
                                        if (
ReadTPCCRegistrySettings( &Reg ) )

          throw new CWEBCLNT_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

                                        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 CWEBCLNT_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 CWEBCLNT_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 CWEBCLNT_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 CWEBCLNT_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 CWEBCLNT_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 CWEBCLNT_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 CWEBCLNT_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 CWEBCLNT_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 CWEBCLNT_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 CWEBCLNT_ERR(
ERR_GETPROCADDR_FAILED, szDllName, GetLastError() );
                                                    }
                                          }

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

          hDoneEvent = CreateEvent( NULL, TRUE /*
manual reset */, FALSE /* initially not signalled */,
NULL );

          InitializeCriticalSection(&DelBuffCriticalSe
ction);

          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 );

          txnDelilog = new CTxnLog(szLogFile,
TXN_LOG_WRITE);


          //write event into txn log for START

          txnDelilog-
>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(
DeliveryWorkerThread, 0, NULL );

          if (pDeliHandles[i] == INVALID_HANDLE_VALUE)

                    throw new CWEBCLNT_ERR(
ERR_DELIVERY_THREAD_FAILED );
                                                    }
                                          }

                                          break;

                                case DLL_PROCESS_DETACH:
                                          if
(dwNumDeliveryThreads)
                                          {
                                                    if
(txnDelilog != NULL)
                                                    {

          //write event into txn log for STOP

          txnDelilog-
```

```
>WriteCtrlRecToLog(TXN_EVENT_STOP, szMyComputerName,
sizeof(szMyComputerName));


          // This will do a clean shutdown of the
delivery log file

          CTxnLog   *txnDelilogLocal = txnDelilog;

          txnDelilog= NULL;

          delete txnDelilogLocal;
                                                  }



          delete [] pDeliHandles;

          delete [] pDelBuff;


          CloseHandle( hWorkerSemaphore );

          CloseHandle( hDoneEvent );

          DeleteCriticalSection(&DelBuffCriticalSectio
n);                                       }


          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;
}


/* 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);
          lstrcpyn(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 );
                                }

                                //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 );
          }

#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(txnDelilog != NULL);

          try
          {
                    if (Reg.eDB_Protocol == ODBC)
                              pTxn = pCTPCC_ODBC_new(
Reg.szDbServer, Reg.szDbUser, Reg.szDbPassword,
szMyComputerName, Reg.szDbName );
                    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.
"
                                        "%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_DELIV_DEF;

                                        // make a
local copy of current entry from delivery buffer and
increment buffer index

                    EnterCriticalSection(&DelBuffCriticalSection
);
                                        delivery =
*(pDelBuff+dwDelBuffBusyIndex);

                    dwDelBuffFreeCount++;

                    dwDelBuffBusyIndex++;
                                        if
(dwDelBuffBusyIndex == dwDelBuffSize)   // wrap-around
if at end of buffer

                    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 =
Get64BitTime(&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)(Get64BitTime(&trans_end) -
txnDeliRec.TxnStartT0);

                    txnDeliRec.DeltaTxnExec =
(int)(Get64BitTime(&trans_end) -
Get64BitTime(&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.
 *
 * RETURNS:                 BOOL      FALSE
          delivery information posted successfully
 *
          TRUE      error cannot post delivery info
 */

BOOL PostDeliveryInfo(short 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)
{
          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=\"TERMID\"
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 VALUE=\"%s\"><BR>"

          "DB User ID   = <INPUT NAME=\"db_user\"
SIZE=20 VALUE=\"%s\"><BR>"

          "DB Password  = <INPUT NAME=\"db_passwd\"
SIZE=20 VALUE=\"%s\"><BR>"

          "DB Name      = <INPUT NAME=\"db_name\"
SIZE=20 VALUE=\"%s\"><BR>"

          "</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=4><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
          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 );
                    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       iTotal;

          EnterCriticalSection(&TermCriticalSection);

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

          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>"
                              , iTotal );
}

char *CWEBCLNT_ERR::ErrorText()
{
          static SERRORMSG errorMsgs[] =
          {
                    {         ERR_COMMAND_UNDEFINED,

          "Command undefined."

                                                  },
                    {         ERR_D_ID_INVALID,

          "Invalid District ID Must be 1 to 10."

                    },
                    {
          ERR_DELIVERY_CARRIER_ID_RANGE,
                    "Delivery Carrier ID out of range
must be 1 - 10."
          },
                    {
          ERR_DELIVERY_CARRIER_INVALID,
          "Delivery Carrier ID invalid must be numeric
1 - 10."                            },
                    {
          ERR_DELIVERY_MISSING_OCD_KEY,
          "Delivery missing Carrier ID key \"OCD*\"."

                    },
                    {
          ERR_DELIVERY_THREAD_FAILED,
                    "Could not start delivery worker
thread."
                    },
                    {         ERR_GETPROCADDR_FAILED,

          "Could not map proc in DLL.  GetProcAddr
error.  DLL="                                       },
                    {         ERR_HTML_ILL_FORMED,

          "Required key field is missing from HTML
string."                                            },
                    {
          ERR_INVALID_SYNC_CONNECTION,
          "Invalid Terminal Sync ID."

                                                  },
                    {         ERR_INVALID_TERMID,

          "Invalid Terminal ID."

                                                        },
                    {         ERR_LOADDLL_FAILED,

          "Load of DLL failed.  DLL="

                                                  },
                    {
          ERR_MAX_CONNECTIONS_EXCEEDED,
          "No connections available.  Max Connections
is probably too low."   },
                    {
          ERR_MISSING_REGISTRY_ENTRIES,
          "Required registry entries are missing.
Rerun INSTALL to correct."    },
                    {
          ERR_NEWORDER_CUSTOMER_INVALID,
                    "New Order customer id invalid
data type, range = 1 to 3000."                      },
                    {
          ERR_NEWORDER_CUSTOMER_KEY,
                    "New Order missing Customer key
\"CID*\"."
                              },
                    {
          ERR_NEWORDER_DISTRICT_INVALID,
                    "New Order District ID Invalid
range 1 - 10."
                    },
                    {
          ERR_NEWORDER_FORM_MISSING_DID,
                    "New Order missing District key
\"DID*\"."
                              },
                    {
          ERR_NEWORDER_ITEMID_INVALID,
          "New Order Item Id is wrong data type, must
be numeric."                                        },
                    {
          ERR_NEWORDER_ITEMID_RANGE,
                    "New Order Item Id is out of
range. Range = 1 to 999999."                        },
                    {
          ERR_NEWORDER_ITEMID_WITHOUT_SUPPW,
          "New Order Item_Id field entered without a
corresponding Supp_W."        },
                    {
          ERR_NEWORDER_MISSING_IID_KEY,
          "New Order missing Item Id key \"IID*\"."

                    },
                    {
          ERR_NEWORDER_MISSING_QTY_KEY,
          "New Order Missing Qty key \"Qty##*\"."

                    },
                    {
          ERR_NEWORDER_MISSING_SUPPW_KEY,
                    "New Order missing Supp_W key
\"SP##*\"."
                              },
                    {
          ERR_NEWORDER_NOITEMS_ENTERED,
          "New Order No order lines entered."
```

```
                        },
                {
        ERR_NEWORDER_QTY_INVALID,
                "New Order Qty invalid must be
numeric range 1 - 99."
        },
                {       ERR_NEWORDER_QTY_RANGE,
                                                "New
Order Qty is out of range. Range = 1 to 99."
                                        },
                {
        ERR_NEWORDER_QTY_WITHOUT_SUPPW,
                "New Order Qty field entered
without a corresponding Supp_W."                },
                {
        ERR_NEWORDER_SUPPW_INVALID,
                "New Order Supp_W invalid data
type must be numeric."
        },
                {       ERR_NO_SERVER_SPECIFIED,
                                "No Server
name specified."

                },
                {
        ERR_ORDERSTATUS_CID_AND_CLT,
        "Order Status Only Customer ID or Last Name
may be entered, not both."    },
                {
        ERR_ORDERSTATUS_CID_INVALID,
        "Order Status Customer ID invalid, range
must be numeric 1 - 3000."    },
                {
        ERR_ORDERSTATUS_CLT_RANGE,
                "Order Status Customer last name
longer than 16 characters."             },
                {
        ERR_ORDERSTATUS_DID_INVALID,
        "Order Status District invalid, value must
be numeric 1 - 10."           },
                {
        ERR_ORDERSTATUS_MISSING_CID_CLT,
        "Order Status Either Customer ID or Last
Name must be entered."                  },
                {
        ERR_ORDERSTATUS_MISSING_CID_KEY,
        "Order Status missing Customer key
\"CID*\"."
                },
                {
        ERR_ORDERSTATUS_MISSING_CLT_KEY,
        "Order Status missing Customer Last Name key
\"CLT*\"."                                      },
                {
        ERR_ORDERSTATUS_MISSING_DID_KEY,
        "Order Status missing District key
\"DID*\"."
                },
                {       ERR_PAYMENT_CDI_INVALID,
                                "Payment
Customer district invalid must be numeric."
                                },
                {       ERR_PAYMENT_CID_AND_CLT,
                                "Payment Only
Customer ID or Last Name may be entered, not both."
        },
                {
        ERR_PAYMENT_CUSTOMER_INVALID,
        "Payment Customer data type invalid, must be
numeric."                               },
                {       ERR_PAYMENT_CWI_INVALID,
                                "Payment
Customer Warehouse invalid, must be numeric."
                                },
                {
        ERR_PAYMENT_DISTRICT_INVALID,
        "Payment District ID is invalid, must be 1 -
10."                                            },
                {       ERR_PAYMENT_HAM_INVALID,
                                "Payment
Amount invalid data type must be numeric."
                                },
                {       ERR_PAYMENT_HAM_RANGE,

        "Payment Amount out of range, 0 - 9999.99."

                },
                {
        ERR_PAYMENT_LAST_NAME_TO_LONG,
                "Payment Customer last name longer
than 16 characters."
        },
                {
        ERR_PAYMENT_MISSING_CDI_KEY,
        "Payment missing Customer district key
\"CDI*\"."
        },
                {
        ERR_PAYMENT_MISSING_CID_CLT,
        "Payment Either Customer ID or Last Name
must be entered."                       },
                {
        ERR_PAYMENT_MISSING_CID_KEY,
        "Payment missing Customer Key \"CID*\"."

                },
                {
        ERR_PAYMENT_MISSING_CLT_KEY,
        "Payment missing Customer Last Name key
\"CLT*\"."
        },
                {
        ERR_PAYMENT_MISSING_CWI_KEY,
        "Payment missing Customer Warehouse key
\"CWI*\"."
        },
                {
        ERR_PAYMENT_MISSING_DID_KEY,
        "Payment missing District Key \"DID*\"."

                },
                {
        ERR_PAYMENT_MISSING_HAM_KEY,
        "Payment missing Amount key \"HAM*\"."

                },
                {
        ERR_STOCKLEVEL_MISSING_THRESHOLD_KEY,
        "Stock Level; missing Threshold key
\"TT*\"."
        },
                {
        ERR_STOCKLEVEL_THRESHOLD_INVALID,
        "Stock Level; Threshold value must be in the
range = 1 - 99."               },
                {
        ERR_STOCKLEVEL_THRESHOLD_RANGE,
                "Stock Level Threshold out of
range, range must be 1 - 99."                   },
                {       ERR_VERSION_MISMATCH,

        "Invalid version field.  RTE and Web Client
are probably out of sync." },
                {       ERR_W_ID_INVALID,

        "Invalid Warehouse ID."

                                                        },
                {       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)
                wsprintf( 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 for
 *                                    char
                   *pValue
          character array into which to place key's
value
 *                                    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++;

          iMax--;  // one position is for terminating
null
          while( *ptr && *ptr != '&' && 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
          *pQueryString       http string from client
browser
 *                                    char
                   *pKey                          key
value to look for
 *                                    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 != '&' && 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;
          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].pTxn;
          }

          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);
                              throw new CWEBCLNT_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=\"TERMID\" 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=\"TERMID\" 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.
 *
 * 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 = wsprintf(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=\"TERMID\" VALUE=\"%d\">"
                    "<INPUT TYPE=\"hidden\"
NAME=\"SYNCID\" VALUE=\"%d\">"
                    "<PRE><font face=\"Courier\">
Stock-Level<BR>"
                    "Warehouse: %4.4d   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></PRE><HR>"
                    "<INPUT TYPE=\"submit\"
NAME=\"CMD\" VALUE=\"Process\">"
                    "<INPUT TYPE=\"submit\"
NAME=\"CMD\" VALUE=\"Menu\">"
                    "</FORM></HTML>" );
          }
          else
          {
                    wsprintf(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></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>";

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

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

          c = wsprintf(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=\"TERMID\" 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 += wsprintf(szForm+c,
"Warehouse: %4.4d   ", Term.pClientData[iTermId].w_id
);


                    strcpy( szForm+c,
```

```
                              "District: <INPUT
NAME=\"DID*\" SIZE=1>
Date:<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>"
                              "  <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>"

                              "  <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 += wsprintf(szForm+c,
"Warehouse: %4.4d   District: %2.2d
Date: ",
                              pNewOrderData->w_id,
                              pNewOrderData->d_id);

                    if ( bValid )
                    {
                              c += wsprintf(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 += wsprintf(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,

          "%%Disc: %5.2f            <BR>"

          "Order Number: %8.8d  Number of Lines: %2.2d
W_tax: %5.2f   D_tax: %5.2f  <BR> <BR>"

          " 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, "  %4.4d   %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 += wsprintf(szForm+c,
                                        "%Disc:<BR>"
                                        "Order Number:
%8.8d  Number of Lines:              W_tax:
D_tax:<BR> <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
);
                    c += (15-i)*5;

                    if ( bValid )
                              c += sprintf(szForm+c,
"Execution Status: Transaction commited.
Total:  $%8.2f  ",
                                        pNewOrderData-
>total_amount);
                    else
                              c += wsprintf(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 = wsprintf(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=\"TERMID\" VALUE=\"%d\">"
                    "<INPUT TYPE=\"hidden\"
NAME=\"SYNCID\" VALUE=\"%d\">"
                    "<PRE><font face=\"Courier\">
Payment<BR>"
                    "Date: "
                    , PAYMENT_FORM, iTermId,
Term.pClientData[iTermId].iSyncId);

          if ( !bInput )
          {
                    c += wsprintf(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 += wsprintf(szForm+c,
                                "<BR> <BR>Warehouse:
%4.4d"
                                "
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 += wsprintf(szForm+c,
                                "<BR> <BR>Warehouse:
%4.4d                            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: %4.4d  Cust-District: %2.2d<BR>"
                                "Name:   %-16s %-2s %-
16s     Since:  %2.2d-%2.2d-%4.4d<BR>"
                                "        %-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
                                , 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=\"TERMID\" VALUE=\"%d\">"
                    "<INPUT TYPE=\"hidden\"
NAME=\"SYNCID\" VALUE=\"%d\">"
                    "<PRE><font face=\"Courier\">
Order-Status<BR>"
                    "Warehouse: %4.4d   ",
                    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> <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);

                    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, "
%4.4d       %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: %4.4d<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> </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> </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,
                              (pDeliveryData-
>exec_status_code == eOK) ? "Delivery has been
queued." : "Delivery Post Failed     "
                              );
          }
}

/* 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.
 *                                   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 CWEBCLNT_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 CWEBCLNT_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*" };
          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
CWEBCLNT_ERR( ERR_NEWORDER_SUPPW_INVALID );
                              pNewOrderData-
>OL[items].ol_supply_w_id = (short)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
CWEBCLNT_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
CWEBCLNT_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
CWEBCLNT_ERR( ERR_NEWORDER_ITEMID_WITHOUT_SUPPW );

                              GetKeyValue(&ptr,
szQty[i], szTmp, sizeof(szTmp),
ERR_NEWORDER_MISSING_QTY_KEY);
                              if ( szTmp[0] )
                                        throw new
CWEBCLNT_ERR( ERR_NEWORDER_QTY_WITHOUT_SUPPW );
                    }
          }
          if ( items == 0 )
                    throw new CWEBCLNT_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 structure
 */

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 CWEBCLNT_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 CWEBCLNT_ERR(
ERR_PAYMENT_MISSING_CID_CLT );

                    _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      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      if string is OK
 */

BOOL IsDecimal(char *ptr)
{
          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;
}
```

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;
                              //syncronization 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;

          //syncronization id
          CLIENTDATA          *pClientData;
                                        //pointer to
allocated client data
} TERM;
```

```
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_TO_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)
                                        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 APIENTRY 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(short w_id, short o_carrier_id);
```

```
BOOL IsNumeric(char *ptr);
BOOL IsDecimal(char *ptr);
void DeliveryWorkerThread(void *ptr);
```

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
#define DllDecl  __declspec( dllexport )

#include "..\..\common\src\trans.h"
          //tpckit transaction header contains
defination 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();
                    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 );
}
```

Tpcc_com.h

```
/*        FILE:               TPCC_COM.H
 *                                        Microsoft TPC-
C Kit Ver. 4.20.000
 *                                        Copyright
Microsoft, 1999
 *              All Rights Reserved
 *
 *                                        not yet
audited
 *
 *        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:
                    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.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 defination 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];

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

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.  GetProcAddr
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)
                        {
                                        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,

                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();

                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)
{
        PORDER_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.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 Thu Dec 13 23:13:14 2001
 */
/* Compiler settings for .\src\tpcc_com_all.idl:
    Oicf (OptLev=i2), W1, 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 __tpcc_com_all_h__
#define __tpcc_com_all_h__

/* Forward Declarations */

#ifndef __TPCC_FWD_DEFINED__
#define __TPCC_FWD_DEFINED__

#ifdef __cplusplus
typedef class TPCC TPCC;
#else
typedef struct TPCC TPCC;
#endif /* __cplusplus */

#endif    /* __TPCC_FWD_DEFINED__ */


#ifndef __NewOrder_FWD_DEFINED__
#define __NewOrder_FWD_DEFINED__

#ifdef __cplusplus
typedef class NewOrder NewOrder;
#else
typedef struct NewOrder NewOrder;
#endif /* __cplusplus */

#endif    /* __NewOrder_FWD_DEFINED__ */


#ifndef __OrderStatus_FWD_DEFINED__
#define __OrderStatus_FWD_DEFINED__

#ifdef __cplusplus
typedef class OrderStatus OrderStatus;
#else
typedef struct OrderStatus OrderStatus;
#endif /* __cplusplus */

#endif    /* __OrderStatus_FWD_DEFINED__ */


#ifndef __Payment_FWD_DEFINED__
#define __Payment_FWD_DEFINED__

#ifdef __cplusplus
typedef class Payment Payment;
#else
typedef struct Payment Payment;
#endif /* __cplusplus */

#endif    /* __Payment_FWD_DEFINED__ */


#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 "oaidl.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;
```

```
#ifndef __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 */

#ifdef __cplusplus
}
#endif

#endif
```

Resource.h

```
//{{NO_DEPENDENCIES}}
// 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
//
#ifdef 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
```

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;
                    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>
{
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_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 Thu Dec 13 23:13:14 2001
 */
/* Compiler settings for .\src\tpcc_com_all.idl:
    Oicf (OptLev=i2), W1, 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,b
7,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,b
7,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,0x71,0x00,0xC
0,0x4F,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,0
x00,0xC0,0x4F,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,0x
00,0xC0,0x4F,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 Thu Dec 13 23:13:14 2001
 */
/* Compiler settings for .\src\tpcc_com_all.idl:
    Oicf (OptLev=i2), W1, 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,b
7,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,b
7,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,0x71,0x00,0xC
0,0x4F,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,0
x00,0xC0,0x4F,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,0x
00,0xC0,0x4F,0xBF,0xE0,0x8B);

#undef MIDL_DEFINE_GUID

#ifdef __cplusplus
}
#endif



#endif /* defined(_M_IA64) || defined(_M_AXP64)*/
```

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 Thu Dec 13 23:13:08 2001
 */
/* Compiler settings for .\src\tpcc_com_ps.idl:
```

```
    Oicf (OptLev=i2), W1, 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("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 ( __stdcall __RPC_FAR *NewOrder )(
            ITPCC __RPC_FAR * This,
            /* [in] */ VARIANT txn_in,
            /* [out] */ VARIANT __RPC_FAR *txn_out);

        HRESULT ( __stdcall __RPC_FAR *Payment )(
            ITPCC __RPC_FAR * This,
            /* [in] */ VARIANT txn_in,
            /* [out] */ VARIANT __RPC_FAR *txn_out);

        HRESULT ( __stdcall __RPC_FAR *Delivery )(
            ITPCC __RPC_FAR * This,
            /* [in] */ VARIANT txn_in,
            /* [out] */ VARIANT __RPC_FAR *txn_out);

        HRESULT ( __stdcall __RPC_FAR *StockLevel )(
            ITPCC __RPC_FAR * This,
            /* [in] */ VARIANT txn_in,
            /* [out] */ VARIANT __RPC_FAR *txn_out);

        HRESULT ( __stdcall __RPC_FAR *OrderStatus )(
            ITPCC __RPC_FAR * This,
            /* [in] */ VARIANT txn_in,
            /* [out] */ VARIANT __RPC_FAR *txn_out);

        HRESULT ( __stdcall __RPC_FAR *CallSetComplete
)(
            ITPCC __RPC_FAR * This);

        END_INTERFACE
    } 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(
    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
```

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


DLLDATA_ROUTINES( aProxyFileList, GET_DLL_CLSID )

#ifdef __cplusplus
}  /*extern "C" */
#endif

/* end of generated dlldata file */
```

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 Thu Dec 13 23:13:08 2001
```

```
 */
/* Compiler settings for .\src\tpcc_com_ps.idl:
    Oicf (OptLev=i2), W1, 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("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 ( __stdcall __RPC_FAR *NewOrder )(
            ITPCC __RPC_FAR * This,
            /* [in] */ VARIANT txn_in,
            /* [out] */ VARIANT __RPC_FAR *txn_out);

        HRESULT ( __stdcall __RPC_FAR *Payment )(
            ITPCC __RPC_FAR * This,
            /* [in] */ VARIANT txn_in,
            /* [out] */ VARIANT __RPC_FAR *txn_out);

        HRESULT ( __stdcall __RPC_FAR *Delivery )(
            ITPCC __RPC_FAR * This,
            /* [in] */ VARIANT txn_in,
            /* [out] */ VARIANT __RPC_FAR *txn_out);

        HRESULT ( __stdcall __RPC_FAR *StockLevel )(
            ITPCC __RPC_FAR * This,
            /* [in] */ VARIANT txn_in,
            /* [out] */ VARIANT __RPC_FAR *txn_out);

        HRESULT ( __stdcall __RPC_FAR *OrderStatus )(
            ITPCC __RPC_FAR * This,
            /* [in] */ VARIANT txn_in,
            /* [out] */ VARIANT __RPC_FAR *txn_out);

        HRESULT ( __stdcall __RPC_FAR *CallSetComplete
)(
            ITPCC __RPC_FAR * This);

        END_INTERFACE
    } 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(
    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
```

Tpcc_com_ps_i.h

```
#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 Thu Dec 13 23:13:08 2001
 */
/* Compiler settings for .\src\tpcc_com_ps.idl:
    Oicf (OptLev=i2), W1, 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,b
7,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,b
7,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,0xFEEE6AA2,0x84B1,0x11d2,0xBA,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 Thu Dec 13 23:13:08 2001
 */
/* Compiler settings for .\src\tpcc_com_ps.idl:
    Oicf (OptLev=i2), W1, 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,b
7,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,b
7,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,0xFEEE6AA2,0x84B1,0x11d2,0xBA,0x47,0x00,0xC0
,0x4F,0xBF,0xE0,0x8B);

#undef MIDL_DEFINE_GUID

#ifdef __cplusplus
}
#endif



#endif /* defined(_M_IA64) || defined(_M_AXP64)*/
```

Tpcc_com_ps_c.h

```
#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 Thu Dec 13 23:13:08 2001
 */
/* Compiler settings for .\src\tpcc_com_ps.idl:
    Oicf (OptLev=i2), W1, 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,{0x00,0x00,0x00,0x00,0x
00,0x00,0x00,0x00}} */


/* Object interface: IUnknown, ver. 0.0,

GUID={0x00000000,0x0000,0x0000,{0xC0,0x00,0x00,0x00,0x
00,0x00,0x00,0x46}} */


/* Object interface: ITPCC, ver. 0.0,

GUID={0xFEEE6AA2,0x84B1,0x11d2,{0xBA,0x47,0x00,0xC0,0x
4F,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,
    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,
    __MIDL_TypeFormatString.Format,
    1, /* -error bounds_check flag */
    0x20000, /* Ndr library version */
    0,
    0x5030118, /* MIDL Version 5.3.280 */
    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_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 */
#ifndef _ALPHA_
#ifndef _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, */
#ifndef _ALPHA_
#ifndef _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 */
#ifndef _ALPHA_
#ifndef _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, */
#ifndef _ALPHA_
#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 */
#ifndef _ALPHA_
#ifndef _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, */
#ifndef _ALPHA_
#ifndef _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 */
#ifndef _ALPHA_
#ifndef _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, */
#ifndef _ALPHA_
#ifndef _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
*/

          /* Procedure Delivery */

/* 68 */  0x33,               /* FC_AUTO_HANDLE */
                               0x6c,               /*
Old Flags:  object, Oi2 */
```

```
/* 70 */  NdrFcLong( 0x0 ),   /* 0 */
/* 74 */  NdrFcShort( 0x5 ),  /* 5 */
#ifndef _ALPHA_
#ifndef _PPC_
#if !defined(_MIPS_)
/* 76 */  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
/* 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, */
#ifndef _ALPHA_
#ifndef _PPC_
#if !defined(_MIPS_)
/* 86 */  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
/* 88 */  NdrFcShort( 0x3c8 ),          /* Type
Offset=968 */

          /* Parameter txn_out */

/* 90 */  NdrFcShort( 0x4113 ),         /* Flags:
must size, must free, out, simple ref, srv alloc
size=16 */
#ifndef _ALPHA_
#ifndef _PPC_
#if !defined(_MIPS_)
/* 92 */  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
/* 94 */  NdrFcShort( 0x3da ),          /* Type
Offset=986 */

          /* Return value */

/* 96 */  NdrFcShort( 0x70 ), /* Flags:  out, return,
base type, */
#ifndef _ALPHA_
#ifndef _PPC_
#if !defined(_MIPS_)
/* 98 */  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
/* 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 */
#ifndef _ALPHA_
#ifndef _PPC_
#if !defined(_MIPS_)
/* 110 */ 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
/* 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, */
#ifndef _ALPHA_
#ifndef _PPC_
#if !defined(_MIPS_)
/* 120 */ 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
/* 122 */ NdrFcShort( 0x3c8 ),          /* Type
Offset=968 */

          /* Parameter txn_out */

/* 124 */ NdrFcShort( 0x4113 ),         /* Flags:
must size, must free, out, simple ref, srv alloc
size=16 */
#ifndef _ALPHA_
#ifndef _PPC_
#if !defined(_MIPS_)
/* 126 */ 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
/* 128 */ NdrFcShort( 0x3da ),          /* Type
Offset=986 */

          /* Return value */

/* 130 */ NdrFcShort( 0x70 ), /* Flags:  out, return,
base type, */
#ifndef _ALPHA_
#ifndef _PPC_
#if !defined(_MIPS_)
/* 132 */ 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
/* 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 */
#ifndef _ALPHA_
#ifndef _PPC_
#if !defined(_MIPS_)
/* 144 */ 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
/* 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, */
#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 */
                                0x9,                /*
FC_ULONG */
/*  8 */  0x7,                  /* Corr desc: FC_USHORT
*/
                                0x0,                /*
*/
/* 10 */  NdrFcShort( 0xfff8 ),         /* -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) */
/* 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( 0xfffffff2 ),    /* 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 */
                              0x0,                /*
*/
/* 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( 0xffffff6e ),     /* 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( 0xffffffd4 ),     /* 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( 0xffffff50 ),     /* 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( 0xfffffffe0 ),     /* 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( 0xffffff40 ),     /* 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( 0xfffffffe0 ),     /* Offset= -32
(504) */
/* 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( 0xffffffd4 ),     /* 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( 0xffffffd8 ),     /* Offset= -40
(584) */
/* 626 */ 0x36,               /* FC_POINTER */
                               0x5b,              /*
FC_END */
/* 628 */
                               0x12, 0x0,         /*
FC_UP */
/* 630 */ NdrFcShort( 0xfffffffe4 ),     /* 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 */
/* 648 */ NdrFcShort( 0x1 ),  /* 1 */
/* 650 */ NdrFcShort( 0x0 ),  /* 0 */
/* 652 */ NdrFcShort( 0x0 ),  /* 0 */
/* 654 */ 0x12, 0x0,          /* FC_UP */
/* 656 */ NdrFcShort( 0xffffffd4 ),     /* 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( 0xffffffd4 ),     /* Offset= -44
(632) */
/* 678 */
```

```
                                0x1d,               /*
FC_SMFARRAY */
                                0x0,                /* 0
*/
/* 680 */ NdrFcShort( 0x8 ),  /* 8 */
/* 682 */ 0x1,                /* FC_BYTE */
                                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( 0xfffffff1
),        /* 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( 0xffffffe8 ),     /* Offset= -24
(684) */
/* 710 */ 0x5c,               /* FC_PAD */
                                0x5b,               /*
FC_END */
/* 712 */
                                0x11, 0x0,          /*
FC_RP */
/* 714 */ NdrFcShort( 0xffffff0c ),     /* 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( 0xffffffe8 ),     /* 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 */
/* 754 */ 0x6,                /* FC_SHORT */
                                0x5b,               /*
FC_END */
/* 756 */
                                0x16,               /*
FC_PSTRUCT */
                                0x3,                /* 3
*/
/* 758 */ NdrFcShort( 0x8 ),  /* 8 */
/* 760 */
                                0x4b,               /*
FC_PP */
                                0x5c,               /*
FC_PAD */
/* 762 */
                                0x46,               /*
FC_NO_REPEAT */
                                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 */

                                0x8,                /*
FC_LONG */
/* 774 */ 0x8,                /* FC_LONG */
                                0x5b,               /*
FC_END */
/* 776 */
                                0x1b,               /*
FC_CARRAY */
                                0x3,                /* 3
*/
/* 778 */ NdrFcShort( 0x4 ),  /* 4 */
/* 780 */ 0x19,               /* Corr desc:  field
pointer, FC_ULONG */
                                0x0,                /*
*/
/* 782 */ NdrFcShort( 0x0 ),  /* 0 */
/* 784 */ 0x8,                /* FC_LONG */
                                0x5b,               /*
FC_END */
/* 786 */
                                0x16,               /*
FC_PSTRUCT */
                                0x3,                /* 3
*/
/* 788 */ NdrFcShort( 0x8 ),  /* 8 */
/* 790 */
                                0x4b,               /*
FC_PP */
                                0x5c,               /*
FC_PAD */
/* 792 */
                                0x46,               /*
FC_NO_REPEAT */
                                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 */

                                0x8,                /*
FC_LONG */
/* 804 */ 0x8,                /* FC_LONG */
                                0x5b,               /*
FC_END */
/* 806 */
                                0x1b,               /*
FC_CARRAY */
                                0x7,                /* 7
*/
/* 808 */ NdrFcShort( 0x8 ),  /* 8 */
/* 810 */ 0x19,               /* Corr desc:  field
pointer, FC_ULONG */
```

```
                            0x0,                /*
*/
/* 812 */ NdrFcShort( 0x0 ),  /* 0 */
/* 814 */ 0xb,                /* FC_HYPER */
                            0x5b,               /*
FC_END */
/* 816 */
                            0x16,               /*
FC_PSTRUCT */
                            0x3,                /* 3
*/
/* 818 */ NdrFcShort( 0x8 ),  /* 8 */
/* 820 */
                            0x4b,               /*
FC_PP */
                            0x5c,               /*
FC_PAD */
/* 822 */
                            0x46,               /*
FC_NO_REPEAT */
                            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 */

                            0x8,                /*
FC_LONG */
/* 834 */ 0x8,                /* FC_LONG */
                            0x5b,               /*
FC_END */
/* 836 */
                            0x15,               /*
FC_STRUCT */
                            0x3,                /* 3
*/
/* 838 */ NdrFcShort( 0x8 ),  /* 8 */
/* 840 */ 0x8,                /* FC_LONG */
                            0x8,                /*
FC_LONG */
/* 842 */ 0x5c,               /* FC_PAD */
                            0x5b,               /*
FC_END */
/* 844 */
                            0x1b,               /*
FC_CARRAY */
                            0x3,                /* 3
*/
/* 846 */ NdrFcShort( 0x8 ),  /* 8 */
/* 848 */ 0x7,                /* Corr desc: FC_USHORT
*/
                            0x0,                /*
*/
/* 850 */ NdrFcShort( 0xffd8 ),         /* -40 */
/* 852 */ 0x4c,               /* FC_EMBEDDED_COMPLEX
*/
                            0x0,                /* 0
*/
/* 854 */ NdrFcShort( 0xfffffffe ),     /* Offset= -18
(836) */
/* 856 */ 0x5c,               /* FC_PAD */
                            0x5b,               /*
FC_END */
/* 858 */
                            0x1a,               /*
FC_BOGUS_STRUCT */
                            0x3,                /* 3
*/
/* 860 */ NdrFcShort( 0x28 ), /* 40 */
/* 862 */ NdrFcShort( 0xffffffee ),     /* Offset= -18
(844) */
/* 864 */ NdrFcShort( 0x0 ),  /* Offset= 0 (864) */
/* 866 */ 0x6,                /* FC_SHORT */
                            0x6,                /*
FC_SHORT */
/* 868 */ 0x38,               /* FC_ALIGNM4 */
                            0x8,                /*
FC_LONG */
/* 870 */ 0x8,                /* FC_LONG */
                            0x4c,               /*
FC_EMBEDDED_COMPLEX */
/* 872 */ 0x0,                /* 0 */
                            NdrFcShort( 0xfffffdf7
),        /* Offset= -521 (352) */
                            0x5b,               /*
FC_END */
/* 876 */
                            0x12, 0x0,          /*
FC_UP */
/* 878 */ NdrFcShort( 0xfffffef6 ),     /* Offset= -
266 (612) */
/* 880 */
                            0x12, 0x8,          /*
FC_UP [simple_pointer] */
/* 882 */ 0x1,                /* FC_BYTE */
                            0x5c,               /*
FC_PAD */
/* 884 */
                            0x12, 0x8,          /*
FC_UP [simple_pointer] */
/* 886 */ 0x6,                /* FC_SHORT */
                            0x5c,               /*
FC_PAD */
/* 888 */
                            0x12, 0x8,          /*
FC_UP [simple_pointer] */
/* 890 */ 0x8,                /* FC_LONG */
                            0x5c,               /*
FC_PAD */

/* 892 */
                            0x12, 0x8,          /*
FC_UP [simple_pointer] */
/* 894 */ 0xa,                /* FC_FLOAT */
                            0x5c,               /*
FC_PAD */
/* 896 */
                            0x12, 0x8,          /*
FC_UP [simple_pointer] */
/* 898 */ 0xc,                /* FC_DOUBLE */
                            0x5c,               /*
FC_PAD */
/* 900 */
                            0x12, 0x0,          /*
FC_UP */
/* 902 */ NdrFcShort( 0xfffffd90 ),     /* Offset= -
624 (278) */
/* 904 */
                            0x12, 0x10,         /*
FC_UP [pointer_deref] */
/* 906 */ NdrFcShort( 0xfffffd92 ),     /* Offset= -
622 (284) */
/* 908 */
                            0x12, 0x10,         /*
FC_UP [pointer_deref] */
/* 910 */ NdrFcShort( 0xfffffda6 ),     /* Offset= -
602 (308) */
/* 912 */
                            0x12, 0x10,         /*
FC_UP [pointer_deref] */
/* 914 */ NdrFcShort( 0xfffffdb4 ),     /* Offset= -
588 (326) */
/* 916 */
                            0x12, 0x10,         /*
FC_UP [pointer_deref] */
/* 918 */ NdrFcShort( 0xfffffdc2 ),     /* 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 */
                            0x7,                /* 7
*/
/* 930 */ NdrFcShort( 0x10 ), /* 16 */
/* 932 */ 0x6,                /* FC_SHORT */
                            0x1,                /*
FC_BYTE */
/* 934 */ 0x1,                /* FC_BYTE */
                            0x38,               /*
FC_ALIGNM4 */
/* 936 */ 0x8,                /* FC_LONG */
                            0x39,               /*
FC_ALIGNM8 */
/* 938 */ 0xb,                /* FC_HYPER */
                            0x5b,               /*
FC_END */
/* 940 */
                            0x12, 0x0,          /*
FC_UP */
/* 942 */ NdrFcShort( 0xfffffff2 ),     /* Offset= -14
(928) */
/* 944 */
                            0x12, 0x8,          /*
FC_UP [simple_pointer] */
/* 946 */ 0x2,                /* FC_CHAR */
                            0x5c,               /*
FC_PAD */
```

```
/* 948 */
                                0x1a,               /*
FC_BOGUS_STRUCT */
                                0x7,                /* 7
*/
/* 950 */ NdrFcShort( 0x20 ), /* 32 */
/* 952 */ NdrFcShort( 0x0 ),  /* 0 */
/* 954 */ NdrFcShort( 0x0 ),  /* Offset= 0 (954) */
/* 956 */ 0x8,                /* FC_LONG */
                                0x8,                /*
FC_LONG */
/* 958 */ 0x6,                /* FC_SHORT */
                                0x6,                /*
FC_SHORT */
/* 960 */ 0x6,                /* FC_SHORT */
                                0x6,                /*
FC_SHORT */
/* 962 */ 0x4c,               /* FC_EMBEDDED_COMPLEX
*/
                                0x0,                /* 0
*/
/* 964 */ NdrFcShort( 0xfffffc42 ),     /* Offset= -
958 (6) */
/* 966 */ 0x5c,               /* FC_PAD */
                                0x5b,               /*
FC_END */
/* 968 */ 0xb4,               /* FC_USER_MARSHAL */
                                0x83,               /*
131 */
/* 970 */ NdrFcShort( 0x0 ),  /* 0 */
/* 972 */ NdrFcShort( 0x10 ), /* 16 */
/* 974 */ NdrFcShort( 0x0 ),  /* 0 */
/* 976 */ NdrFcShort( 0xfffffc32 ),     /* Offset= -
974 (2) */
/* 978 */
                                0x11, 0x4,          /*
FC_RP [alloced_on_stack] */
/* 980 */ NdrFcShort( 0x6 ),  /* Offset= 6 (986) */
/* 982 */
                                0x13, 0x0,          /*
FC_OP */
/* 984 */ NdrFcShort( 0xfffffffc ),     /* Offset= -36
(948) */
/* 986 */ 0xb4,               /* FC_USER_MARSHAL */
                                0x83,               /*
131 */
/* 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_uuid] interfaces */
    0, /* Filler1 */
    0, /* Filler2 */
    0  /* Filler3 */
};


#endif /* !defined(_M_IA64) && !defined(_M_AXP64)*/


#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 Thu Dec 13 23:13:08 2001
 */
/* Compiler settings for .\src\tpcc_com_ps.idl:
    Oicf (OptLev=i2), W1, 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,{0x00,0x00,0x00,0x00,0x
00,0x00,0x00,0x00}} */
```

```
/* Object interface: IUnknown, ver. 0.0,

GUID={0x00000000,0x0000,0x0000,{0xC0,0x00,0x00,0x00,0x
00,0x00,0x00,0x46}} */


/* Object interface: ITPCC, ver. 0.0,

GUID={0xFEEE6AA2,0x84B1,0x11d2,{0xBA,0x47,0x00,0xC0,0x
4F,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],
    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,
    __MIDL_TypeFormatString.Format,
    1, /* -error bounds_check flag */
    0x50002, /* Ndr library version */
    0,
    0x5030118, /* MIDL Version 5.3.280 */
    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 */
#ifndef _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, */
                                0x3,                /* 3
*/
/* 16 */  0xa,                /* 10 */
                                0x7,                /*
Ext Flags:  new corr desc, clt corr check, srv corr
check, */
/* 18 */  NdrFcShort( 0x20 ), /* 32 */
/* 20 */  NdrFcShort( 0x20 ), /* 32 */
/* 22 */  NdrFcShort( 0x0 ),  /* 0 */
/* 24 */  NdrFcShort( 0x0 ),  /* 0 */

          /* Parameter txn_in */

/* 26 */  NdrFcShort( 0x8b ), /* Flags:  must size,
must free, in, by val, */
#ifndef _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 */
#ifndef _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, */
#ifndef _ALPHA_
/* 40 */  NdrFcShort( 0x30 ), /* ia64 Stack
size/offset = 48 */
#else
                              NdrFcShort( 0x28 ), /*
axp64 Stack size/offset = 40 */
#endif
/* 42 */  0x8,                /* FC_LONG */
                              0x0,                /* 0
*/

          /* Procedure Payment */

/* 44 */  0x33,               /* FC_AUTO_HANDLE */
                              0x6c,               /*
Old Flags:  object, Oi2 */
/* 46 */  NdrFcLong( 0x0 ),   /* 0 */
/* 50 */  NdrFcShort( 0x4 ),  /* 4 */
#ifndef _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 */

          /* Parameter txn_in */

/* 70 */  NdrFcShort( 0x8b ), /* Flags:  must size,
must free, in, by val, */
#ifndef _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 */
#ifndef _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, */
#ifndef _ALPHA_
/* 84 */  NdrFcShort( 0x30 ), /* ia64 Stack
size/offset = 48 */
#else
                              NdrFcShort( 0x28 ), /*
axp64 Stack size/offset = 40 */
#endif
/* 86 */  0x8,                /* FC_LONG */
                              0x0,                /* 0
*/

          /* Procedure Delivery */

/* 88 */  0x33,               /* FC_AUTO_HANDLE */
                              0x6c,               /*
Old Flags:  object, Oi2 */
/* 90 */  NdrFcLong( 0x0 ),   /* 0 */
/* 94 */  NdrFcShort( 0x5 ),  /* 5 */
#ifndef _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, */
#ifndef _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 */
#ifndef _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, */
#ifndef _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 */
#ifndef _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, */
#ifndef _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 */
#ifndef _ALPHA_
/* 166 */ NdrFcShort( 0x28 ), /* ia64 Stack
size/offset = 40 */
#else
                               NdrFcShort( 0x20 ), /*
axp64 Stack size/offset = 32 */
#endif
/* 168 */ NdrFcShort( 0x3c8 ),          /* Type
Offset=968 */

         /* Return value */

/* 170 */ NdrFcShort( 0x70 ), /* Flags:  out, return,
base type, */
#ifndef _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 */
#ifndef _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, */
#ifndef _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 */
#ifndef _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, */
#ifndef _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
        }
    };

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( 0xfff8 ),         /* -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) */
/* 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( 0xfffffff0 ),     /* 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 */
/* 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( 0xffffff74 ),     /* 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( 0xffffffdc ),     /* 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( 0xffffff58 ),     /* 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( 0xffffffdc ),     /* 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( 0xffffff44 ),     /* 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( 0xffffffdc ),     /* Offset= -36
(500) */
/* 538 */
                              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( 0xffffffdc ),     /* Offset= -36
(538) */
/* 576 */
                              0x2f,               /*
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( 0xffffffd6 ),     /* Offset= -42
(576) */
/* 620 */ 0x39,               /* FC_ALIGNM8 */
                              0x36,               /*
FC_POINTER */
/* 622 */ 0x5c,               /* FC_PAD */
                              0x5b,               /*
FC_END */
/* 624 */
                              0x12, 0x0,          /*
FC_UP */
/* 626 */ NdrFcShort( 0xfffffffe0 ),     /* 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( 0xffffffd8 ),     /* 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 */
                              0x5b,               /*
FC_END */
/* 662 */
                              0x11, 0x0,          /*
FC_RP */
/* 664 */ NdrFcShort( 0xffffffdc ),     /* Offset= -36
(628) */
/* 666 */
                              0x1d,               /*
FC_SMFARRAY */
                              0x0,                /* 0
*/
/* 668 */ NdrFcShort( 0x8 ),  /* 8 */
/* 670 */ 0x1,                /* FC_BYTE */
                              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( 0xfffffffe7
),        /* Offset= -25 (672) */
                              0x5b,               /*
FC_END */
```

```
/* 700 */
                                0x11, 0x0,          /*
FC_RP */
/* 702 */ NdrFcShort( 0xffffff10 ),     /* 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 */
/* 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( 0xffffffe6 ),     /* 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( 0xffffffe6 ),     /* 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( 0xffffffec ),     /* Offset= -20
(816) */
/* 838 */ 0x5c,               /* FC_PAD */
                                0x5b,               /*
FC_END */
/* 840 */
                                0x1a,               /*
FC_BOGUS_STRUCT */
                                0x3,                /* 3
*/
/* 842 */ NdrFcShort( 0x38 ), /* 56 */
/* 844 */ NdrFcShort( 0xffffffec ),     /* 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( 0xffffff02 ),     /* 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] */
/* 880 */ 0xc,                  /* FC_DOUBLE */
                                0x5c,               /*
FC_PAD */
/* 882 */
                                0x12, 0x0,          /*
FC_UP */
/* 884 */ NdrFcShort( 0xfffffda4 ),     /* Offset= -
604 (280) */
/* 886 */
                                0x12, 0x10,         /*
FC_UP [pointer_deref] */
/* 888 */ NdrFcShort( 0xfffffda6 ),     /* Offset= -
602 (286) */
/* 890 */
                                0x12, 0x10,         /*
FC_UP [pointer_deref] */
/* 892 */ NdrFcShort( 0xfffffdbc ),     /* 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 */
                                0x7,                /* 7
*/
/* 912 */ NdrFcShort( 0x10 ), /* 16 */
/* 914 */ 0x6,                  /* FC_SHORT */
                                0x1,                /*
FC_BYTE */
/* 916 */ 0x1,                  /* FC_BYTE */
                                0x38,               /*
FC_ALIGNM4 */
/* 918 */ 0x8,                  /* FC_LONG */
                                0x39,               /*
FC_ALIGNM8 */
/* 920 */ 0xb,                  /* FC_HYPER */
                                0x5b,               /*
FC_END */
/* 922 */
                                0x12, 0x0,          /*
FC_UP */
/* 924 */ NdrFcShort( 0xfffffff2 ),     /* Offset= -14
(910) */
/* 926 */
                                0x12, 0x8,          /*
FC_UP [simple_pointer] */
/* 928 */ 0x2,                  /* FC_CHAR */
                                0x5c,               /*
FC_PAD */
/* 930 */
                                0x1a,               /*
FC_BOGUS_STRUCT */
                                0x7,                /* 7
*/
/* 932 */ NdrFcShort( 0x20 ), /* 32 */
/* 934 */ NdrFcShort( 0x0 ),  /* 0 */
/* 936 */ NdrFcShort( 0x0 ),  /* Offset= 0 (936) */
/* 938 */ 0x8,                  /* FC_LONG */
                                0x8,                /*
FC_LONG */
/* 940 */ 0x6,                  /* FC_SHORT */
                                0x6,                /*
FC_SHORT */
/* 942 */ 0x6,                  /* FC_SHORT */
                                0x6,                /*
FC_SHORT */
/* 944 */ 0x4c,                 /* FC_EMBEDDED_COMPLEX
*/
                                0x0,                /* 0
*/
/* 946 */ NdrFcShort( 0xfffffc54 ),     /* Offset= -
940 (6) */
/* 948 */ 0x5c,                 /* FC_PAD */
                                0x5b,               /*
FC_END */
/* 950 */ 0xb4,                 /* FC_USER_MARSHAL */
                                0x83,               /*
131 */
/* 952 */ NdrFcShort( 0x0 ),  /* 0 */
/* 954 */ NdrFcShort( 0x18 ), /* 24 */
/* 956 */ NdrFcShort( 0x0 ),  /* 0 */
/* 958 */ NdrFcShort( 0xfffffc44 ),     /* Offset= -
956 (2) */
/* 960 */
                                0x11, 0x4,          /*
FC_RP [alloced_on_stack] */
/* 962 */ NdrFcShort( 0x6 ),  /* Offset= 6 (968) */
/* 964 */
                                0x13, 0x0,          /*
FC_OP */
/* 966 */ NdrFcShort( 0xfffffdc ),      /* Offset= -36
(930) */
/* 968 */ 0xb4,                 /* FC_USER_MARSHAL */
                                0x83,               /*
131 */
/* 970 */ NdrFcShort( 0x0 ),  /* 0 */
/* 972 */ NdrFcShort( 0x18 ), /* 24 */
/* 974 */ NdrFcShort( 0x0 ),  /* 0 */
/* 976 */ NdrFcShort( 0xfffffff4 ),     /* Offset= -12
(964) */

                                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_uuid] interfaces */
    0, /* Filler1 */
    0, /* Filler2 */
    0  /* Filler3 */
};


#endif /* defined(_M_IA64) || defined(_M_AXP64)*/
```

Appendix B:
Database Design

CreateDB.sql

```
--  File:     CREATEDB.SQL
--            Microsoft TPC-C Benchmark
Kit Ver. 4.41
--            Copyright Microsoft, 2001
--  Purpose:  Creates tpcc database and
backup files


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)
)

insert  into tpcc_timer values (0,0)
go

--      Store starting time

update  tpcc_timer
set     start_date      = (select
convert(char(30), getdate(),9))
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            = 43620MB,
       FILEGROWTH      = 0),
(       NAME            = MSSQL_misc2,
       FILENAME        = "G:",
       SIZE            = 56460MB,
       FILEGROWTH      = 0),
(       NAME            = MSSQL_misc3,
       FILENAME        = "H:",
       SIZE            = 56460MB,
       FILEGROWTH      = 0),
(       NAME            = MSSQL_misc4,
       FILENAME        = "I:",
       SIZE            = 43620MB,
       FILEGROWTH      = 0),
(       NAME            = MSSQL_misc5,
       FILENAME        = "J:",
       SIZE            = 30780MB,
       FILEGROWTH      = 0),
FILEGROUP       MSSQL_cs_fg
(       NAME            = MSSQL_cs1,
       FILENAME        = "M:",
       SIZE            = 80340MB,
       FILEGROWTH      = 0),
(       NAME            = MSSQL_cs2,
       FILENAME        = "N:",
       SIZE            = 103980MB,
       FILEGROWTH      = 0),
(       NAME            = MSSQL_cs3,
       FILENAME        = "O:",
       SIZE            = 103980MB,
       FILEGROWTH      = 0),
(       NAME            = MSSQL_cs4,
       FILENAME        = "P:",
       SIZE            = 80340MB,
       FILEGROWTH      = 0),
(       NAME            = MSSQL_cs5,
       FILENAME        = "Q:",
       SIZE            = 56700MB,
       FILEGROWTH      = 0)
LOG ON
(       NAME            = MSSQL_tpcc_log,
       FILENAME        = "E:",
       SIZE            = 204720MB,
       FILEGROWTH      = 0)
COLLATE Latin1_General_BIN
go

-- Store ending time
update  tpcc_timer
set     end_date        = (select
convert(char(30), getdate(),9))
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
```

BackupDev.sql

```
--  File:     BACKUPDEVB.SQL
--            Microsoft TPC-C Benchmark
Kit Ver. 4.41
--            Copyright Microsoft, 2001
--  Purpose:  Creates tpcc database
Backup Devices


use master
go
```

```
--  create backup devices

exec sp_addumpdevice
'disk','tpccback1','T:\tpccback1.dmp'
go
exec sp_addumpdevice
'disk','tpccback2','U:\tpccback2.dmp'
go
exec sp_addumpdevice
'disk','tpccback3','V:\tpccback3.dmp'
go
exec sp_addumpdevice
'disk','tpccback4','V:\tpccback4.dmp'
go
```

Backup.sql

```
--  File:     BACKUP.SQL
--            Microsoft TPC-C Benchmark
Kit Ver. 4.41
--            Copyright Microsoft, 2001
--  Purpose:  Creates backup of tpcc
database


declare @startdate datetime
declare @enddate datetime
select @startdate = getdate()
select "Start date:",
convert(varchar(30),@startdate,9)

dump database tpcc to tpccback1,
tpccback2, tpccback3, tpccback4 with
init, stats = 1

select @enddate = getdate()
select "End date: ",
convert(varchar(30),@enddate,9)
select "Elapsed time (in seconds): ",
datediff(second, @startdate, @enddate)

go
```

Tables.sql

```
--  File:     TABLES.SQL
--            Microsoft TPC-C Benchmark
Kit Ver. 4.41
--            Copyright Microsoft, 2001
--  Purpose:  Creates TPC-C tables


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' )
       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
       smallint,
       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),
       w_tax
       numeric(4,4),
       w_ytd
       numeric(12,2)
) on MSSQL_misc_fg
go

create table district
(
       d_id
       tinyint,
       d_w_id
       smallint,
       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),
        d_tax
        numeric(4,4),
        d_ytd
        numeric(12,2),
        d_next_o_id                     int
) on MSSQL_misc_fg
go

create table customer
(
        c_id
        int,
        c_d_id
        tinyint,
        c_w_id
        smallint,
        c_first
        char(16),
        c_middle
        char(2),
        c_last
        char(16),
        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
        numeric(12,2),
        c_discount
        numeric(4,4),
        c_balance
        numeric(12,2),
        c_ytd_payment
        numeric(12,2),
        c_payment_cnt           smallint,
        c_delivery_cnt          smallint,
        c_data
        char(500)
) on MSSQL_cs_fg
go

create table history
(
        h_c_id
        int,
        h_c_d_id
        tinyint,
        h_c_w_id
        smallint,
        h_d_id
        tinyint,
        h_w_id
        smallint,
        h_date
        datetime,
        h_amount
        numeric(6,2),
        h_data
        char(24)
) on MSSQL_misc_fg
go

create table new_order
(
        no_o_id
        int,
        no_d_id
        tinyint,
        no_w_id
        smallint
) on MSSQL_misc_fg
go

create table orders
(
        o_id
        int,
        o_d_id
        tinyint,
        o_w_id
        smallint,
        o_c_id
        int,
        o_entry_d
        datetime,
        o_carrier_id            tinyint,
        o_ol_cnt
        tinyint,
        o_all_local
        tinyint
) on MSSQL_misc_fg
go

create table order_line
(
        ol_o_id
        int,
        ol_d_id
        tinyint,
        ol_w_id
        smallint,
        ol_number
        tinyint,
        ol_i_id
        int,
        ol_supply_w_id          smallint,
        ol_delivery_d           datetime,
        ol_quantity
        smallint,
        ol_amount
        numeric(6,2),
        ol_dist_info            char(24)
) on MSSQL_misc_fg
go

create table item

(
        i_id
        int,
        i_im_id
        int,
        i_name
        char(24),
```

```
        i_price
        numeric(5,2),
        i_data
        char(50)
) on MSSQL_misc_fg
go

create table stock
(
        s_i_id
        int,
        s_w_id
        smallint,
        s_quantity
        smallint,
        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),
        s_ytd
        int,
        s_order_cnt
        smallint,
        s_remote_cnt          smallint,
        s_data
        char(50)
) on MSSQL_cs_fg
go
```

Idxcusnc.sql

```
--  File:     IDXCUSNC.SQL
--            Microsoft TPC-C Benchmark
Kit Ver. 4.41
--            Copyright Microsoft, 2001
--  Purpose:  Creates non-clustered index
on customer table


use tpcc
go

declare @startdate datetime
declare @enddate datetime
select @startdate = getdate()
select "Start date:",
convert(varchar(30),@startdate,9)

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,9)
select "Elapsed time (in seconds): ",
datediff(second, @startdate, @enddate)

go
```

Idxdiscl.sql

```
--  File:     IDXDISCL.SQL
--            Microsoft TPC-C Benchmark
Kit Ver. 4.41
--            Copyright Microsoft, 2001
--  Purpose:  Creates clustered index on
district table


use tpcc
go

declare @startdate datetime
declare @enddate datetime
select @startdate = getdate()
select "Start date:",
convert(varchar(30),@startdate,9)

if exists ( select name from sysindexes
where name = 'district_c1' )
        drop index district.district_c1

create unique clustered index
district_c1 on district(d_w_id, d_id)
        with fillfactor=100 on
MSSQL_misc_fg

select @enddate = getdate()
select "End date: ",
convert(varchar(30),@enddate,9)
select "Elapsed time (in seconds): ",
datediff(second, @startdate, @enddate)

go
```

Idxhiscl.sql

```
--  File:     IDXHISCL.SQL
--            Microsoft TPC-C Benchmark
Kit Ver. 4.41
--            Copyright Microsoft, 2001
--  Purpose:  Creates clustered index on
history table
--
--  CAUTION:
****************************************
--  CAUTION:  This index is only
beneficial for systems
--  CAUTION:  with 8 or more processors.
```

```
--  CAUTION:  It may negatively impact
performance on
--  CAUTION:  on systems with less than 8
processors.
--  CAUTION:
****************************************



use tpcc
go

declare @startdate datetime
declare @enddate datetime
select @startdate = getdate()
select "Start date:",
convert(varchar(30),@startdate,9)

if exists ( select name from sysindexes
where  name = 'history_c1' )
       drop index history.history_c1

create unique clustered index history_c1
on history(h_c_w_id, h_date, h_c_d_id,
h_c_id, h_amount)
       on MSSQL_tpcc_fg

select @enddate = getdate()
select "End date: ",
convert(varchar(30),@enddate,9)
select "Elapsed time (in seconds): ",
datediff(second, @startdate, @enddate)

go
```

Idxitmcl.sql

```
--  File:     IDXITMCL.SQL
--            Microsoft TPC-C Benchmark
Kit Ver. 4.41
--            Copyright Microsoft, 2001
--  Purpose:  Creates clustered index on
item table


use tpcc
go

declare @startdate datetime
declare @enddate datetime
select @startdate = getdate()
select "Start date:",
convert(varchar(30),@startdate,9)

if exists ( select name from sysindexes
where  name = 'item_c1' )
       drop index item.item_c1

create unique clustered index item_c1 on
item(i_id)
       on MSSQL_misc_fg


select @enddate = getdate()
select "End date: ",
convert(varchar(30),@enddate,9)
select "Elapsed time (in seconds): ",
datediff(second, @startdate, @enddate)

go
--  File:     IDXNODCL.SQL
--            Microsoft TPC-C Benchmark
Kit Ver. 4.41
--            Copyright Microsoft, 2001
--  Purpose:  Creates clustered index on
new_order table


use tpcc
go

declare @startdate datetime
declare @enddate datetime
select @startdate = getdate()
select "Start date:",
convert(varchar(30),@startdate,9)

if exists ( select name from sysindexes
where  name = 'new_order_c1' )
       drop index new_order.new_order_c1

create unique clustered index
new_order_c1 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,9)
select "Elapsed time (in seconds): ",
datediff(second, @startdate, @enddate)

go
```

Idxodlcl.sql

```
--  File:     IDXODLCL.SQL
--            Microsoft TPC-C Benchmark
Kit Ver. 4.41
--            Copyright Microsoft, 2001
--  Purpose:  Creates clustered index on
order_line table


use tpcc
go

declare @startdate datetime
declare @enddate datetime
select @startdate = getdate()
select "Start date:",
convert(varchar(30),@startdate,9)

if exists ( select name from sysindexes
where  name = 'order_line_c1' )
       drop index
order_line.order_line_c1

create unique clustered index
order_line_c1 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,9)
select "Elapsed time (in seconds): ",
datediff(second, @startdate, @enddate)

go
```

ldxordcl.sql

```
--  File:     IDXORDCL.SQL
--            Microsoft TPC-C Benchmark
Kit Ver. 4.41
--            Copyright Microsoft, 2001
--  Purpose:  Creates clustered index on
orders table


use tpcc
go

declare @startdate datetime
declare @enddate datetime

select @startdate = getdate()
select "Start date:",
convert(varchar(30),@startdate,9)

if exists ( select name from sysindexes
where  name = 'orders_c1' )
       drop index orders.orders_c1

create unique clustered index orders_c1
on orders(o_w_id, o_d_id, o_id)
       on MSSQL_misc_fg

select @enddate = getdate()
select "End date: ",
convert(varchar(30),@enddate,9)
select "Elapsed time (in seconds): ",
datediff(second, @startdate, @enddate)

go
```

ldxordnc.sql

```
--  File:     IDXORDNC.SQL
--            Microsoft TPC-C Benchmark
Kit Ver. 4.41
--            Copyright Microsoft, 2001
--  Purpose:  Creates non-clustered index
on orders table


use tpcc
go

declare @startdate datetime
declare @enddate datetime
select @startdate = getdate()
select "Start date:",
convert(varchar(30),@startdate,9)

if exists ( select name from sysindexes
where  name = 'orders_nc1' )
       drop index orders.orders_nc1

create index orders_nc1 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,9)
select "Elapsed time (in seconds): ",
datediff(second, @startdate, @enddate)

go
```

ldxstkcl.sql

```
--  File:     IDXSTKCL.SQL
--            Microsoft TPC-C Benchmark
Kit Ver. 4.41
--            Copyright Microsoft, 2001
--  Purpose:  Creates clustered index on
stock table


use tpcc
go

declare @startdate datetime
declare @enddate datetime
select @startdate = getdate()
select "Start date:",
convert(varchar(30),@startdate,9)

if exists ( select name from sysindexes
where  name = 'stock_c1' )
       drop index stock.stock_c1

create unique clustered index stock_c1 on
stock(s_i_id, s_w_id)
       on MSSQL_cs_fg

select @enddate = getdate()
select "End date: ",
convert(varchar(30),@enddate,9)
select "Elapsed time (in seconds): ",
datediff(second, @startdate, @enddate)

go
```

ldxwarcl.sql

```
--  File:     IDXWARCL.SQL
--            Microsoft TPC-C Benchmark
Kit Ver. 4.41
--            Copyright Microsoft, 2001
--  Purpose:  Creates clustered index on
warehouse table


use tpcc
go

declare @startdate datetime
declare @enddate datetime
select @startdate = getdate()
```

```
select "Start date:",
convert(varchar(30),@startdate,9)

if exists ( select name from sysindexes
where name = 'warehouse_c1' )
       drop index warehouse.warehouse_c1

create unique clustered index
warehouse_c1 on warehouse(w_id)
       with fillfactor=100 on
MSSQL_misc_fg

select @enddate = getdate()
select "End date: ",
convert(varchar(30),@enddate,9)
select "Elapsed time (in seconds): ",
datediff(second, @startdate, @enddate)

go
```

Idxcuscl.sql

```
--  File:     IDXCUSCL.SQL
--            Microsoft TPC-C Benchmark
Kit Ver. 4.41
--            Copyright Microsoft, 2001
--  Purpose:  Creates clustered index on
customer table


use tpcc
go

declare @startdate datetime
declare @enddate datetime
select @startdate = getdate()
select "Start date:",
convert(varchar(30),@startdate,9)

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)
       on MSSQL_cs_fg

select @enddate = getdate()
select "End date: ",
convert(varchar(30),@enddate,9)
select "Elapsed time (in seconds): ",
datediff(second, @startdate, @enddate)

go
```

VerifyTpccLoad.sql

```
--  File:     VERIFYTPCCLOAD.SQL
--            Microsoft TPC-C Benchmark
Kit Ver. 4.41
--            Copyright Microsoft, 2001
--  Purpose:  Performs series of TPCC
database checks to verify
--            that database load
completed correctly

print   " "

select  convert(char(30), getdate(),9)
print   " "

use tpcc
go

--
       ********************************
***
--
--     Check rows per table from
SYSINDEXES
--
--
       ********************************
***

print   'WAREHOUSE TABLE'

select  rows
from    sysindexes
where   id      = object_id("warehouse")
go

print   'DISTRICT TABLE = (10 * No of
warehouses)'

select  rows
from    sysindexes
where   id      =object_id("district")
go

print   'ITEM TABLE = 100,000'

select  rows
from    sysindexes
where   id      =object_id("item")
go

print   'CUSTOMER TABLE = (30,000 * No of
warehouses)'

select  rows
from    sysindexes
where   id      =object_id("customer")
go

print 'ORDERS TABLE = (30,000 * No of
warehouses)'

select  rows
from    sysindexes
where   id      =object_id("orders")
go

print   'HISTORY TABLE = (30,000 * No of
warehouses)'

select  rows
from    sysindexes
where   id      =object_id("history")
go

print   'STOCK TABLE = (100,000 * No of
warehouses)'
```

```
select  rows
from    sysindexes
where   id      =object_id("stock")
go

print   'ORDER_LINE TABLE = (300,000 * No
of warehouses + some change)'

select  rows
from    sysindexes
where   id      =object_id("order_line")
go

print   'NEW_ORDER TABLE = (9000 * No of
warehouses)'

select  rows
from    sysindexes
where   id      =object_id("new_order")
go

--      *************
--
--      Check indices
--
--      *************

print '**************Index
Check*****************'

use tpcc
go

sp_helpindex   customer
go

sp_helpindex   stock
go

sp_helpindex   district
go

sp_helpindex   item
go

sp_helpindex   new_order
go

sp_helpindex   orders
go

sp_helpindex   order_line
go

sp_helpindex   warehouse
go
```

Dbopt2.sql

```
--  File:     DBOPT2.SQL
--            Microsoft TPC-C Benchmark
Kit Ver. 4.41
--            Copyright Microsoft, 2001
--  Purpose:  Resets database options
after data load

exec sp_dboption tpcc,'select
into/bulkcopy',false
exec sp_dboption tpcc,'trunc. log on
chkpt.',false
exec sp_dboption tpcc,'torn page
detection',false
GO

USE tpcc
GO

CHECKPOINT
GO

sp_configure 'allow updates',1
GO

RECONFIGURE WITH OVERRIDE
GO

DECLARE @msg           varchar(50)

--
--
--        OPTIONS FOR SQL SERVER 2000
--
-- Set option values for user-defined
indexes --
--
--

SET    @msg    = ' '
PRINT  @msg
SET    @msg    = 'Setting SQL Server
indexoptions'
PRINT  @msg
SET    @msg    = ' '
PRINT  @msg

EXEC sp_indexoption    'customer',
       'DisAllowPageLocks',   TRUE
EXEC sp_indexoption    'district',
       'DisAllowPageLocks',   TRUE
EXEC sp_indexoption    'warehouse',
       'DisAllowPageLocks',   TRUE
EXEC sp_indexoption    'stock',
       'DisAllowPageLocks',   TRUE
EXEC sp_indexoption    'order_line',
       'DisAllowRowLocks',    TRUE
EXEC sp_indexoption    'orders',
       'DisAllowRowLocks',    TRUE
EXEC sp_indexoption    'new_order',
       'DisAllowRowLocks',    TRUE
EXEC sp_indexoption    'item',
       'DisAllowRowLocks',    TRUE
EXEC sp_indexoption    'item',
       'DisAllowPageLocks',   TRUE
GO

Print ' '
Print '******************'
Print 'Pre-specified Locking Hierarchy:'
Print '  Lockflag = 0 ==> No pre-
specified 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 updates',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
```

Dbopt1.sql

```
--  File:     DBOPT1.SQL
--            Microsoft TPC-C Benchmark
Kit Ver. 4.41
--            Copyright Microsoft, 2001
--  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
exec sp_dboption tpcc,'torn page
detection',false
go

use tpcc
go

checkpoint
go
```

Stocklev.sql

```
--  File:     STOCKLEV.SQL
--            Microsoft TPC-C Benchmark
Kit Ver. 4.41
--            Copyright Microsoft, 2001
--  Purpose:  Creates stock level
transaction stored procedure
--
--      Interface Level: 4.10.000

use tpcc
go

if exists (select name from sysobjects
where name = 'tpcc_stocklevel' )
        drop procedure tpcc_stocklevel
go

create proc tpcc_stocklevel   @w_id
        smallint,
                              @d_id
        tinyint,
                              @threshhold
        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     <  @threshhold

go
```

Neword.sql

```
--  File:     NEWORD.SQL
--            Microsoft TPC-C Benchmark
Kit Ver. 4.41
--            Copyright Microsoft, 2001
--  Purpose:  Creates new order
transaction stored procedure
--
--      Interface Level: 4.10.000

use tpcc
go
```

```
if exists ( select name from sysobjects
where name = 'tpcc_neworder' )
       drop procedure tpcc_neworder
go

create proc tpcc_neworder

       @w_id           smallint,

       @d_id           tinyint,

       @c_id           int,

       @o_ol_cnt       tinyint,

       @o_all_local    tinyint,

       @i_id1  int = 0, @s_w_id1
smallint = 0, @ol_qty1  smallint = 0,

       @i_id2  int = 0, @s_w_id2
smallint = 0, @ol_qty2  smallint = 0,

       @i_id3  int = 0, @s_w_id3
smallint = 0, @ol_qty3  smallint = 0,

       @i_id4  int = 0, @s_w_id4
smallint = 0, @ol_qty4  smallint = 0,

       @i_id5  int = 0, @s_w_id5
smallint = 0, @ol_qty5  smallint = 0,

       @i_id6  int = 0, @s_w_id6
smallint = 0, @ol_qty6  smallint = 0,

       @i_id7  int = 0, @s_w_id7
smallint = 0, @ol_qty7  smallint = 0,

       @i_id8  int = 0, @s_w_id8
smallint = 0, @ol_qty8  smallint = 0,

       @i_id9  int = 0, @s_w_id9
smallint = 0, @ol_qty9  smallint = 0,

       @i_id10 int = 0, @s_w_id10
smallint = 0, @ol_qty10 smallint = 0,

       @i_id11 int = 0, @s_w_id11
smallint = 0, @ol_qty11 smallint = 0,

       @i_id12 int = 0, @s_w_id12
smallint = 0, @ol_qty12 smallint = 0,

       @i_id13 int = 0, @s_w_id13
smallint = 0, @ol_qty13 smallint = 0,

       @i_id14 int = 0, @s_w_id14
smallint = 0, @ol_qty14 smallint = 0,

       @i_id15 int = 0, @s_w_id15
smallint = 0, @ol_qty15 smallint = 0



as
declare @w_tax          numeric(4,4),
        @d_tax          numeric(4,4),
        @c_last         char(16),
        @c_credit       char(2),
        @c_discount     numeric(4,4),
        @i_price        numeric(5,2),
        @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      smallint,
        @li_qty         smallint,
        @ol_number      int,
        @c_id_local     int

begin

begin transaction n

--  get district tax and next availible
order id and update
--  plus initialize local variables

       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 (tablock
repeatableread)
                where   i_id = @li_id

--  update stock values

                update  stock
                set     s_ytd          =
s_ytd + @li_qty,
                        @s_quantity    =
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 + 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,

             @li_s_w_id,

             'dec 31, 1899',

             @li_qty,

             @i_price * @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 (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,

       @o_entry_d,
                                      0,

       @o_ol_cnt,

       @o_all_local)

--  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 (repeatableread)
       where   w_id    = @w_id

       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
```

Ordstat.sql

```
--  File:     ORDSTAT.SQL
--            Microsoft TPC-C Benchmark
Kit Ver. 4.41
--            Copyright Microsoft, 2001
--  Purpose:  Creates order status
transaction stored procedure
--
--      Interface Level: 4.10.000

use tpcc
go
```

```
if exists ( select name from sysobjects
where name = 'tpcc_orderstatus' )
        drop procedure   tpcc_orderstatus
go

create proc tpcc_orderstatus  @w_id
        smallint,
                              @d_id
        tinyint,

                              @c_id
        int,
                              @c_last
        char(16) = ''


as

declare @c_balance
        numeric(12,2),
         @c_first             char(16),
         @c_middle            char(2),
         @o_id                int,
         @o_entry_d           datetime,
         @o_carrier_id        smallint,
         @cnt                 smallint

begin tran o

if (@c_id = 0)
        begin

--  get customer id and info using last
name

                select  @cnt    =
(count(*)+1)/2
                from    customer
(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
(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
(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 (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
(repeatableread)
        where   ol_o_id = @o_id and
                ol_d_id = @d_id and
                ol_w_id = @w_id

custnotfound:

commit tran o

--  return data to client

select  @c_id,
```

```
        @c_last,
        @c_first,
        @c_middle,

        @o_entry_d,
        @o_carrier_id,
        @c_balance,
        @o_id

go
```

Payment.sql

```
--  File:     PAYMENT.SQL
--            Microsoft TPC-C Benchmark
Kit Ver. 4.41
--            Copyright Microsoft, 2001
--  Purpose:  Creates payment transaction
stored procedure
--
--      Interface Level: 4.10.000

use tpcc
go

if exists (select name from sysobjects
where name = 'tpcc_payment' )
        drop procedure tpcc_payment
go

create proc tpcc_payment      @w_id
smallint,
                              @c_w_id
smallint,
                              @h_amount
numeric(6,2),
                              @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   numeric(12,2),
         @c_balance      numeric(12,2),
         @c_discount     numeric(4,4),
         @data           char(500),
         @c_data         char(500),
         @datetime       datetime,
         @w_ytd          numeric(12,2),
         @d_ytd          numeric(12,2),
         @cnt            smallint,
         @val            smallint,
         @screen_data   char(200),
        @d_id_local    tinyint,
        @w_id_local    smallint,
        @c_id_local    int

select @screen_data = ''

begin tran 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
(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
(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,

                @data           = c_data,

                @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) +

substring(@data, 1, 458)

--  update customer info

                update  customer
                set     c_data  = @c_data

                where   c_id    = @c_id and
                        c_w_id  = @c_w_id
and
                        c_d_id  = @c_d_id

                select  @screen_data =
substring (@c_data,1,200)
        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,
                @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 tran 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
```

Delivery.sql

```
--  File:     DELIVERY.SQL
--            Microsoft TPC-C Benchmark
Kit Ver. 4.41
--            Copyright Microsoft, 2001
--  Purpose:  Creates delivery
transaction stored procedure
--
--      Interface Level: 4.10.000

use tpcc
go

if exists (select name from sysobjects
where name = 'tpcc_delivery' )
        drop procedure tpcc_delivery
go

create proc tpcc_delivery     @w_id
smallint,


        @o_carrier_id   smallint
as


declare @d_id  tinyint,
        @o_id  int,
        @c_id  int,
        @total numeric(12,2),
        @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 tran 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
(serializable updlock)
                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

--  accummulate 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
                                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 tran d

-- return delivery data to client

select @oid1,
       @oid2,
       @oid3,
       @oid4,
       @oid5,
       @oid6,
       @oid7,
       @oid8,
       @oid9,
       @oid10

go
```

Loader Source Code

Tpccldr.c

```
//      File:           TPCCLDR.C
//                              Microsoft
TPC-C Kit Ver. 4.41
//                              Copyright
Microsoft, 1996, 1997, 1998, 1999, 2000,
2001
//      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

// Functions declarations

void HandleErrorDBC (SQLHDBC  hdbc1);

void CheckDataBase();

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();
void OpenConnections();
void BuildIndex();
void FormatDate ();

// Shared memory structures

typedef struct
{
    long                ol;
    long                ol_i_id;
    short               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;
    short               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;
    short
       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;
//  fix to avoid ODBC float to numeric
conversion problem.
//  double
        c_balance;
        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;
                // for SQL Server version
verification
HDBC    i_hdbc1;
                // for ITEM table
HDBC    w_hdbc1;
                // for WAREHOUSE,
DISTRICT, STOCK
HDBC    c_hdbc1;
                // for CUSTOMER
HDBC    c_hdbc2;
                // for HISTORY
HDBC    o_hdbc1;
                // for ORDERS
HDBC    o_hdbc2;
                // for NEW-ORDER

HDBC    o_hdbc3;
                // for ORDER-LINE

HSTMT   v_hstmt;
                // for SQL Server version
verification
HSTMT   i_hstmt1;
HSTMT   w_hstmt1;
HSTMT   c_hstmt1, c_hstmt2;
HSTMT   o_hstmt1, o_hstmt2, o_hstmt3;

ORDERS_STRUCT
orders_buf[ORDERS_PER_DISTRICT];
CUSTOMER_STRUCT
customer_buf[CUSTOMERS_PER_DISTRICT];
long            orders_rows_loaded;
long            new_order_rows_loaded;
long            order_line_rows_loaded;
long            history_rows_loaded;
long            customer_rows_loaded;
long            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);


       // verify database and tables
exist before attempting to load
       //CheckDataBase();


       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

    sprintf(buffer,"TPC-C load started
for %ld warehouses.\n",aptr-
>num_warehouses);

       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]);
                        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()
{
    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(1);

        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");

        //rc = bcp_init(i_hdbc1, name,
NULL, "logs\\item.err", DB_IN);
        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 = 100000");
                rc = bcp_control(i_hdbc1,
BCPHINTS, (void*) bcphint);
                if (rc != SUCCEED)

        HandleErrorDBC(i_hdbc1);
        }

        rc = bcp_bind(i_hdbc1, (BYTE *)
&i_id, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT4, 1);
        if (rc != SUCCEED)
                HandleErrorDBC(i_hdbc1);

        rc = bcp_bind(i_hdbc1, (BYTE *)
&i_im_id, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT4, 2);
        if (rc != SUCCEED)
                HandleErrorDBC(i_hdbc1);

        rc = bcp_bind(i_hdbc1, (BYTE *)
i_name, 0, I_NAME_LEN, NULL, 0, 0, 3);
        if (rc != SUCCEED)
                HandleErrorDBC(i_hdbc1);

        rc = bcp_bind(i_hdbc1, (BYTE *)
&i_price, 0, SQL_VARLEN_DATA, NULL, 0,
SQLFLT8, 4);
        if (rc != SUCCEED)
                HandleErrorDBC(i_hdbc1);

        rc = bcp_bind(i_hdbc1, (BYTE *)
i_data, 0, I_DATA_LEN, NULL, 0, 0, 5);
        if (rc != SUCCEED)
                HandleErrorDBC(i_hdbc1);

        time_start = (TimeNow() / MILLI);

        item_rows_loaded = 0;

        for (i_id = 1; i_id <= max_items;
i_id++)
        {
                i_im_id = RandomNumber(1L,
10000L);

                MakeAlphaString(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()
{
    short      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");

        //rc = bcp_init(w_hdbc1, name,
NULL, "logs\\whouse.err", DB_IN);
        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);
        }

        rc = bcp_bind(w_hdbc1, (BYTE *)
&w_id, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT2, 1);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
w_name, 0, W_NAME_LEN, NULL, 0, 0, 2);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
w_street_1, 0, ADDRESS_LEN, NULL, 0, 0,
3);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
w_street_2, 0, ADDRESS_LEN, NULL, 0, 0,
4);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
w_city, 0, ADDRESS_LEN, NULL, 0, 0, 5);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
w_state, 0, STATE_LEN, NULL, 0, 0, 6);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
w_zip, 0, ZIP_LEN, NULL, 0, 0, 7);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
&w_tax, 0, SQL_VARLEN_DATA, NULL, 0,
SQLFLT8, 8);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
&w_ytd, 0, SQL_VARLEN_DATA, NULL, 0,
SQLFLT8, 9);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        time_start = (TimeNow() / MILLI);

        warehouse_rows_loaded = 0;

        for (w_id = (short)aptr-
>starting_warehouse; w_id <= aptr-
>num_warehouses; w_id++)
        {
                MakeAlphaString(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("idxwarcl");

        stock_rows_loaded = 0;
        district_rows_loaded = 0;

        District();
        Stock();

}
```

```
//=====================================
==================================
//
// Function   : District
//
//=====================================
==================================

void District()
{
    short      d_id;
    short      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;
        int            w_id;
        RETCODE rc;
        DBINT  rcint;
        char   bcphint[128];
        char   err_log_path[256];

        // Seed with unique number
        seed(4);

        printf("Loading district
table...\n");

        // 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");

        //rc = bcp_init(w_hdbc1, name,
NULL, "logs\\district.err", DB_IN);
        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);

        }

        rc = bcp_bind(w_hdbc1, (BYTE *)
&d_id, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT2, 1);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
&d_w_id, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT2, 2);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
d_name, 0, D_NAME_LEN, NULL, 0, 0, 3);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
d_street_1, 0, ADDRESS_LEN, NULL, 0, 0,
4);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
d_street_2, 0, ADDRESS_LEN, NULL, 0, 0,
5);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
d_city, 0, ADDRESS_LEN, NULL, 0, 0, 6);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
d_state, 0, STATE_LEN, NULL, 0, 0, 7);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
d_zip, 0, ZIP_LEN, NULL, 0, 0, 8);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
&d_tax, 0, SQL_VARLEN_DATA, NULL, 0,
SQLFLT8, 9);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
&d_ytd, 0, SQL_VARLEN_DATA, NULL, 0,
SQLFLT8, 10);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
&d_next_o_id, 0, SQL_VARLEN_DATA, NULL,
0, SQLINT4, 11);
        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++)
                {

        MakeAlphaString(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...
        if ((aptr->build_index == 1) &&
(aptr->index_order == 0))
                BuildIndex("idxdiscl");

    return;
}


//=====================================
================================
//
// Function   : Stock
//
//=====================================
================================

void Stock()
{
    long       s_i_id;
    short      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");

        //rc = bcp_init(w_hdbc1, name,
NULL, "logs\\stock.err", DB_IN);
        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);
        }

        rc = bcp_bind(w_hdbc1, (BYTE *)
&s_i_id, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT4, 1);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        bcp_bind(w_hdbc1, (BYTE *)
&s_w_id, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT2, 2);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
&s_quantity, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT2, 3);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
s_dist_01, 0, S_DIST_LEN, NULL, 0, 0, 4);
```

```
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
s_dist_02, 0, S_DIST_LEN, NULL, 0, 0, 5);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
s_dist_03, 0, S_DIST_LEN, NULL, 0, 0, 6);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
s_dist_04, 0, S_DIST_LEN, NULL, 0, 0, 7);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
s_dist_05, 0, S_DIST_LEN, NULL, 0, 0, 8);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
s_dist_06, 0, S_DIST_LEN, NULL, 0, 0, 9);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
s_dist_07, 0, S_DIST_LEN, NULL, 0, 0,
10);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
s_dist_08, 0, S_DIST_LEN, NULL, 0, 0,
11);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
s_dist_09, 0, S_DIST_LEN, NULL, 0, 0,
12);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
s_dist_10, 0, S_DIST_LEN, NULL, 0, 0,
13);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
&s_ytd, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT4, 14);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
&s_order_cnt, 0, SQL_VARLEN_DATA, NULL,
0, SQLINT2, 15);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
&s_remote_cnt, 0, SQL_VARLEN_DATA, NULL,
0, SQLINT2, 16);
        if (rc != SUCCEED)
                HandleErrorDBC(w_hdbc1);

        rc = bcp_bind(w_hdbc1, (BYTE *)
s_data, 0, S_DATA_LEN, NULL, 0, 0, 17);
        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 = (short)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(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;
        short
        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];
        int
                num_procs;
        char
        err_log_path_cust[256];
        char
        err_log_path_hist[256];
        // SQLRETURN
        rc_1;
        // SQLSMALLINT
        recnum, MsgLen;
        // SQLCHAR
                SqlState[6],
Msg[SQL_MAX_MESSAGE_LENGTH];
        // SQLINTEGER
        NativeError;

        // 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");

        //rc = bcp_init(c_hdbc1, name,
NULL, "logs\\customer.err", DB_IN);
        strcpy(err_log_path_cust,aptr-
>log_path);
        strcat(err_log_path_cust,"custome
r.err");
        rc = bcp_init(c_hdbc1, name,
NULL, err_log_path_cust, DB_IN);
        if (rc != SUCCEED)
                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 != SUCCEED)

        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 != SUCCEED)
                HandleErrorDBC(c_hdbc2);

        sprintf(bcphint, "tablock");
        rc = bcp_control(c_hdbc2,
BCPHINTS, (void*) bcphint);
```

```
        if (rc != SUCCEED)
                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 = (short)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,


&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\" >
logs\\nurand_load.log",
        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()
{
        int     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;


        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;

                //  fix to avoid ODBC
float to numeric conversion problem.
                //
        customer_buf[i].c_balance = 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, int 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);


        MakeAlphaString(8,16,FIRST_NAME_L
EN, 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;

                // Generate CUSTOMER and
HISTORY data

                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_str
eet_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;

                //  fix to avoid ODBC
float to numeric conversion problem.

                //
customer_buf[i].c_balance = -10.0;

        strcpy(customer_buf[i].c_balance,
"-10.0");
```

```
                MakeAlphaString(300, 500,
C_DATA_LEN, customer_buf[i].c_data);


                // Generate HISTORY data
                MakeAlphaString(12, 24,
H_DATA_LEN, customer_buf[i].h_data);

        }
}

//=====================================
================================
//
// Function   : LoadCustomerTable
//
//=====================================
================================

void LoadCustomerTable(LOADER_TIME_STRUCT
*customer_time_start)
{
        int         i;
    long        c_id;
    short       c_d_id;
    short       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;

        //  fix to avoid ODBC float to
numeric conversion problem.
        //  double            c_balance;
        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;

    rc = bcp_bind(c_hdbc1, (BYTE *)
&c_id, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT4, 1);
        if (rc != SUCCEED)
                HandleErrorDBC(c_hdbc1);

    rc = bcp_bind(c_hdbc1, (BYTE *)
&c_d_id, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT2, 2);
        if (rc != SUCCEED)
                HandleErrorDBC(c_hdbc1);

        rc = bcp_bind(c_hdbc1, (BYTE *)
&c_w_id, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT2, 3);
        if (rc != SUCCEED)
                HandleErrorDBC(c_hdbc1);

    rc = bcp_bind(c_hdbc1, (BYTE *)
c_first, 0, FIRST_NAME_LEN, NULL, 0, 0,
4);
        if (rc != SUCCEED)
                HandleErrorDBC(c_hdbc1);

    rc = bcp_bind(c_hdbc1, (BYTE *)
c_middle, 0, MIDDLE_NAME_LEN,NULL, 0, 0,
5);
        if (rc != SUCCEED)
                HandleErrorDBC(c_hdbc1);

    rc = bcp_bind(c_hdbc1, (BYTE *)
c_last, 0, LAST_NAME_LEN, NULL, 0, 0, 6);
        if (rc != SUCCEED)
                HandleErrorDBC(c_hdbc1);

    rc = bcp_bind(c_hdbc1, (BYTE *)
c_street_1, 0, ADDRESS_LEN, NULL, 0, 0,
7);
        if (rc != SUCCEED)
                HandleErrorDBC(c_hdbc1);

    rc = bcp_bind(c_hdbc1, (BYTE *)
c_street_2, 0, ADDRESS_LEN, NULL,0,0, 8);
        if (rc != SUCCEED)
                HandleErrorDBC(c_hdbc1);

    rc = bcp_bind(c_hdbc1, (BYTE *)
c_city, 0, ADDRESS_LEN, NULL, 0, 0, 9);
        if (rc != SUCCEED)
                HandleErrorDBC(c_hdbc1);

    rc = bcp_bind(c_hdbc1, (BYTE *)
c_state, 0, STATE_LEN, NULL, 0, 0, 10);
        if (rc != SUCCEED)
                HandleErrorDBC(c_hdbc1);

    rc = bcp_bind(c_hdbc1, (BYTE *)
c_zip, 0, ZIP_LEN, NULL, 0, 0, 11);
        if (rc != SUCCEED)
                HandleErrorDBC(c_hdbc1);

    rc = bcp_bind(c_hdbc1, (BYTE *)
c_phone, 0, PHONE_LEN, NULL, 0, 0, 12);

        if (rc != SUCCEED)
                HandleErrorDBC(c_hdbc1);

        rc = bcp_bind(c_hdbc1, (BYTE *)
&c_since, 0, C_SINCE_LEN, NULL, 0,
SQLCHARACTER, 13);
        if (rc != SUCCEED)
                HandleErrorDBC(c_hdbc1);

    rc = bcp_bind(c_hdbc1, (BYTE *)
c_credit, 0, CREDIT_LEN, NULL, 0, 0, 14);
        if (rc != SUCCEED)
                HandleErrorDBC(c_hdbc1);

    rc = bcp_bind(c_hdbc1, (BYTE *)
&c_credit_lim, 0, SQL_VARLEN_DATA, NULL,
0, SQLFLT8, 15);
        if (rc != SUCCEED)
                HandleErrorDBC(c_hdbc1);
```

```
    rc = bcp_bind(c_hdbc1, (BYTE *)
&c_discount, 0, SQL_VARLEN_DATA, NULL, 0,
SQLFLT8, 16);
       if (rc != SUCCEED)
              HandleErrorDBC(c_hdbc1);


       //  fix to avoid ODBC float to
numeric conversion problem.

    //  rc = bcp_bind(c_hdbc1, (BYTE *)
&c_balance, 0, SQL_VARLEN_DATA, NULL, 0,
SQLFLT8, 17);
       //  if (rc != SUCCEED)
       //     HandleErrorDBC(c_hdbc1);
    rc = bcp_bind(c_hdbc1, (BYTE *)
c_balance, 0, 5, NULL, 0, SQLCHARACTER,
17);
       if (rc != SUCCEED)
              HandleErrorDBC(c_hdbc1);


    rc = bcp_bind(c_hdbc1, (BYTE *)
&c_ytd_payment, 0, SQL_VARLEN_DATA, NULL,
0, SQLFLT8, 18);
       if (rc != SUCCEED)
              HandleErrorDBC(c_hdbc1);

    rc = bcp_bind(c_hdbc1, (BYTE *)
&c_payment_cnt, 0, SQL_VARLEN_DATA, NULL,
0, SQLINT2, 19);
       if (rc != SUCCEED)
              HandleErrorDBC(c_hdbc1);

    rc = bcp_bind(c_hdbc1, (BYTE *)
&c_delivery_cnt,0, SQL_VARLEN_DATA, NULL,
0, SQLINT2, 20);
       if (rc != SUCCEED)
              HandleErrorDBC(c_hdbc1);

    rc = bcp_bind(c_hdbc1, (BYTE *)
c_data, 0, 500, NULL, 0, 0, 21);
       if (rc != SUCCEED)
              HandleErrorDBC(c_hdbc1);

    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;

              //  fix to avoid ODBC
float to numeric conversion problem.

              //  c_balance =
customer_buf[i].c_balance;
              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)
{
       int         i;
    long        c_id;
    short       c_d_id;
    short       c_w_id;
       double          h_amount;
    char        h_data[H_DATA_LEN+1];
       char
       h_date[H_DATE_LEN+1];
       RETCODE        rc;
```

```
    rc = bcp_bind(c_hdbc2, (BYTE *)
&c_id, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT4, 1);
       if (rc != SUCCEED)
              HandleErrorDBC(c_hdbc2);

    rc = bcp_bind(c_hdbc2, (BYTE *)
&c_d_id, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT2, 2);
       if (rc != SUCCEED)
              HandleErrorDBC(c_hdbc2);

    rc = bcp_bind(c_hdbc2, (BYTE *)
&c_w_id, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT2, 3);
       if (rc != SUCCEED)
              HandleErrorDBC(c_hdbc2);

    rc = bcp_bind(c_hdbc2, (BYTE *)
&c_d_id, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT2, 4);
       if (rc != SUCCEED)
              HandleErrorDBC(c_hdbc2);

    rc = bcp_bind(c_hdbc2, (BYTE *)
&c_w_id, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT2, 5);
       if (rc != SUCCEED)
              HandleErrorDBC(c_hdbc2);

       rc = bcp_bind(c_hdbc2, (BYTE *)
&h_date, 0, H_DATE_LEN, NULL, 0,
SQLCHARACTER, 6);
       if (rc != SUCCEED)
              HandleErrorDBC(c_hdbc2);

    rc = bcp_bind(c_hdbc2, (BYTE *)
&h_amount, 0, SQL_VARLEN_DATA, NULL, 0,
SQLFLT8, 7);
       if (rc != SUCCEED)
              HandleErrorDBC(c_hdbc2);

    rc = bcp_bind(c_hdbc2, (BYTE *)
h_data, 0, H_DATA_LEN, NULL, 0, 0, 8);
       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)
                     HandleErrorDBC(c_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;
       short
       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("idxordcl");

       BuildIndex("idxnodcl");

       BuildIndex("idxodlcl");
       }

       // 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.e
rr");
       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);
       }

       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 = (short)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());
                        }

                }
        }

       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_d
ist_info,"");
                }
        }



}


//=======================================
================================
//
// Function   : OrdersBufLoad
//
// Fills shared buffer for ORDERS,
NEWORDER, and ORDERLINE
//
//=======================================
================================

void OrdersBufLoad(int d_id, int w_id)
{

        int
cust[ORDERS_PER_DISTRICT+1];
        long    o_id;
        short   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_supp
ly_w_id = w_id;

        orders_buf[o_id].o_ol[ol].ol_quan
tity = 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)
                        {

        orders_buf[o_id].o_ol[ol].ol_amou
nt = 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_amou
nt = 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;
        short           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
    rc = bcp_bind(o_hdbc1, (BYTE *)
&o_id, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT4, 1);
        if (rc != SUCCEED)
                HandleErrorDBC(o_hdbc1);

    rc = bcp_bind(o_hdbc1, (BYTE *)
&o_d_id, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT2, 2);
        if (rc != SUCCEED)
                HandleErrorDBC(o_hdbc1);

    rc = bcp_bind(o_hdbc1, (BYTE *)
&o_w_id, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT2, 3);
        if (rc != SUCCEED)
                HandleErrorDBC(o_hdbc1);

    rc = bcp_bind(o_hdbc1, (BYTE *)
&o_c_id, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT4, 4);
        if (rc != SUCCEED)
                HandleErrorDBC(o_hdbc1);

        rc = bcp_bind(o_hdbc1, (BYTE *)
&o_entry_d, 0, O_ENTRY_D_LEN, NULL, 0,
SQLCHARACTER, 5);
        if (rc != SUCCEED)
                HandleErrorDBC(o_hdbc1);

    rc = bcp_bind(o_hdbc1, (BYTE *)
&o_carrier_id, 0, SQL_VARLEN_DATA, NULL,
0, SQLINT2, 6);
        if (rc != SUCCEED)
                HandleErrorDBC(o_hdbc1);

    rc = bcp_bind(o_hdbc1, (BYTE *)
&o_ol_cnt, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT2, 7);
        if (rc != SUCCEED)
                HandleErrorDBC(o_hdbc1);

    rc = bcp_bind(o_hdbc1, (BYTE *)
&o_all_local, 0, SQL_VARLEN_DATA, NULL,
0, SQLINT2, 8);
        if (rc != SUCCEED)
                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 != SUCCEED)


        HandleErrorDBC(o_hdbc1);


                orders_rows_loaded++;

                CheckForCommit(o_hdbc1,
o_hstmt1, orders_rows_loaded, "orders",
&orders_time_start->time_start);
    }

        // rcint = bcp_batch(o_hdbc1);
        // if (rcint < 0)
        //      HandleErrorDBC(o_hdbc1);


        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);

                // 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)
{
    int         i;
    long        o_id;
    short       o_d_id;
    short       o_w_id;
        RETCODE         rc;
        DBINT           rcint;

        // Bind NEW-ORDER data

    rc = bcp_bind(o_hdbc2, (BYTE *)
&o_id, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT4, 1);
        if (rc != SUCCEED)
                HandleErrorDBC(o_hdbc2);

    rc = bcp_bind(o_hdbc2, (BYTE *)
&o_d_id, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT2, 2);
        if (rc != SUCCEED)
                HandleErrorDBC(o_hdbc2);

    rc = bcp_bind(o_hdbc2, (BYTE *)
&o_w_id, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT2, 3);
        if (rc != SUCCEED)
                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 != SUCCEED)

        HandleErrorDBC(o_hdbc2);


                new_order_rows_loaded++;

                CheckForCommit(o_hdbc2,
o_hstmt2, new_order_rows_loaded,
"new_order", &new_order_time_start-
>time_start);
        }

        // rcint = bcp_batch(o_hdbc2);
        // if (rcint < 0)
        //      HandleErrorDBC(o_hdbc2);


        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("idxnodcl");

        }

}


//=======================================
================================
//
// Function   : LoadOrderLineTable
//
//=======================================
================================

void
LoadOrderLineTable(LOADER_TIME_STRUCT
*order_line_time_start)
{
        int         i,j;
    long        o_id;
        short           o_d_id;
        short           o_w_id;
    long        ol;
        long            ol_i_id;
    short       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
    rc = bcp_bind(o_hdbc3, (BYTE *)
&o_id, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT4, 1);
        if (rc != SUCCEED)
                HandleErrorDBC(o_hdbc3);

    rc = bcp_bind(o_hdbc3, (BYTE *)
&o_d_id, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT2, 2);
        if (rc != SUCCEED)
                HandleErrorDBC(o_hdbc3);

    rc = bcp_bind(o_hdbc3, (BYTE *)
&o_w_id, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT2, 3);
        if (rc != SUCCEED)
                HandleErrorDBC(o_hdbc3);

    rc = bcp_bind(o_hdbc3, (BYTE *) &ol,
0, SQL_VARLEN_DATA, NULL, 0, SQLINT4, 4);
        if (rc != SUCCEED)
                HandleErrorDBC(o_hdbc3);

    rc = bcp_bind(o_hdbc3, (BYTE *)
&ol_i_id, 0, SQL_VARLEN_DATA, NULL, 0,
SQLINT4, 5);
        if (rc != SUCCEED)
                HandleErrorDBC(o_hdbc3);

    rc = bcp_bind(o_hdbc3, (BYTE *)
&ol_supply_w_id, 0, SQL_VARLEN_DATA,
NULL, 0, SQLINT2, 6);
        if (rc != SUCCEED)
                HandleErrorDBC(o_hdbc3);

        rc = bcp_bind(o_hdbc3, (BYTE *)
&ol_delivery_d, 0, OL_DELIVERY_D_LEN,
NULL, 0, SQLCHARACTER, 7);
        if (rc != SUCCEED)
                HandleErrorDBC(o_hdbc3);

    rc = bcp_bind(o_hdbc3, (BYTE *)
&ol_quantity, 0, SQL_VARLEN_DATA, NULL,
0, SQLINT2, 8);
        if (rc != SUCCEED)
                HandleErrorDBC(o_hdbc3);

    rc = bcp_bind(o_hdbc3, (BYTE *)
&ol_amount, 0, SQL_VARLEN_DATA, NULL, 0,
SQLFLT8, 9);
        if (rc != SUCCEED)
                HandleErrorDBC(o_hdbc3);

    rc = bcp_bind(o_hdbc3, (BYTE *)
ol_dist_info, 0, DIST_INFO_LEN, NULL, 0,
0, 10);
        if (rc != SUCCEED)
                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 != SUCCEED)


        HandleErrorDBC(o_hdbc3);



        order_line_rows_loaded++;

        CheckForCommit(o_hdbc3, o_hstmt3,
order_line_rows_loaded, "order_line",
&order_line_time_start->time_start);
                }

        }

        // rcint = bcp_batch(o_hdbc3);
        // if (rcint < 0)
        //      HandleErrorDBC(o_hdbc3);


        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;
        }

}


//=====================================
================================
//
// Function   : CheckForCommit
//
//=====================================
================================

void CheckForCommit(HDBC hdbc,

        HSTMT hstmt,
                                int
rows_loaded,

        char *table_name,
                                long
*time_start)
{

    long       time_end, time_diff;
        // DBINT       rcint;

    if ( !(rows_loaded % aptr->batch) )
    {

                // rcint =
bcp_batch(hdbc);
                // if (rcint < 0)
                //
        HandleErrorDBC(hdbc);

                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   : 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);

        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(c_hdbc2,
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(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)
                HandleErrorDBC(i_hdbc1);

        // 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)
                HandleErrorDBC(w_hdbc1);

        // 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)
                HandleErrorDBC(c_hdbc1);

        // Connection 4

        sprintf( 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)
                HandleErrorDBC(c_hdbc2);

        // Connection 5

        sprintf( 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)
                HandleErrorDBC(o_hdbc1);

        // Connection 6

        sprintf( 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)
                HandleErrorDBC(o_hdbc2);

        // Connection 7

        sprintf( 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,


        (SQLCHAR*)&szDriverString[0] ,
```

```
                SQL_NTS,


        (SQLCHAR*)&szDriverStringOut[0],

                sizeof(szDriverStringOut),

                &cbDriverStringOut,

                SQL_DRIVER_NOPROMPT );
        if (rc != SUCCEED)
                HandleErrorDBC(o_hdbc3);

}

//=====================================
================================
//
// 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);
}


void HandleErrorDBC (SQLHDBC  hdbc1)
{

        SQLCHAR        SqlState[6],
Msg[SQL_MAX_MESSAGE_LENGTH];
        SQLINTEGER  NativeError;
        SQLSMALLINT i, MsgLen;
        SQLRETURN   rc2;
        char           timebuf[128];
        char           datebuf[128];
        char           err_log_path[256];
        FILE           *fp1;

        i = 1;
        while (( rc2 =
SQLGetDiagRec(SQL_HANDLE_DBC , hdbc1, i,
SqlState , &NativeError,
                                        Msg,
sizeof(Msg) , &MsgLen )) != SQL_NO_DATA )
        {

                sprintf( szLastError ,
"%s" ,  Msg );

                _strtime(timebuf);
                _strdate(datebuf);

                printf( "[%s : %s] %s\n" ,
datebuf, timebuf, szLastError);

                strcpy(err_log_path,aptr-
>log_path);

        strcat(err_log_path,"tpccldr.err"
);
                fp1 =
fopen(err_log_path,"w");
                //fp1 =
fopen("logs\\tpccldr.err","w");
                if (fp1 == NULL)

                        printf("ERROR:
Unable to open errorlog file.\n");
                else
                {
                        fprintf(fp1, "[%s
: %s] %s\n" , datebuf, timebuf,
szLastError);
                        fclose(fp1);
                }

                i++;

        }
}

void HandleErrorSTMT (HSTMT  hstmt1)
{

        SQLCHAR        SqlState[6],
Msg[SQL_MAX_MESSAGE_LENGTH];
        SQLINTEGER  NativeError;
        SQLSMALLINT i, MsgLen;
        SQLRETURN   rc2;
        char           timebuf[128];
        char           datebuf[128];
        char           err_log_path[256];
        FILE           *fp1;

        i = 1;
        while (( rc2 =
SQLGetDiagRec(SQL_HANDLE_STMT , hstmt1,
i, SqlState , &NativeError,
                                        Msg,
sizeof(Msg) , &MsgLen )) != SQL_NO_DATA )
        {

                sprintf( szLastError ,
"%s" ,  Msg );

                _strtime(timebuf);
                _strdate(datebuf);

                printf( "[%s : %s] %s\n" ,
datebuf, timebuf, szLastError);

                strcpy(err_log_path,aptr-
>log_path);
```

```
        strcat(err_log_path,"tpccldr.err"
);
                fp1 =
fopen(err_log_path,"w");
                //fp1 =
fopen("logs\\tpccldr.err","w");
                if (fp1 == NULL)

                        printf("ERROR:
Unable to open errorlog file.\n");
                else
                {
                        fprintf(fp1, "[%s
: %s] %s\n" , datebuf, timebuf,
szLastError);
                        fclose(fp1);
                }

                i++;

        }
}


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;

}

//=======================================
================================
//
// Function   : CheckDataBase
//
//=======================================
================================

void CheckDataBase()
{

        RETCODE         rc;

        char
        szDriverString[300];
        char
        szDriverStringOut[1024];
        char
        TablesBitMap[9] = {"000000000"};
        int                             i,
ExitFlag;

        SQLSMALLINT
        cbDriverStringOut;
        SQLCHAR
        TabName[10];
        SQLINTEGER              TabNameInd,
TabCount, TabCountInd;


        ExitFlag = 0;

        SQLAllocHandle(SQL_HANDLE_ENV,
SQL_NULL_HANDLE, &henv );

        SQLSetEnvAttr(henv,
SQL_ATTR_ODBC_VERSION,
(void*)SQL_OV_ODBC3, 0 );

        SQLAllocHandle(SQL_HANDLE_DBC,
henv , &v_hdbc);

        SQLSetConnectAttr(v_hdbc,
SQL_COPT_SS_BCP, (void *)SQL_BCP_ON,
SQL_IS_INTEGER );

        // Open connection to SQL Server

        sprintf( szDriverString ,
"DRIVER={SQL
Server};SERVER=%s;UID=%s;PWD=%s;DATABASE=
%s" ,

          aptr->server,

          aptr->user,

          aptr->password,

          aptr->database );

        rc = SQLSetConnectAttr( v_hdbc,
SQL_ATTR_PACKET_SIZE, (SQLPOINTER)aptr-
>pack_size, SQL_IS_UINTEGER );
        if (rc != SQL_SUCCESS)
                HandleErrorDBC(v_hdbc);

        rc = SQLDriverConnect ( v_hdbc,

NULL,

        (SQLCHAR*)&szDriverString[0] ,

        SQL_NTS,

        (SQLCHAR*)&szDriverStringOut[0],

        sizeof(szDriverStringOut),

        &cbDriverStringOut,

        SQL_DRIVER_NOPROMPT );

        // if the rc is SQL_ERROR, the
the TPCC database probably does not exist
        if (rc == SQL_ERROR)
        {
                printf("The database TPCC
does not appear to exist!\n");
                printf("\nCheck LOGS\\
directory for database creation
errors.\n");

                // cleanup database
connections and handles
```

```
	SQLFreeHandle(SQL_HANDLE_STMT,
v_hstmt);
		SQLDisconnect(v_hdbc);

	SQLFreeHandle(SQL_HANDLE_DBC,
v_hdbc);

		// since there is not a
database, exit back to SETUP.CMD
		exit(1);
	}

	if (
SQLAllocHandle(SQL_HANDLE_STMT, v_hdbc ,
&v_hstmt) != SQL_SUCCESS )
		HandleErrorDBC(v_hdbc);

	if ( SQLBindCol(v_hstmt, 1,
SQL_C_ULONG, &TabCount, 0, &TabCountInd)
!= SQL_SUCCESS )
		HandleErrorSTMT(v_hstmt);

	// count the number of user
tables from sysobjects
	rc = SQLExecDirect(v_hstmt,
"select count(*) from sysobjects where
xtype = \'U\'", SQL_NTS);
	if ((rc != SQL_SUCCESS) && (rc !=
SQL_SUCCESS_WITH_INFO))
		HandleErrorSTMT(v_hstmt);


	if ( SQLFetch(v_hstmt) !=
SQL_SUCCESS )
		HandleErrorSTMT(v_hstmt);

	// if the number of tables is
less than 9, select all the user tables
in TPCC
	if (TabCount != 9)
	{

	SQLFreeHandle(SQL_HANDLE_STMT,
v_hstmt);


	SQLAllocHandle(SQL_HANDLE_STMT,
v_hdbc , &v_hstmt);

		if ( SQLBindCol(v_hstmt,
1, SQL_C_CHAR, &TabName, sizeof(TabName),
&TabNameInd) != SQL_SUCCESS )

	HandleErrorSTMT(v_hstmt);

		// select the list of user
tables into a result set
		rc =
SQLExecDirect(v_hstmt, "select * from
sysobjects where xtype = \'U\'",
SQL_NTS);
		if ((rc != SQL_SUCCESS) &&
(rc != SQL_SUCCESS_WITH_INFO))

	HandleErrorSTMT(v_hstmt);

		// go through the result
set and set the bitmap for each found
table
		// set the bitmap to '1'
if the table name is found

		while ((rc =
SQLFetch(v_hstmt)) != SQL_NO_DATA)
		{
			switch( TabName[0]
)
			{
			case 'w':

	TablesBitMap[0] = '1';
				break;
			case 'd':

	TablesBitMap[1] = '1';
				break;
			case 'c':

	TablesBitMap[2] = '1';
				break;
			case 'h':

	TablesBitMap[3] = '1';
				break;
			case 'n':

	TablesBitMap[4] = '1';
				break;
			case 'o':
				if
(TabName[5] = 's')

	TablesBitMap[5] = '1';
				if
(TabName[5] = '_')

	TablesBitMap[6] = '1';
				break;
			case 'i':

	TablesBitMap[7] = '1';
				break;
			case 's':

	TablesBitMap[8] = '1';
				break;
			}
		}

		// a '0' ExitFlag means do
NOT exit the loader early, a '1' means
exit the loader early
		ExitFlag = 0;

		// interate through the
bitmap to display which table(s) is
actually missing
		for (i = 0; i <= 8; i++)
		{
			switch(i)
			{
			case 0:
				if
(TablesBitMap[i] == '0')

				{

	printf("The Warehouse table is
missing or damaged.\n");
```

```
        ExitFlag = 1;
                                }
                                break;
                        case 1:
                                if
(TablesBitMap[i] == '0')
                                {

        printf("The District table is
missing or damaged.\n");

        ExitFlag = 1;
                                }
                                break;
                        case 2:
                                if
(TablesBitMap[i] == '0')
                                {

        printf("The Customer table is
missing or damaged.\n");

        ExitFlag = 1;
                                }
                                break;
                        case 3:
                                if
(TablesBitMap[i] == '0')
                                {

        printf("The History table is
missing or damaged.\n");

        ExitFlag = 1;
                                }
                                break;
                        case 4:
                                if
(TablesBitMap[i] == '0')
                                {

        printf("The New_Order table is
missing or damaged.\n");

        ExitFlag = 1;
                                }
                                break;
                        case 5:
                                if
(TablesBitMap[i] == '0')
                                {


        printf("The Orders table is
missing or damaged.\n");

        ExitFlag = 1;
                                }
                                break;
                        case 6:
                                if
(TablesBitMap[i] == '0')
                                {

        printf("The Order_Line table is
missing or damaged.\n");

        ExitFlag = 1;
                                }
                                break;
                        case 7:
                                if
(TablesBitMap[i] == '0')
                                {

        printf("The Item table is missing
or damaged.\n");

        ExitFlag = 1;
                                }
                                break;
                        case 8:
                                if
(TablesBitMap[i] == '0')
                                {

        printf("The Stock table is
missing or damaged.\n");

        ExitFlag = 1;
                                }
                                break;
                        }
                }

                // if one or more tables
are missing, display message and exit the
loader
                if (ExitFlag = 1)
                {
                        printf("\nExiting
TPC-C Loader!\n");
                        printf("\nCheck
LOGS\\ directory for database\n");
                        printf("or table
creation errors.\n");

                        // cleanup
database connections and handles

        SQLFreeHandle(SQL_HANDLE_STMT,
v_hstmt);

        SQLDisconnect(v_hdbc);

        SQLFreeHandle(SQL_HANDLE_DBC,
v_hdbc);

                        exit(1);
                }
        }

        // cleanup database connections
and handles
        SQLFreeHandle(SQL_HANDLE_STMT,
v_hstmt);
        SQLDisconnect(v_hdbc);
        SQLFreeHandle(SQL_HANDLE_DBC,
v_hdbc);

        return;
}
```

Random.c

```
//      File:           RANDOM.C
//                              Microsoft
TPC-C Kit Ver. 4.41
```

```
//                              Copyright
Microsoft, 1996, 1997, 1998, 1999, 2000,
2001
//      Purpose:       Random number
generation routines for database loader


// Includes
#include "tpcc.h"
#include "math.h"

// Defines
#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()
{

#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

//Orginal 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
```

```
    return rand_num;
}
```

Strings.c

```
//      File:           STRINGS.C
//                              Microsoft
TPC-C Kit Ver. 4.41
//                              Copyright
Microsoft, 1996, 1997, 1998, 1999, 2000,
2001
//      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

    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[] =
"0123456789ABCDEFGHIJKLMNOPQRSTUVWXYZabcd
efghijklmnopqrstuvwxyz";
       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++)
       {
              cc =
chArray[RandomNumber(0, chArrayMax)];
        str[i] = cc;
    }
       //if ( len < z )
       //     memset(str+len, ' ', z -
len);
       str[len] = 0;

    return len;
}


//=====================================
==============================
//
// 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 prercentage is valid
    if ((percent < 0) || (percent > 100))
    {

       printf("MakeOrigianlAlphaString:
Invalid percentage: %d\n", percent);
              exit(-1);
    }

    // verify string is at least 8 chars
in length
    if ((x + y) <= 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 strlen(str);
}


//=====================================
==============================
//
// 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
//
// 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;
}
```

Time.c

```
//      File:           TIME.C
//                              Microsoft
TPC-C Kit Ver. 4.41
//                              Copyright
Microsoft, 1996, 1997, 1998, 1999, 2000,
2001
//      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;

   return time_now;
}
```

Tpcc.h

```
//      File:           TPCC.H
//                              Microsoft
TPC-C Kit Ver. 4.41
//                              Copyright
Microsoft, 1996, 1997, 1998, 1999, 2000,
2001
//      Purpose:        Header file for
TPC-C database loader


// Build number of TPC Benchmark Kit
#define TPCKIT_VER     "4.41"

// 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>

// ODBC headers
#include <sql.h>
#include <sqlext.h>
#include <odbcss.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.440\\SETUP\\logs\\load.out"
#define LOG_PATH
"C:\\MSTPCC.440\\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;
} TPCCLDR_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
       #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    MakeOriginalAlphaString();
int    MakeNumberString();
int    MakeZipNumberString();
void   InitString();
void   InitAddress();
void   PaddString();
```

Getargs.c

```
//      File:          GETARGS.C
//                             Microsoft
TPC-C Kit Ver. 4.41
//                             Copyright
Microsoft, 1996, 1997, 1998, 1999, 2000,
2001
//      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;
        pargs->table_warehouse       =
FALSE;
        pargs->table_customer        =
FALSE;
        pargs->table_orders
        =  FALSE;
        pargs->loader_res_file
        =  LOADER_RES_FILE;
        pargs->log_path
                =  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
throught */

        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;

                        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");
    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("-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);
}
```

Appendix C:
Tunable Parameters

Server Configuration Parameters

Microsoft Windows .NET Enterprise Server Parameters
The following registry key was added:
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Session Manager\I/O System]
"CountOperations"=dword:00000000
Microsoft Windows .NET Enterprise 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 2000 Startup Parameters

Microsoft SQL Server was started with the following command line options
sqlservr -c -x -T3502 –g100
where

-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.
-g100	Reserve 100 MB for non-buffer pool allocations

Boot.ini Parameters

The flag /pae was added to the boot line in the boot.ini file.

Microsoft SQL Server 2000 Configuration Parameters

affinity mask	15
allow updates	1
awe enabled	1
lightweight pooling	1
locks	0
max degree of parallelism	1
max worker threads	385
min memory per query	1024
priority boost	1
recovery interval	60
remote access	0
remote login timeout	20
remote query timeout	600
set working set size	0

all other SQL Server configuration settings are default.

RTE Parameters

```
Profile:    6600_8_4_1
File Path:
      C:\benchcrf.old\profiles\6
600_8_4_1.pro
Version:    1.0.1

      Number of Engines: 8

            Name: DRIVER1
            Description:
            Directory:
c:\tpcclog\rte1.log
            Machine: rte1
            Parameter Set:
PARAM2
            Index: 0
            Seed: 49167
            Configured Users:
5000
            Pipe Name:
DRIVER180913046
            Connect Rate: 2000
            Start Rate: 1800
            CLIENT_NURAND: 233
            CPU: 0

            Name: DRIVER2
            Description:
            Directory:
c:\tpcclog\rte2.log
            Machine: rte2
            Parameter Set:
PARAM2
            Index: 100000000
            Seed: 49167
            Configured Users:
5000
            Pipe Name:
DRIVER280977169
            Connect Rate: 2000
            Start Rate: 1800
            CLIENT_NURAND: 233
            CPU: 0

            Name: DRIVER3
            Description:
            Directory:
c:\tpcclog\rte3.log
            Machine: rte3
            Parameter Set:
PARAM2
            Index: 200000000
            Seed: 49167
            Configured Users:
5000
            Pipe Name:
DRIVER381024647
            Connect Rate: 2000
            Start Rate: 1800
            CLIENT_NURAND: 233
            CPU: 0

            Name: DRIVER4
            Description:
            Directory:
c:\tpcclog\rte4.log
            Machine: rte4
            Parameter Set:
PARAM2
            Index: 300000000
            Seed: 49167
            Configured Users:
5000
            Pipe Name:
DRIVER481051565
            Connect Rate: 2000
            Start Rate: 1800
            CLIENT_NURAND: 233
            CPU: 0

            Name: DRIVER5
            Description:
            Directory:
c:\tpcclog\rte5.log
            Machine: rte5
            Parameter Set:
PARAM2
            Index: 400000000
            Seed: 49167
            Configured Users:
11500
            Pipe Name:
DRIVER581091363
            Connect Rate: 2000
            Start Rate: 1800
            CLIENT_NURAND: 233
            CPU: 0

            Name: DRIVER6
            Description:
            Directory:
c:\tpcclog\rte6.log
            Machine: rte6
            Parameter Set:
PARAM2
            Index: 500000000
```

```
            Seed: 59267
            Configured Users:
11500
            Pipe Name:
DRIVER68913036
            Connect Rate: 2000
            Start Rate: 1800
            CLIENT_NURAND: 233
            CPU: 0

            Name: DRIVER7
            Description:
            Directory:
c:\tpcclog\rte7.log
            Machine: rte7
            Parameter Set:
PARAM2
            Index: 600000000
            Seed: 69268
            Configured Users:
11500
            Pipe Name:
DRIVER78986822
            Connect Rate: 2000
            Start Rate: 1800
            CLIENT_NURAND: 233
            CPU: 0

            Name: DRIVER8
            Description:
            Directory:
c:\tpcclog\rte8.log
            Machine: rte8
            Parameter Set:
PARAM2
            Index: 700000000
            Seed: 69279
            Configured Users:
11500
            Pipe Name:
DRIVER8778980184
            Connect Rate: 2000
            Start Rate: 1800
            CLIENT_NURAND: 233
            CPU: 0

      Number of User groups: 8

            Driver Engine:
DRIVER1
            IIS Server: client1
            SQL Server: sut
            User: sa
            Protocol: Html
            w_id Range: 1 - 500
            w_id Max Warehouse:
6600
                                    Scale: Normal
                                    User Count: 5000
                                    District id: 1
                                    Scale Down: No

                                    Driver Engine:
                              DRIVER2
                                    IIS Server: client2
                                    SQL Server: sut
                                    User: sa
                                    Protocol: Html
                                    w_id Range: 501 -
                              1000
                                    w_id Max Warehouse:
                              6600
                                    Scale: Normal
                                    User Count: 5000
                                    District id: 1
                                    Scale Down: No

                                    Driver Engine:
                              DRIVER3
                                    IIS Server: client3
                                    SQL Server: sut
                                    User: sa
                                    Protocol: Html
                                    w_id Range: 1001 -
                              1500
                                    w_id Max Warehouse:
                              6600
                                    Scale: Normal
                                    User Count: 5000
                                    District id: 1
                                    Scale Down: No

                                    Driver Engine:
                              DRIVER4
                                    IIS Server: client4
                                    SQL Server: sut
                                    User: sa
                                    Protocol: Html
                                    w_id Range: 1501 -
                              2000
                                    w_id Max Warehouse:
                              6600
                                    Scale: Normal
                                    User Count: 5000
                                    District id: 1
                                    Scale Down: No

                                    Driver Engine:
                              DRIVER5
                                    IIS Server: client1
                                    SQL Server: sut
                                    User: sa
                                    Protocol: Html
```

```
            w_id Range: 2001 -
3150                                                ~Default
            w_id Max Warehouse:                     Default Parameter
6600                                    Set
            Scale: Normal                                          Txn
            User Count: 11500           Think   Key     RT      RT
            District id: 1              Menu
            Scale Down: No
                                        Weight  Time    Time    Delay
            Driver Engine:              Fence   Delay
DRIVER6                                             New Order
            IIS Server: client2         10.00   12.05       18.01
            SQL Server: sut             0.10     5.00        0.10
            User: sa                            Payment
            Protocol: Html              10.00   12.05        3.01
            w_id Range: 3151 -          0.10     5.00        0.10
4300                                            Delivery
            w_id Max Warehouse:         1.00     5.05        2.01
6600                                    0.10     5.00        0.10
            Scale: Normal                       Stock Level
            User Count: 11500           1.00     5.05        2.01
            District id: 1              0.10    20.00        0.10
            Scale Down: No                      Order Status
                                        1.00    10.05        2.01
            Driver Engine:              0.10     5.00        0.10
DRIVER7
            IIS Server: client3                 PARAM2
            SQL Server: sut
            User: sa                                               Txn
            Protocol: Html              Think   Key     RT      RT
            w_id Range: 4301 -          Menu
5450
            w_id Max Warehouse:         Weight  Time    Time    Delay
6600                                    Fence   Delay
            Scale: Normal                       New Order
            User Count: 11500           44.88   12.04       18.02
            District id: 1              0.10     5.00        0.10
            Scale Down: No                      Payment
                                        43.03   12.04        3.02
            Driver Engine:              0.10     5.00        0.10
DRIVER8                                         Delivery
            IIS Server: client4         4.03     5.04        2.02
            SQL Server: sut             0.10     5.00        0.10
            User: sa                            Stock Level
            Protocol: Html              4.03     5.04        2.02
            w_id Range: 5451 -          0.10    20.00        0.10
6600                                            Order Status
            w_id Max Warehouse:         4.03    10.04        2.02
6600                                    0.10     5.00        0.10
            Scale: Normal
            User Count: 11500
            District id: 1
            Scale Down: No

      Number of Parameter Sets:
2
```

Client Configuration Parameters

COM+ Settings

TPCC.AllTxns:
Activation:
Enable Object Pooling selected
Minimum Pool Size: 85
Maximum Pool Size: 85
Creation Timeout: 60,000
Enable Object Construction
Enable Just in Time Activation
Concurrency:
Concurrency Required

TPCC Application Registry Parameters

```
Windows Registry Editor Version 5.00
[HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\TPCC]
"Path"="c:\\inetpub\\wwwroot\\"
"NumberOfDeliveryThreads"=dword:00000006
"MaxConnections"=dword:00000181
"MaxPendingDeliveries"=dword:000009c4
"DB_Protocol"="ODBC"
"TxnMonitor"="COM"
"DbServer"="sut"
"DbName"="tpcc"
"DbUser"="sa"
"DbPassword"=""
"COM_SinglePool"="YES"
```

Microsoft Internet Information Server Registry Parameters

```
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\InetInfo]
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\InetInfo\Parameters]
"ListenBackLog"=dword:00000019
"DispatchEntries"=hex(7):4c,00,44,00,41,00,50,00,53,00,56,00,43,00,00,00,00,00
"PoolThreadLimit"=dword:000000be
"ThreadTimeout"=dword:00015180
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\InetInfo\Performance]
"Library"="infoctrs.dll"
"Open"="OpenINFOPerformanceData"
"Close"="CloseINFOPerformanceData"
"Collect"="CollectINFOPerformanceData"
"Last Counter"=dword:00000842
"Last Help"=dword:00000843
"First Counter"=dword:00000802
"First Help"=dword:00000803
"Library Validation Code"=hex:de,fc,ed,18,0a,98,c0,01,10,25,00,00,00,00,00,00
"WbemAdapFileTime"=hex:00,60,4e,96,aa,40,bf,01
"WbemAdapFileSize"=dword:00002510
"WbemAdapStatus"=dword:00000000
```

Appendix D:
Disk Storage

TPC-C 60 Day Space Requirements						
Warehouses	**7,200**				TpmC	**82,226.46**
Table	.	Data KB	Index KB	Extra 5% KB	8hr Space	Total Space KB
Warehouse	7,200	**768**	**48**	41		857
District	72,000	**8,000**	**64**	403		8467
Customer	216,000,000	**157,090,912**	**10,087,304**	8,358,911		175537127
History	216,000,000	**12,000,008**	**40**		(84,243,960)	12000048
New_order	64,800,000	**1,024,512**	**2,768**	51,364		1078644
Orders	216,000,000	**6,620,696**	**3,656,712**		(65,767,825)	10277408
Order_line	2,147,483,647	**134,999,472**	**336,168**		(947,897,275)	135335640
Item	100,000	**9,528**	**72**	480		10080
Stock	720,000,000	**230,400,000**	**515,968**	11,545,798		242461766
Total		542,153,896	14,599,144	19,956,997	(1,097,909,060)	576,710,037

	MB	
Dynamic Space	150,020	Sum of Data for Order, Orderline and History
Static Space	413,174	Sum of Data+Index+5%-Dynamic Space
Free Space	na	Total Allocated Spac - (Dynamic + Static Space)
Daily Growth	27,412	(Dynamic Space/(W*62.5))*tpmc
Daily Spread	-	(Free Space -1.5*Daily Growth) Zero Assumed

60 Day Space MB	2,057,919	
60 Day Space GB	**2,009.69**	GB
Log Size	204,720.00	MB
KB Per New Order	4.61	KB
8 hr log MB	196,691	MB
8 hr log GB	**192.0806**	GB

Space Usage	GB Needed	Disks Measured	GB Priced	Disk Size	Formatted Size
60 Day Space DB	2,009.69	270	4563.00	18.2GB	16.900
			0.00		
			0.00		
Total DB			4563.00		
8-hr log + mirror	384.1612	24	814.08	36.4GB	33.92
OS, Swap	3	1	72.00	80GB	72.000
Total Storage	2,396.85	GB	5,449.08	GB	

	MSSQL_misc_fg	MSSQL_cs_fg
	857	
	8467	
		175537127
	-72243912	
	1078644	
	-55490417	
	-812561635	
	10080	
		242461766
	(939,197,916)	417,998,893
files=	**3**	**3**
size=	**1,984,000**	**4,096,000**
Total=	5,952,000	12,288,000
8K blocks	47,616,000	98,304,000

Appendix E:
Price Quotes

Microsoft Corporation
One Microsoft Way
Redmond, WA 98052-6399

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

Microsoft

April 17, 2003

RackSaver
Paul Mecucci
9449 Carroll Park Drive
San Diego, CA 92121

Mr. Mecucci:

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
810-00846	**SQL Server 2000 Enterprise Edition** *Per processor licensing* *Discount Schedule: Open Program Level C* *Unit Price reflects a 17% discount from the retail unit price of $19,999.*	$16,541	4	$66,164
C11-00821	**Windows 2000 Server** *Server license only - No CALs* *Discount Schedule: Open Program - No Level* *Unit Price reflects a 8% discount from the retail unit price of $799.*	$738	4	$2,952
P72-00264	**Windows Server 2003, Enterprise Server** *Server license only - No CALs* *Discount Schedule: Open Program - No Level* *Unit Price reflects a 40% discount from the retail unit price of $3,999.*	$2,399	1	$2,399
254-00170	**Visual C++ Standard** *No discounts applied*	$109	1	$109
PRO-PRORS-16U-01	**Database Server Support Package** *1 Year Term*	$1,950	3	$5,850

Some products may not be currently orderable but will be available through Microsoft's normal distribution channels by April 2, 2003.

This quote is valid for the next 90 days.

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

Reference ID: PCpame0317044970
Please include this Reference ID in any correspondence regarding this price quote.