



**TPC Benchmark™ C  
Full Disclosure  
Report**

**Advanced Logic Research, Inc.**

**ALR Revolution 6X6 Client/Server**

**using**

**Microsoft NT Server 4.0 Enterprise Edition  
and**

**Microsoft SQL Server 6.5 Enterprise Edition**

**Submitted for review  
November 1997**

**ALR Part Number 65970120-B**

## **Second Edition - November 1997**

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All performance data contained in this report was obtained in a rigorously controlled environment, and therefore results obtained in other operating environments may vary significantly. Advanced Logic Research, Inc. and Microsoft Corporation do not warrant or represent that a user can or will achieve similar performance expressed in transactions per minute (tpmC) or normalized price/performance (\$/tpmC). No warranty of system performance or price/performance is expressed or implied in this report.

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## **Overview**

This report documents the methodology and results of the TPC Benchmark C (TPC-C) conducted on the Advanced Logic Research, Inc. Revolution 6X6 server. The operating system on the server was Microsoft Windows NT Server 4.0 Enterprise Edition. The DBMS used was Microsoft SQL Server 6.5 Enterprise Edition. The operating system on the clients was Microsoft Windows NT Server 4.0 SP2. The clients ran Microsoft's Internet Information Server 3.0 and Tuxedo 6.3 CFS for NT.

## **TPC Benchmark Metrics**

The standard TPC Benchmark C metrics, ipmC (transactions per minute), price per ipmC (five year capital cost per measured ipmC), and the availability date are reported as required by the benchmark specification.

## **Executive Summary**

The following pages contain the executive summary results of the benchmark.

## **Auditor**

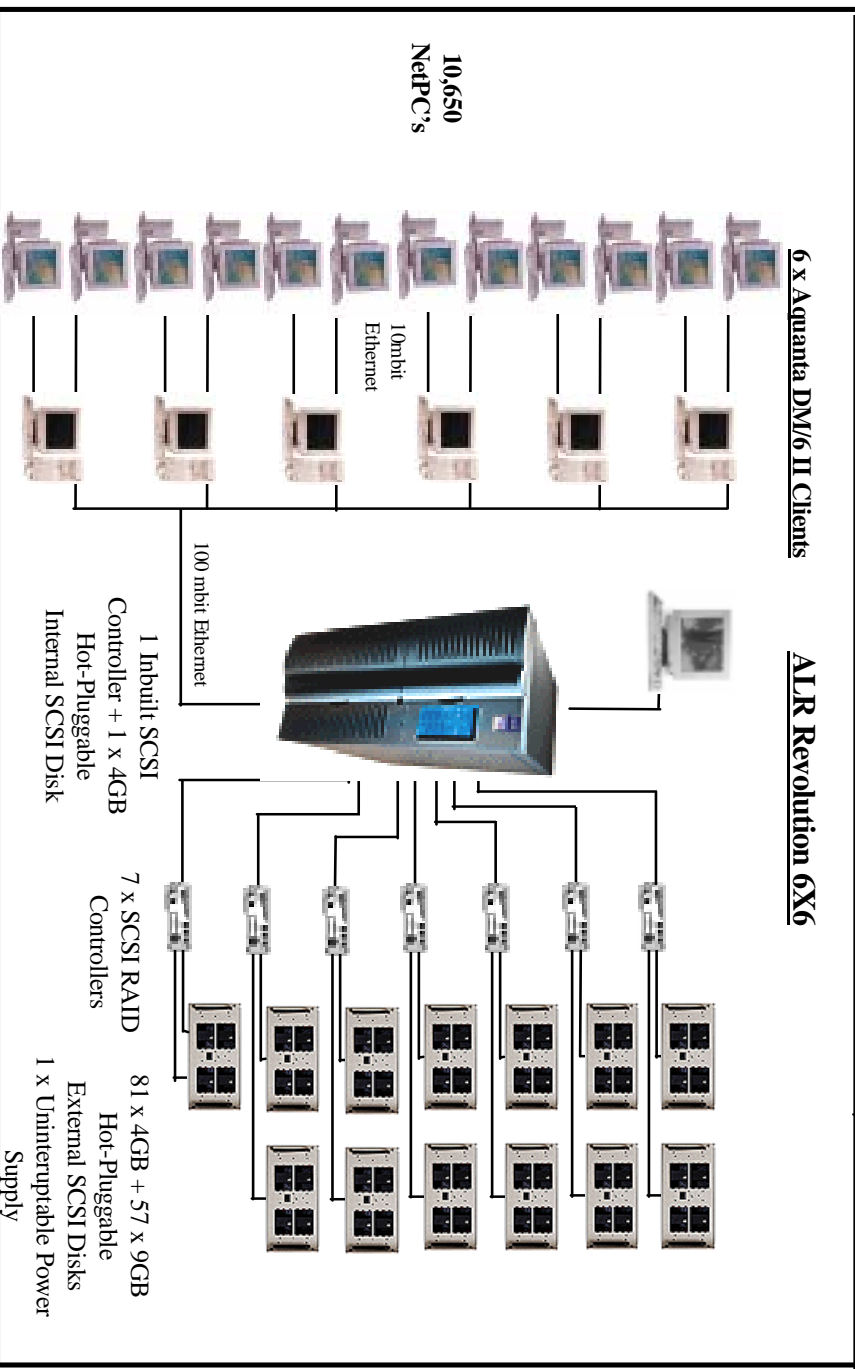
The benchmark configuration, environment, and methodology used to produce and validate the test results, along with the pricing model used to calculate the cost per ipmC, were audited by Richard Gimarc of Performance Metrics, Inc. to verify compliance with the relevant TPC specification.

# ALR

## ALR Revolution 6X6 Client/Server

TPC-C Rev. 3.3  
Report Date:  
26-Nov-1997

Total System Cost	TPC-C Throughput	Price/Performance	Availability Date
<b>\$459,524</b>	<b>13,089.30 tpmC</b>	<b>\$35.11 per tpmC</b>	<b>31-Dec-1997</b>
Processors	Database Manager	Operating System	Other Software
6 Pentium® Pro 200 MHz 1MB L2 cache	Microsoft SQL Server 6.5 Enterprise Edition	Microsoft NT Server 4.0 Enterprise Edition	Microsoft IIS 3.0 Tuxedo 6.3 CFS
			Number of Users
			<b>10,650</b>



System Components	Server		Clients	
	Quantity	Type	Quantity	Type
Processors	6	200 MHz Pentium® Pro with 1MB Level 2 Cache	6	200MHz Pentium® Pro with 256KB Level 2 Cache
Memory	1	4096MB	6	256MB
Disk Controllers	7	SCSI RAID Inbuilt SCSI	6	Inbuilt IDE
Disk Drives	82	4GB	6	1.5GB
	57	9GB		
Total Storage		813.47 GB		7.5GB
CD-ROM / Tape	1	CD-ROM Drive	6	CD-ROM Drive

Description	Part Number	Third Party Brand Pricing	Unit List		Qty.	Extended Price	5 Years Maint.
			Price				
<b>Server Hardware</b>							
Revolution 6X6 200/ 1M Model 1- 128 (incl 1 CPU)	74636701		\$10,717		1	\$10,717	\$19,123
PRQO 200/ 1M CPU Module Kit	12968612		\$3,715		4	\$14,860	
Tri-6 CPU Module (includes 1 200-MHz/ 1M CPU)	12968613		\$3,934		1	\$3,934	
ECC Memory Board, 0-MB memory	(included w/ 74636701)		\$0		1	\$0	
DIMM, 256-MB	34327500		\$1,563		16	\$25,007	
3- ch ADAC PCI SCSI Caching RAID Ctrlr	11900984		\$1,315		7	\$9,205	
VGA Card	(included w/ 74636701)		\$0		1	\$0	
10/100 PCI Network Interface Card	CR000169		\$290		1	\$290	
Quick Hot Swap Cage Kit 6D	(included w/ 74636701)		\$0		1	\$0	
Quick Hot Swap Drawer II, w/ cables 7U	11910190		\$1,795		15	\$26,925	
4- GB SCA + 10%spares	11351430		\$750		91	\$68,250	spared
9- GB SCA + 10%spares	11351910		\$1,395		54	\$75,330	spared
9- GB SCA + 10%spares	11351930		\$1,695		10	\$16,950	spared
14-Inch Color Monitor	11001034		\$261		1	\$261	
Keyboard	(included w/ 74636701)		\$0		1	\$0	
Mouse, 2-button PS 2	11600203		\$21		1	\$21	
Smart UPS 2200R	13001405		\$1,546		1	\$1,546	
Rack Cabinet (44U)	11910170		\$2,002		3	\$6,006	
Rack Coupling Kit (44U)	82321506		\$150		2	\$301	
Rack Cabinet Bezel Kit (44U)	(included w/ 11910170)		\$0		3	\$0	
Rack Stabilizer Kit (44U)	(included w/ 11910170)		\$0		3	\$0	
Rack Cabinet Side Panel Kit (44U)	82321503		\$223		1	\$223	
Rack Cabinet Filler Panels (2U)	82321203		\$21		6	\$123	
	<b>Subtotal</b>					<b>\$259,949</b>	<b>\$19,123</b>
<b>Server Software</b>							
Microsoft NT Server 4.0 Enterprise Edition, incl 25 CALS		Microsoft	\$3,999		2	\$3,999	\$0
Microsoft SQL Server 6.5 Enterprise Edition, unlimited user license		Microsoft	\$28,999		1	\$28,999	\$10,475
	<b>Subtotal</b>					<b>\$32,998</b>	<b>\$10,475</b>
<b>Client Hardware</b>							
SYS Aquanta DW/ 6 II, 0 Proc, 0MB Mem	CMT60072-ZFA	Unisys	\$896		6	\$5,376	\$4,908
PRQO:1x200MHz PentiumPro/ 256KB Cache	PRQ6200-256	Unisys	\$727		6	\$4,362	
MEM: 64 MB Memory Upgrade	MTF6- 64M	Unisys	\$634		24	\$15,216	
CTRL: VGA, 64-bit with 2MB	PCV102-PCI	Unisys	\$123		6	\$738	
DISK: 1.6GB IDE 3.5 Internal	HDI1600-5	Unisys	\$234		6	\$1,404	
CDROM: Twelve Speed IDE	CDRI200-AI	Unisys	\$126		6	\$756	
ETHERNET: 100Mbit/sec, PCI 32-bit	ETH101007-PCI	Unisys	\$120		6	\$720	
ETHERNET: 10Mbit/sec, PCI 32-bit	ETH101-PCI	Unisys	\$133		12	\$1,596	
MONITOR:14-inch Color	EVG142-COL	Unisys	\$245		6	\$1,470	
KEYBD: 104 Key Spacesaver	PKK104-SKB	Unisys	\$34		6	\$204	
MOUSE: 2 Button PS2	PMM1-PS2	Unisys	\$26		6	\$156	
	<b>Subtotal</b>					<b>\$31,998</b>	<b>\$4,908</b>
<b>Client Software</b>							
Microsoft Windows NT Server 4.0, incl 5 CALS		Microsoft	\$809		6	\$4,854	
Microsoft SQL Workstation w/ Programmer's Toolkit		Microsoft	\$499		1	\$499	
Microsoft Visual C++ 32-bit edition (subscription)		Microsoft	\$499		1	\$499	
TUXEDO Core Functional Services 6.3 for NT		BEA	\$3,000		6	\$18,000	\$13,500
	<b>Subtotal</b>					<b>\$23,852</b>	<b>\$13,500</b>
<b>User Connectivity</b>							
Ethernet Hub, 8-Port 100TX TrueFast+ 10%spares	NX-H8TX	Netlux	\$299		4	\$897	spared
Ethernet Hub, 16-Port 10Base-T + 1-Port BNC+ 10%spares	NX-H16EZ	Netlux	\$84		4	\$61,824	spared
	<b>Subtotal</b>					<b>\$62,721</b>	<b>\$0</b>
	<b>Total</b>					<b>\$411,518</b>	<b>\$48,006</b>

**Five Year Cost of Ownership**  
**TFC-C Throughput** \$459,524  
**\$/tpm C** 13,089.30  
**\$/tpm C** \$35.11

**Notes:**  
 1. All Microsoft maintenance is covered by the maintenance cost of Microsoft SQL Server.  
 2. 10% or minimum 2 spares are added in place of onsite service (products have a five year return-to-vendor warranty)  
 3. Pricing: 1 - Unisys, 2 - Microsoft, 3 - BEA, 4 - Netlux

**The benchmark results and test methodology were audited by Richard Gimarc of Performance Metrics, Inc.**

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

# NUMERICAL QUANTITIES SUMMARY

## ALR Revolution 6X6 Server

### Microsoft SQL Server 6.5 Enterprise Edition

**MQTh, Computed Maximum Qualified Throughput:** **13089.30**  
 % throughput difference, reported & reproducibility runs: **0.20%**

#### Transaction Mix

New Order	44.75%
Payment	43.17%
Delivery	4.04%
Stock-Level	4.03%
Order-Status	4.01%

#### Response Times

Transaction	Average	Maximum	90th %ile
New-Order	0.54	5.24	0.78
Payment	0.56	5.20	0.71
Delivery	0.39	4.64	0.70
Stock-Level	2.31	7.81	3.80
Order Status	1.07	6.25	1.60
Menu	0.22	3.59	0.30
Delivery (Deferred)	3.42	16.82	9.73

#### Response time delay added for emulated components (seconds)

RT Response time	0.1
Menu Response time	0.1

#### Keying/Think Time Times (seconds)

Transaction	Minimum	Average	Maximum
New-Order	18.00/0	18.01/12.03	19.19/120.4
Payment	3.00/0	3/12.04	4.24/120.4
Delivery	2.00/0	2/5.08	3.15/50.7
Stock-Level	2.00/0	2/5.06	3.15/50.7
Order-Status	2.00/0	2/10.08	3.13/100.91

#### Test Duration

Ramp up time	93 minutes
Measurement interval (M)	30 minutes
Transactions (all types) completed during measurement interval	877586
Ramp-down time	23 minutes

#### Checkpointing:

Number of checkpoints	1
Checkpoint interval	30 minutes

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## **Document Structure**

The TPC Benchmark C Standard Specification requires test sponsors to publish, submit to the TPC, and make available to the public, a full disclosure report for any result to be considered compliant with the specification. The required contents of the full disclosure report are specified in Clause 8.

This report is submitted to satisfy the specification's requirement for full disclosure. It documents the compliance of the benchmark implementation and execution reported for the Advanced Logic Research, Inc. Revolution 6X6 Server using Microsoft Windows NT 4.0 Enterprise Edition and Microsoft SQL Server 6.5 Enterprise Edition.

## **TPC Benchmark C Overview**

The TPC Benchmark™ C Standard Specification Revision 3.3.2 was developed by the Transaction Processing Council (TPC). It is the intent of the TPC to develop a suite of benchmarks to measure the performance of computer systems executing a wide range of applications. Advanced Logic Research, Inc. and Microsoft Corporations are active participants in the TPC to define and develop such a suite of benchmarks.

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.

Despite the fact that this benchmark offers a rich environment that emulates many OLTP environments, 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.

## **0.1. Order and Titles**

*The order and titles of sections in the Test Sponsor's Full Disclosure report must correspond with the order and titles of sections from the TPC-C standard specification (i.e., this document). The intent is to make it as easy as possible for readers to compare and contrast material in different Full Disclosure reports.*

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

## **0.2. Executive Summary Statement**

*The TPC Executive Summary Statement must be included near the beginning of the Full Disclosure report.*

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

## **0.3. Numerical Quantities Summary**

*The numerical quantities listed below must be summarized near the beginning of the Full Disclosure report :*

- *measurement interval in minutes,*
- *number of checkpoints in the measurement interval,*
- *checkpoint interval in minutes,*
- *number of transactions (all types) completed within the measurement interval,*
- *computed Maximum Qualified Throughput in tpmC,*
- *percentage difference between reported throughput and throughput obtained in reproducibility run,*
- *ninetieth percentile, average and maximum response times for the New-Order, Payment, Order-Status, Stock-Level, Delivery (deferred and interactive) and Menu transactions,*
- *time in seconds added to response time to compensate for delays associated with emulated components,*
- *percentage of transaction mix for each transaction type.*

These numerical quantities are summarized near the beginning of this report.

## **0.4. Application Code Disclosure**

*The applicable 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 and output functions.*

Appendix A contains the client application code used in this TPC-C benchmark. Appendix B contains the SQL stored procedures which implement the TPC-C transactions.

## 0.5. Benchmark Sponsor

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

This TPC benchmark C was sponsored by Advanced Logic Research, Inc. The benchmark test was developed by Microsoft and Unisys. The benchmark was conducted at Unisys, Mission Viejo, California.

## 0.6. 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:*

- *Data Base tuning options*
- *Recovery/commit options*
- *Consistency/locking options*
- *Operating system and application configuration parameters*

Appendix C contains the configuration and system parameters used in running these TPC-C tests. It also contains all the client and server OS, and SQL Server tunable parameters.

## 0.7. Configuration Diagrams

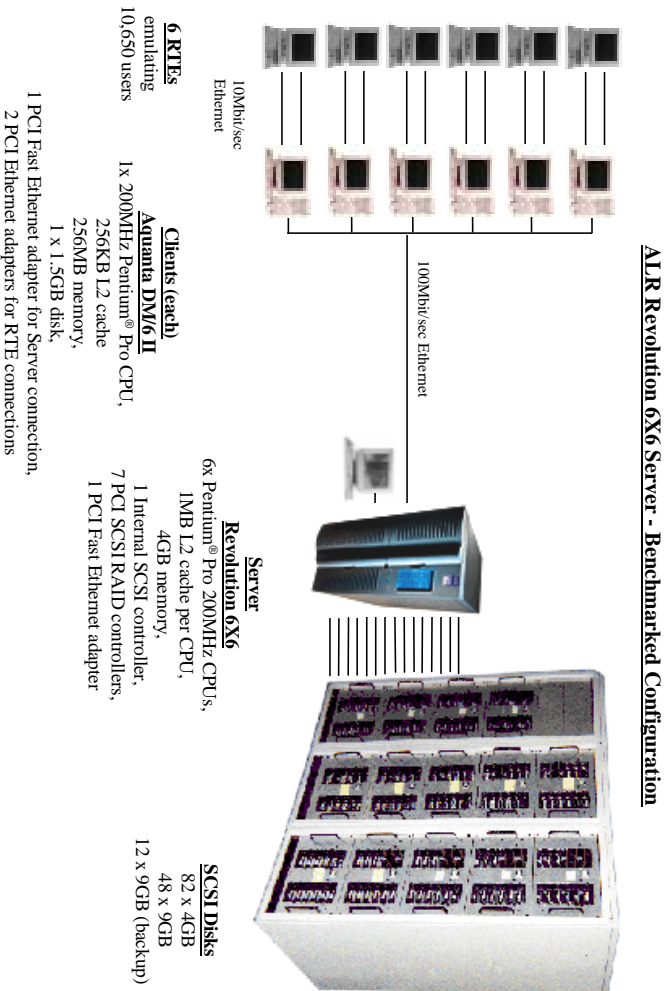
*Diagrams of both measured and priced configurations must be provided, accompanied by a description of the differences. This includes, but is not limited to:*

- *Number and type of processors.*
- *Size of allocated memory; and any specific mapping/partitioning of memory unique to the test.*
- *Number and type of disk units (and controllers, if applicable).*
- *Number of channels or bus connections to disk units, including their protocol type.*
- *Number of LAN (e.g., Ethernet) connections, including routers, workstations, terminals, etc., that were physically used in the test or are incorporated into the pricing structure (see Clause 8.1.8).*
- *Type and the run-time execution location of software components (e.g., DBMS, client processes, transaction monitors, software drivers, etc.).*

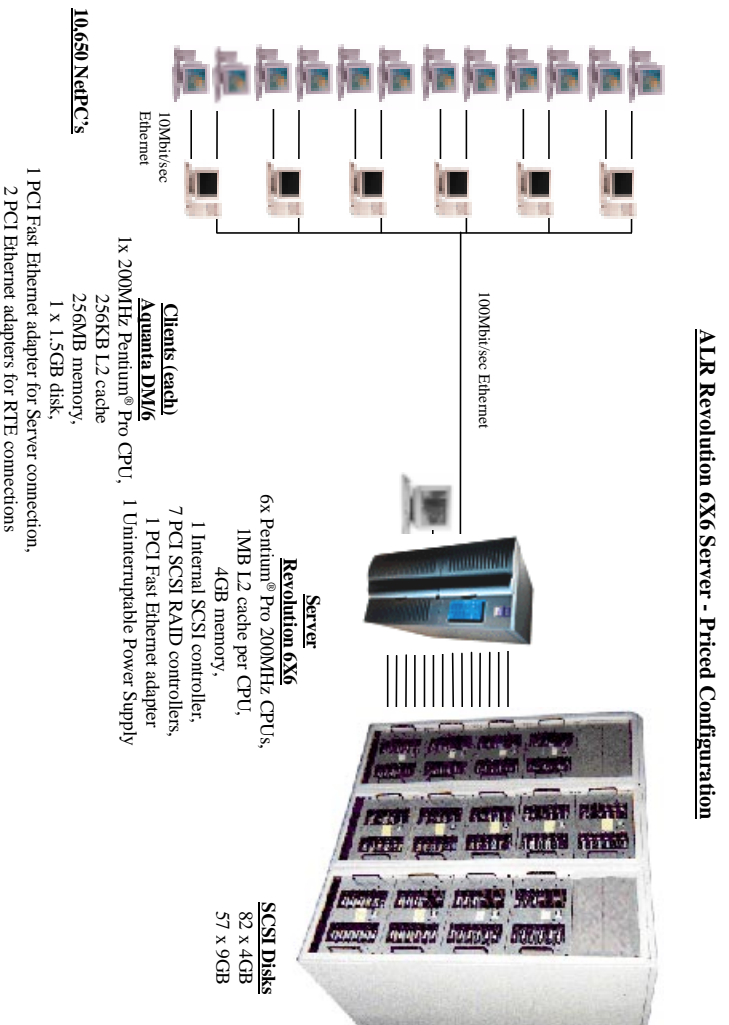
The Remote Terminal Emulator (RTE) software used for these TPC-C tests is proprietary to Unisys. The benchmarked configuration of the RTE and Revolution 6X6 server is illustrated in Figure 0.1. Tables 4.3, 4.4 and 4.5 contain a detailed explanation of the disk configuration.

The priced configuration for the Revolution 6X6 server is shown in Figure 0.2.

**Figure 0.1: Benchmarked Configuration**



**Figure 0.2: Priced Configuration**







# 1.

## ***Clause 1: Logical Database Design***

---

### **1.1. Table Definitions**

*Listings must be provided for all table definition statements and all other statements used to setup the data base.*

Appendix B contains the SQL definitions of all the required database devices, tables, indexes and stored procedures, plus a listing of the program used to load the database and establish the required initial populations of each table.

### **1.2. Physical Organization of the Database**

*The physical organization of tables and indices, within the data base, must be disclosed.*

The disk space was allocated to SQL Server according to the data in Table 4.4. The SQL definitions are contained in Appendix B.

### **1.3. Insert and/or 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 data base 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.*

There were no restrictions on insert and/or delete operations to any of the tables.

### **1.4. Partitioning**

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

Partitioning was not used for any table in this implementation.

### **1.5. Replication, Duplication or Additions**

*Replication of tables, if used, must be disclosed.*

*Additional and/or duplicate attributes in any table must be disclosed along with a statement on the impact on performance.*

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



## **2. Clause 2: Transaction & Terminal Profiles**

### **2.1. Random Number Generation**

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

The drivers used the Unisys RTE program, which was independently audited. The initial population of the database was performed by the loader program from V3-02 of the Microsoft TPC-C toolkit, which was also independently audited. Furthermore, the auditor sampled various initial and runtime distributions produced by this implementation to verify correctness.

### **2.2. Input/Output Screen Layout**

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

The screen layouts are based on those in Clauses 2.4.3, 2.5.3, 2.6.3, 2.7.3, and 2.8.3 of the TPC Benchmark C Standard Specification. There are some minor differences in appearance due to the use of a web client implementation.

### **2.3. Priced Terminal Feature 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).*

This was verified by the auditor by a direct experiment during the onsite audit portion of this benchmark, using Microsoft Internet Explorer 3.0 as the web browser.

### **2.4. Presentation Managers or Intelligent Terminal**

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

Application code running on the client implemented the TPC-C user interface. A listing of this code is included in Appendix A. No presentation manager was used on the client, as screen manipulation and data input/output was handled for each user by the Microsoft Internet Explorer web browser running on each user PC.

### **2.5. Transaction Statistics**

*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 order 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.

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

Table 2.1 contains all these statistics.

**Table 2.1: Transaction Statistics**

Transaction Type	Statistics	Value
New Order	Rolledback transactions	1.01%
	Home warehouse	98.99%
	Remote warehouse	1.01%
	Average Items per Order	9.99
Payment	Home warehouse	84.96%
	Remote warehouse	15.04%
	Non-primary key access	60.03%
Order Status	Non-primary key access	60.10%
Delivery	Skipped transactions (Interactive)	0
	Skipped transaction counts (Deferred)	0
	Skipped District counts (Deferred)	0
Transaction Mix	New Order	44.75%
	Payment	43.17%
	Delivery	4.04%
	Stock-Level Order-Status	4.03% 4.01%

## 2.6. Queuing Mechanism of Delivery

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

Tuxedo provides the queue for delivery servers. The client application process posts delivery transactions to the delivery queue using a Tuxedo asynchronous call with the TPNOReply option. Upon return from this call, the client application provides a 'delivery queued' response to the user. Delivery servers independently retrieve messages from their queue, submit them to the data base for processing, and log the result to a file upon completion. The source code for this delivery process is included in Appendix A.

## **3. Clause 3: Transaction & System Properties**

### **3.1. Transaction System Properties (ACID)**

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

The TPC Benchmark C Standard Specification defines a set of transaction processing system properties that a system under test (SUT) must support during the execution of the benchmark. Those properties are Atomicity, Consistency, Isolation, and Durability (ACID).

This section defines each of these properties, describes the steps taken to ensure that they were present during the test and describes a series of tests done to demonstrate compliance with the specification. All ACID property tests were executed successfully.

### **3.2. Atomicity**

*The system under test must guarantee that data base 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.*

#### **3.2.1. Completed Transaction**

*Perform the Payment transaction for a randomly selected warehouse, district, and customer (by customer number) and verify that the records in the CUSTOMER, DISTRICT, and WAREHOUSE tables have been changed appropriately.*

The balances from a randomly selected warehouse, district, and customer row were retrieved by customer number from a script. A Payment transaction was submitted with the same warehouse, district and customer identifiers for a known amount. After completion of the Payment transaction, the balances of the selected warehouse, district, and customer were again retrieved to verify that the changes had been made correctly.

#### **3.2.2. Aborted Transactions**

*Perform the Payment transaction for a randomly selected warehouse, district, and customer (by customer number) and substitute a ROLLBACK of the transaction for the COMMIT of the transaction. Verify that the records in the CUSTOMER, DISTRICT, and WAREHOUSE tables have NOT been changed.*

The balances from a randomly selected warehouse, district, and customer row were retrieved by customer number from a script. A Payment transaction was submitted with the same warehouse, district and customer identifiers that issued a ROLLBACK command rather than a COMMIT. After the transaction completed, the balances of the selected warehouse, district, and customer were again retrieved to verify that no changes had been made to the database.

### **3.3. Consistency**

*Consistency is the property of the application that requires any execution of a data base transaction to take the data base from one consistent state to another, assuming that the data base is initially in a consistent state.*

The benchmark specification requires explicit demonstration of the following four consistency conditions:

1. The sum of the district balances in a warehouse is equal to the warehouse balance;
2. For each district, the next order id minus one is equal to maximum order id in the ORDER table and equal to the maximum new order id in the NEW ORDER table;
3. For each district, the maximum order id minus minimum order id in the ORDER table plus one equals the number of rows in the NEW-ORDER table for that district;
4. For each district, the sum of the order line counts in the ORDER table equals the number of rows in the ORDER-LINE table for that district;

In order to demonstrate this consistency, the following steps were taken:

1. Prior to the start of a benchmark run, the consistency of the database was verified by testing successfully conditions 1-4 described above with a script.
2. A run under full user load was executed for over 10 minutes with a checkpoint during the run.
3. After completion of that test, the consistency of the database was again verified by successfully testing using the same consistency script as in step 1.

### 3.4. 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.*

The benchmark specification defines seven required tests to be performed to demonstrate that required levels of transaction isolation are met. These tests, described in Clauses 3.4.2.1 - 3.4.2.7, were all performed from a script and verified by the auditor. In Isolation Test 7, Case A was observed. In addition, the phantom tests and stock level tests were executed and verified to be successful.

### 3.5. Durability

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

Three durability tests were executed to satisfy the requirements of the specification. The test for loss of memory and instantaneous interruption was combined and performed with a fully scaled database with 10,650 emulated users. The loss of log and loss of data tests were combined and performed on a separate ten warehouse database with 100 emulated users. To the best of our knowledge, these tests prove that the fully scaled configuration used for the throughput test would also meet all durability tests.

#### 3.5.1. Loss of Log and Loss of Data Disk

The following steps were taken (using a ten warehouse database on the SUT) to demonstrate durability in the case of loss of a log and subsequent loss of a data disk:

1. The database was backed up to extra disks on a dump device.
2. The D\_NEXT\_O\_ID fields for all rows in the district table were summed up to determine the initial count of orders present in the database.
3. The RTE was started with 100 users. On the driver systems, committed and rolled back New-Order transactions were recorded in a “success” file.
4. One of the mirrored hot-pluggable log disks was removed from the disk cabinet after five minutes of steady state.

5. Log disk mirroring is done by a RAID controller, so NT and SQL Server did not notice the disk loss. The benchmark run continued without interruption.
6. After another five minutes of running at steady state, a hot-pluggable database disk was removed from the disk cabinet.
7. NT and SQL Server encountered IO errors due to the missing disk and recorded these errors in the NT event log and SQL Server error log, respectively.
8. First, the RTEs and clients were stopped, then SQL Server was stopped, and finally the SUT was shutdown and restarted.
9. SQL Server was restarted and marked the database as 'suspect'. A dump of the transaction log was taken to extra disks on a dump device.
10. Next, scripts were executed to drop the database and all its devices. Then, SQL Server was shutdown again and the SUT shutdown.
11. A different data disk was inserted in the disk cabinet to replace the one removed. (The removed log disk was never replaced.) The RAID controller was used to recreate the stripe set containing the new data disk.
12. The SUT was restarted, and Disk Administrator was used to assign the proper drive letter to the new stripe set. SQL Server was then restarted and an empty database created. After space allocation had finished, the database was recovered by first reloading the entire initial database and log from backup, then by loading and applying the transaction log dump that was taken after the data disk failure. The latter step restored all committed transactions to the database.
13. Consistency condition 3 of Clause 3.3.2.3 was executed to verify database consistency.
14. Step 2 was repeated to determine the total number of orders. This number was subtracted from the count obtained previously in Step 2 to determine the number of additional orders added to the database.
15. The contents of the "success" files on the drivers were sampled to verify that the records in the "success" file for committed New-Order transactions had corresponding records in the ORDER table and no entries existed for rolled back transactions. Moreover, the counts were matched with those obtained in step 14.

### 3.5.2. Instantaneous Interruption and Loss of Memory

Instantaneous interruption and loss of memory tests were combined because the loss of power erased the contents of memory. This failure was induced by removing the primary power to the System Under Test while the benchmark was executing.

1. The D\_NEXT\_O\_ID fields for all rows in the district table were summed up to determine the initial count of orders present in the database (count1).
2. On the driver systems, committed and rolled back New-Order transaction were recorded in a "success" file.
3. The benchmark was executed at full load with 10,650 emulated users for a minimum of 10 minutes.
4. Immediately after execution of a checkpoint completed, the system's primary power was turned off.
5. The test was aborted on the driver and client systems, and the RTEs and clients were shutdown.
6. Power was restored to the SUT, the system rebooted, SQL Server was restarted, and automatic database recovery was performed. The database recovery uses the transaction log to reapply all committed transactions and rollback any (in progress) uncommitted transactions, so that the database disks are correct.
7. After recovery finished, Consistency Condition of Clause 3.3.2.3 (no gaps in NO\_O\_ID) was executed to verify that the database was consistent..
8. Next, samples of the contents of the "success" file on the driver were compared against corresponding rows of the ORDER table to verify that records in the "success" file for committed New-Order transactions had corresponding records in the ORDER table and no entries existed for rolled back transactions.
9. Finally, step 1 was repeated to determine the total number of orders (count2). Count2 minus count1 was not less than the number of committed New-Order records in the "success" file.





# 4.

## *Clause 4: Scaling & Database Population*

### 4.1. Initial Cardinality of Tables

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

The TPC-C database for this test was configured with 1,110 warehouses. The cardinality of each table in the database is listed in Table 4.1

**Table 4.1: Initial Cardinality of Database Table**

<b>Table</b>	<b>Occurrences</b>
Warehouse	1,110
District	11,100
Customer	33,300,000
History	33,300,000
Order	33,300,000
New Order	9,990,000
Order Line	332,999,230
Stock	111,000,000
Item	100,000

45 rows were deleted from the warehouse table before executing the measurement runs.

### 4.2. Constant Values

The following values were used as the constant C input values to the NURand function during Build and Run time for this implementation.

**Table 4.2: Constant C for NURand**

<b>Function</b>	<b>Value</b>
C_LAST (Build)	123
C_LAST (Run)	223

### 4.3. Database Layout

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

Tables 4.3, 4.4 and 4.5 list the distribution of the database over 121 disks and the transaction log over four mirrored pairs of disks for the benchmark configuration. In addition, there was one disk containing Windows NT Enterprise Edition and SQL Server Enterprise Edition code and the Master database plus the paging file. Database backup used an extra 12 disks. For Durability testing with a smaller 10 warehouse database, another 8 disks were used: 4 for the database, 2 for a mirrored log and 2 for backup. All these 20 extra disks were excluded from the priced configuration. Nine extra database disks were added to the priced configuration to meet the 180-day spare required.

### 4.4. DBMS: Data Model and DBMS Interface/Access Language

*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, DLI, 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 6.5 Enterprise Edition is a relational DBMS.

The client software interfaced to SQL Server through Stored Procedures invoked through Remote Procedure Calls embedded in the C application code. Specifically, DBLIB and TCP/IP sockets were used.

### 4.5. DBMS Partitions/Replications

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

No table partitioning or replication was done.

### 4.6. DBMS Space Requirements

*Details of the 180 day space computation along with proof that the database is configured to sustain 8 hours of growth for dynamic tables (Order, Order-line, and History) must be disclosed (see Clause 4.2.3).*

Appendix E lists the space requirements for the 180-day space as well as the logical log space for eight hours.



Table 4.4: Disk Usage/Size Totals

Disk Usage/Size Totals for TPCC											
Disk Usage	Size (GB)	Adaptec	HA-1	HA-2	HA-3	HA-4	HA-5	HA-6	HA-7	Extra	Total
system	4	1									1
tpcc - data	4		21	20	10	10	10	10			81
tpcc - data	9				10	10	10	10			40
tpcc - log	9									8	8
tpcc - backup	9									12	12
<b>Total Measured</b>	<b>4 &amp; 9</b>	<b>1</b>	<b>21</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>142</b>
4GB drives	4	1	21	20	10	10	10	10			82
9GB drives	9				10	10	10	10		20	60
<b>Total Priced</b>	<b>4 &amp; 9</b>	<b>1</b>	<b>21</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>8</b>	<b>139</b>
4GB drives	4	1	21	20	10	10	10	10			82
9GB drives	9				10	10	10	10		8	57

Table 4.5: Disk Administrator Configuration

Disk Administrator Configuration for HS/6									
Disk	Partition 1	Partition 2	Partition 3	Unused Capacity	HA#	LD#	Usage		
0	unassigned	J:	P:		1	1			
87126MB	(raw) 1004 MB	(raw) 10503 MB	(raw) 5005 MB	Free Space 70614 MB			data tpcc		
1	E:	K:	unassigned		2	1			
82976MB	(raw) 1004 MB	(raw) 13500 MB	(raw) 5005 MB	Free Space 63468 MB			data tpcc		
2	H:	L:	R:		3	1			
128308 MB	(raw) 1004 MB	(raw) 10503 MB	(raw) 5005 MB	Free Space 111796 MB			data tpcc		
3	I:	M:	S:		4	1			
128308 MB	(raw) 1004 MB	(raw) 10503 MB	(raw) 5005 MB	Free Space 111796 MB			data tpcc		
4	F:	N:	T:		5	1			
128308 MB	(raw) 1004 MB	(raw) 10503 MB	(raw) 5005 MB	Free Space 111796 MB			data tpcc		
5	G:	O:	U:		6	1			
128308 MB	(raw) 1004 MB	(raw) 10503 MB	(raw) 5005 MB	Free Space 111796 MB			data tpcc		
6	V:				7	1			
34726 MB	(raw) 34726 MB			(none)			log tpcc		
7	W:				7	2			
86812 MB	BACKUP NTFS 86812 MB			(none)			backup tpcc		
8	C:	X:					Adaptec		
4149 MB	SYSTEM NTFS	FILES NTFS		(none)			system files		
2047 MB	2047 MB	2102 MB							
CD-ROM	D:						Adaptec		



## 5. Clause 5: Performance Metrics & Response Time

### 5.1. Measured Throughput (tpmC)

*Measured tpmC must be reported.*

The measured tpmC was 13,089.30.

### 5.2. 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 Time Data

Transaction	Average	Maximum	90th %ile
New-Order	0.54	5.24	0.78
Payment	0.56	5.20	0.71
Delivery	0.39	4.64	0.70
Stock-Level	2.31	7.81	3.80
Order Status	1.07	6.25	1.60
Menu	0.22	3.59	0.30
Delivery (Deferred)	3.42	16.82	9.73

### 5.3. 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	Minimum	Average	Maximum
New-Order	18.00	18.01	19.19
Payment	3.00	3.00	4.24
Delivery	2.00	2.00	3.15
Stock-Level	2.00	2.00	3.15
Order Status	2.00	2.00	3.13

Table 5.3: Think Times

Transaction	Minimum	Average	Maximum
New-Order	0.00	12.03	120.40
Payment	0.00	12.04	120.40
Delivery	0.00	5.08	50.70
Stock-Level	0.00	5.06	50.70
Order Status	0.00	10.08	100.91

## 5.4. Response Time Frequency Distribution Curves

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

Figure 5.1: New Order Response Time Distribution

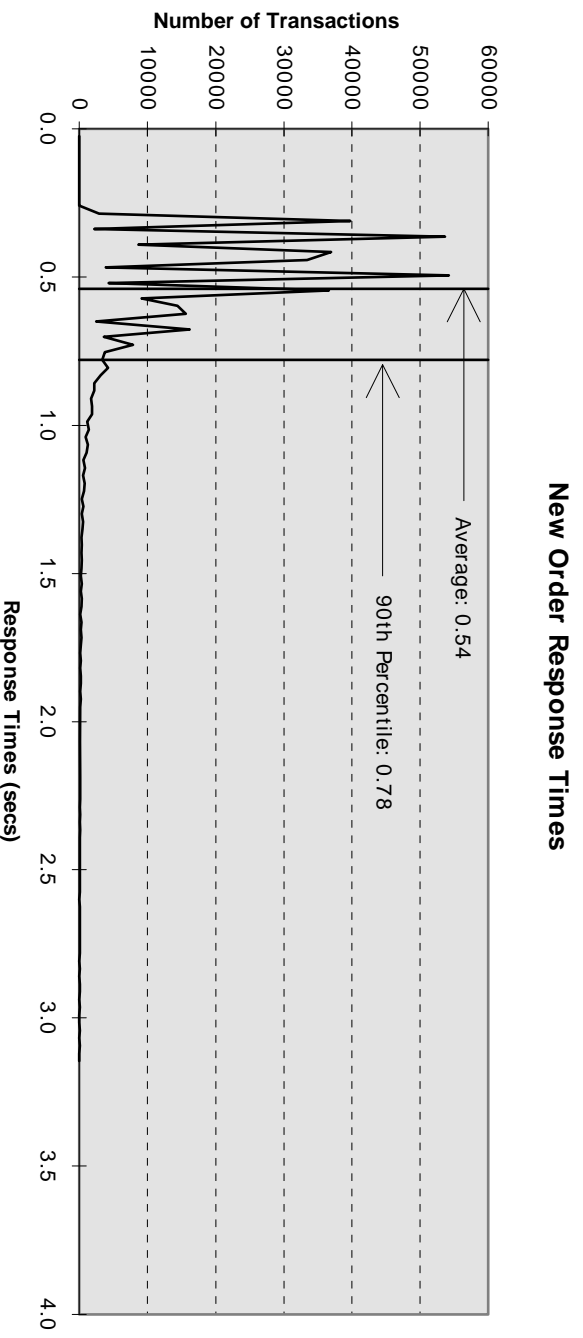
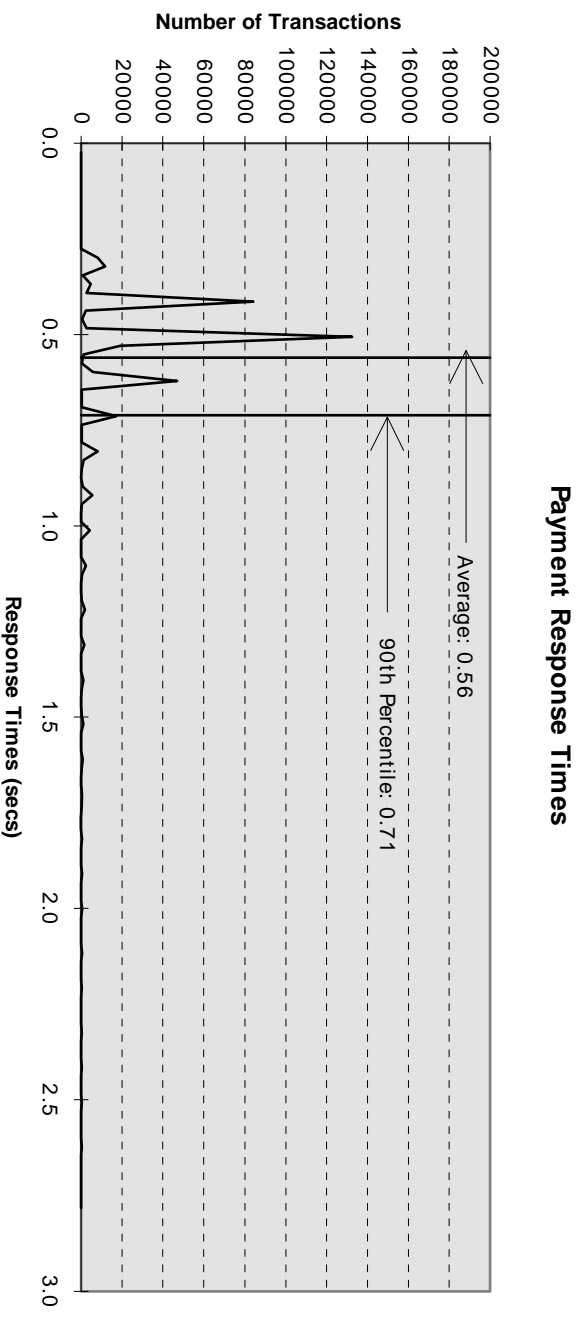


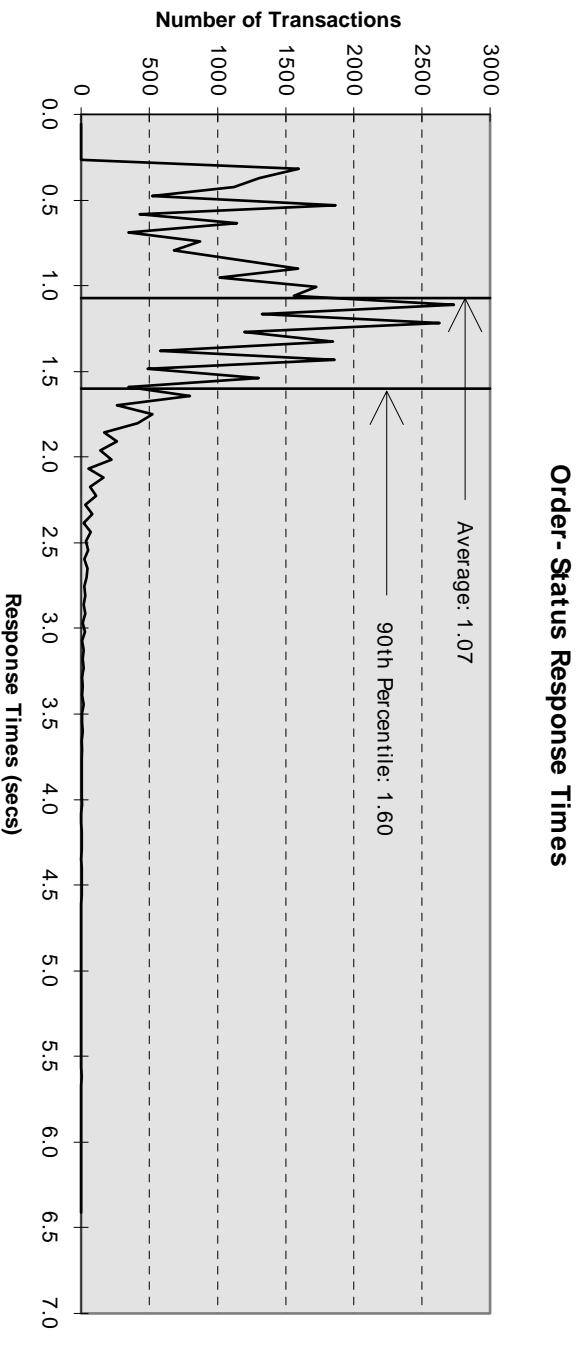


Figure 5.2: Payment Response Time Distribution



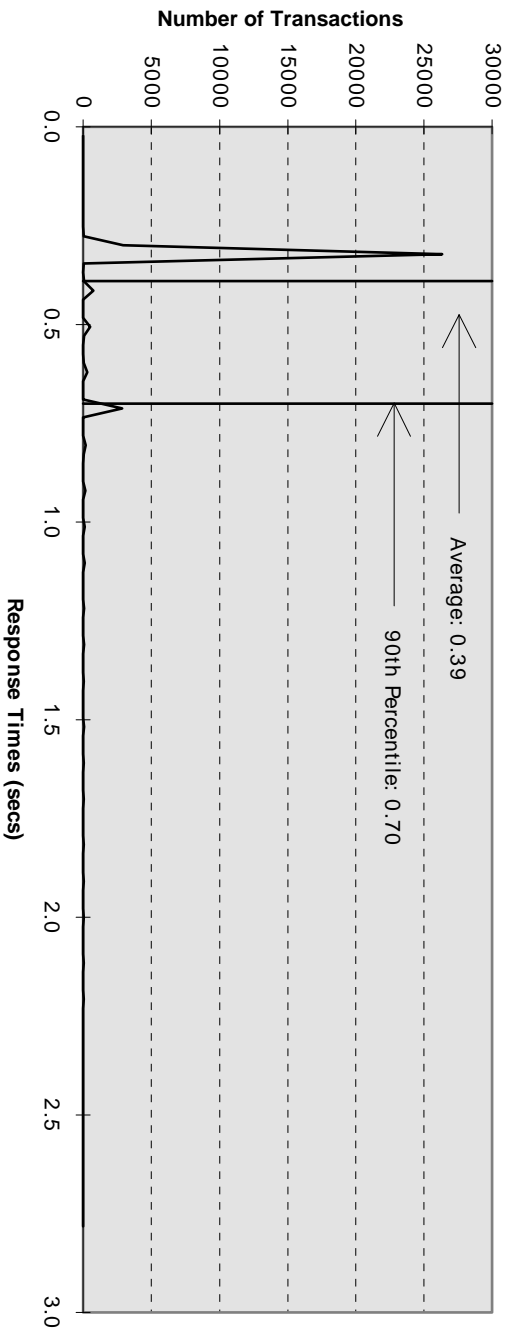
**Payment Response Times**

Figure 5.3: Order Status Response Time Distribution



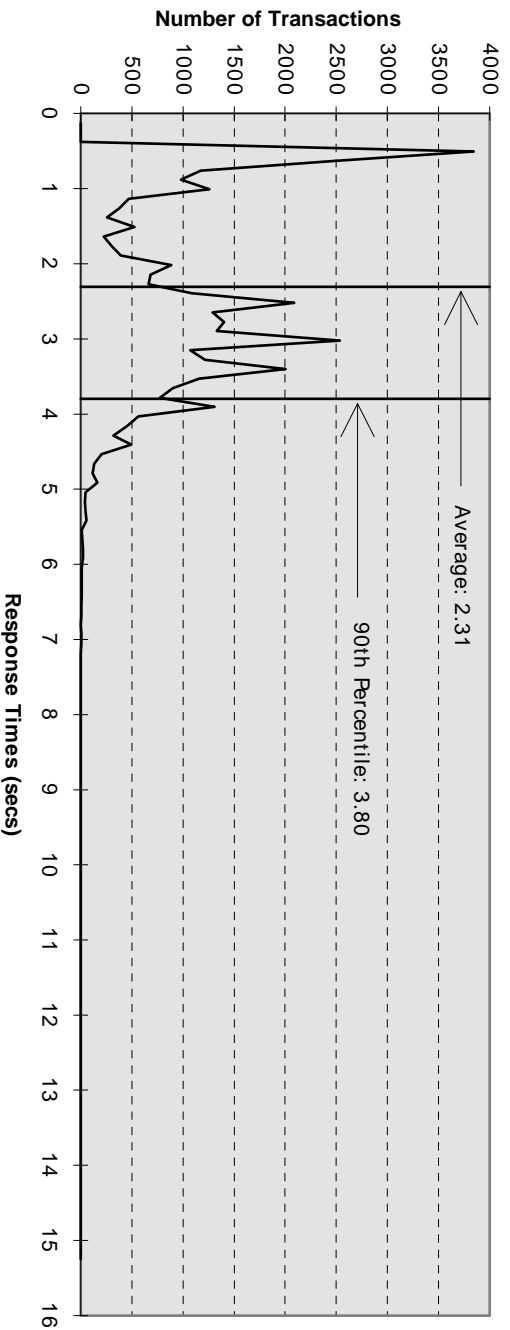
**Order - Status Response Times**

**Figure 5.4: Delivery Response Time Distribution**  
**Delivery Response Times**



**Figure 5.5: Stock Level Response Time Distribution**

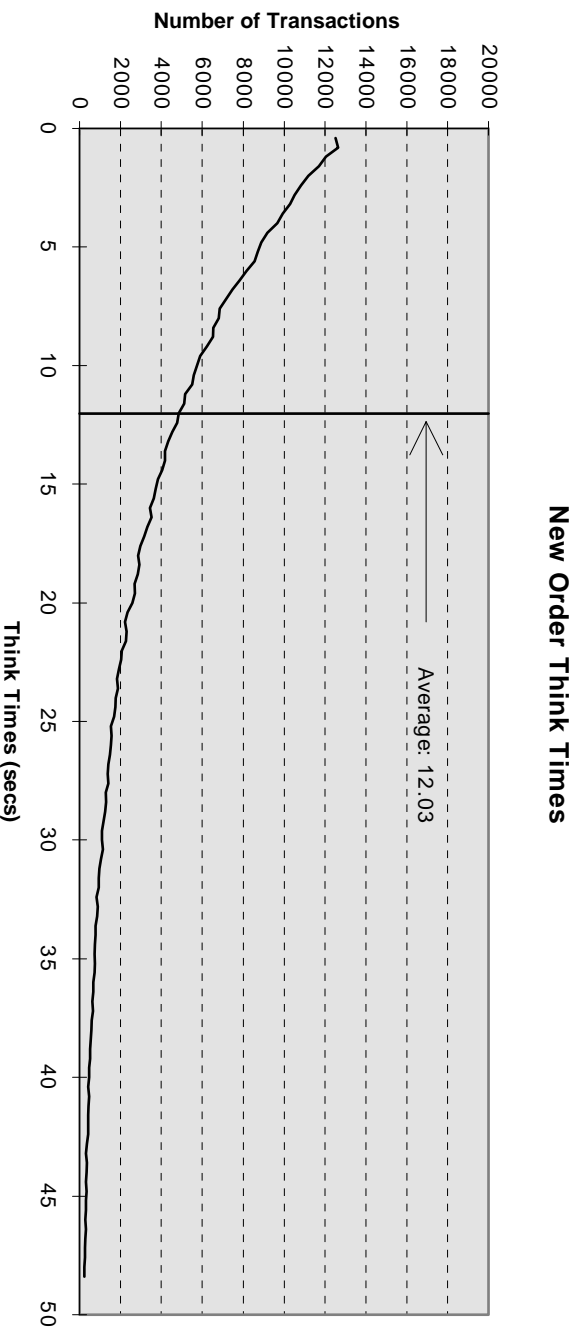
**Stock-Level Response Times**



## 5.5. New Order Think Time Frequency Distribution Curve

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

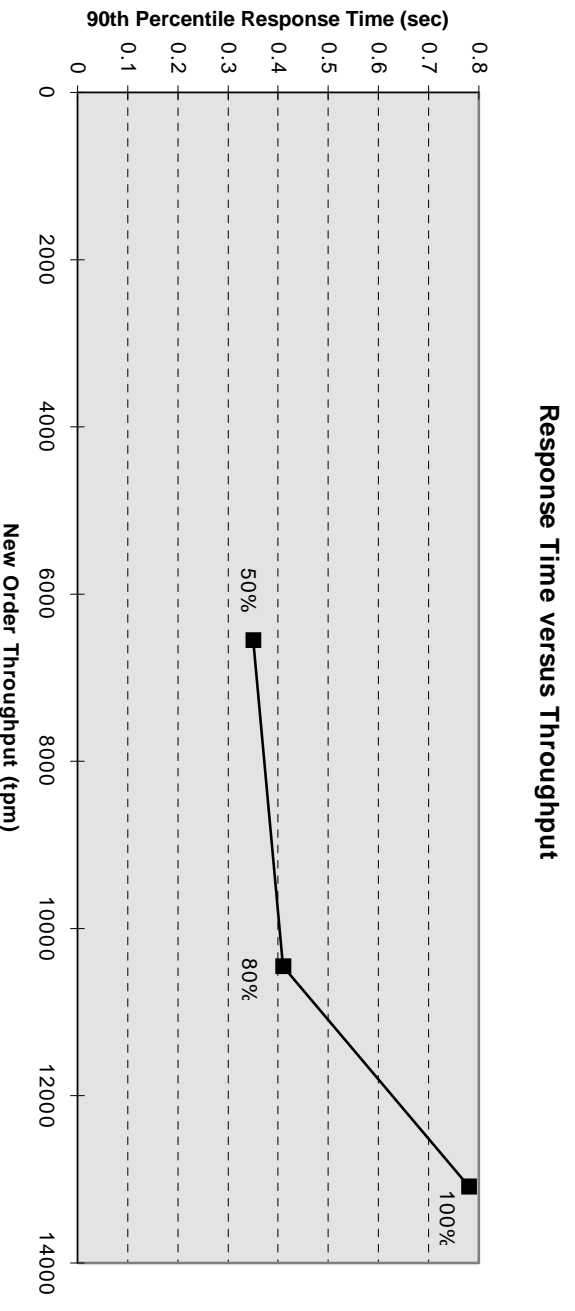
**Figure 5.6: New Order Think Time Distribution**



## 5.6. Response Time versus Throughput Performance Curve

*The performance curve for response times versus throughput (Clause 5.6.2) must be reported for the New-Order transaction*

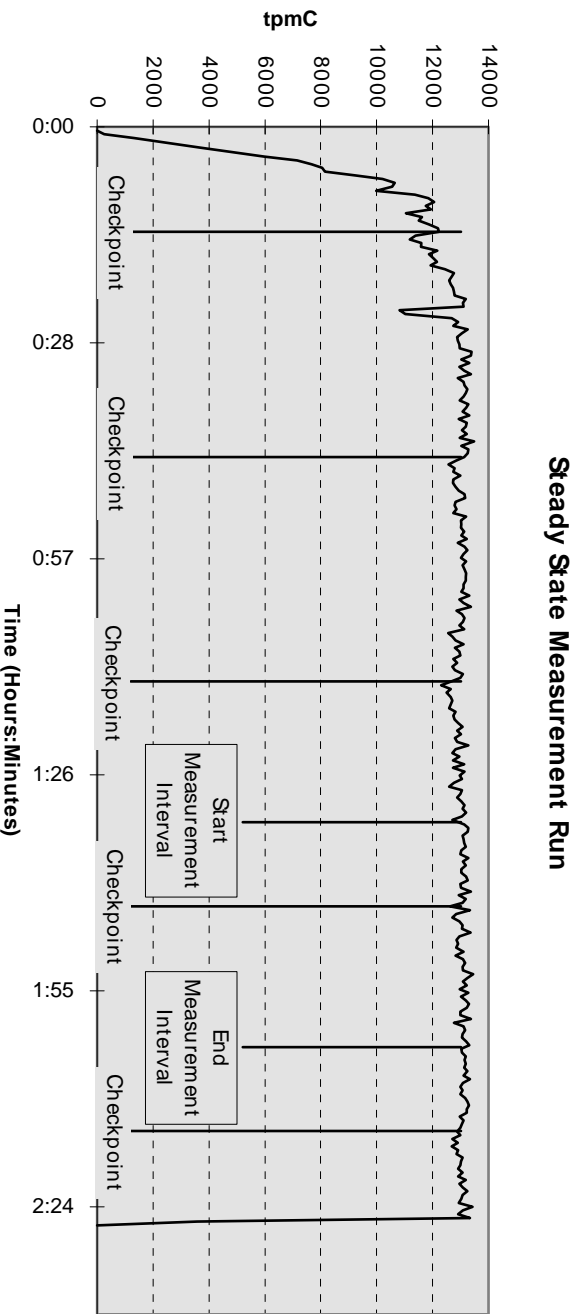
**Figure 5.7: Response Time versus Throughput**



## 5.7. New-Order Throughput vs. Time

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

Figure 5.8: Throughput (tpmC) versus Time



## 5.8. Determination of “Steady State”

*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.*

The transaction throughput rate (tpmC) and response time were relatively constant after the initial ‘ramp up’ period. The throughput and response time behavior were determined by examining data reported for each 30-second interval over the duration of the benchmark. Ramp-up, steady state, and ramp-down regions are discernible in the graph presented in Figure 5.8.

## 5.9. 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 selects a transaction type from the menu and prepares to request the appropriate blank form. A timestamp is taken before the form request is sent and after the response is returned. The difference between the two is saved off as the menu response time. The RTE then generates input data for the transaction to create a completed form and waits the appropriate key time. A timestamp is taken before the completed form is sent and after the response is returned. The difference between these two is saved off as the transaction response time. Both response times are padded with a 0.1 second delay per spec to account for the web browser delay. The appropriate transaction data and response times are logged and the RTE waits the required think time interval before repeating the process. Each RTE driver maintains its own log file. Log file contents are consolidated for the reports.

The RTE emulates web browsers (not terminals) in this client-server implementation. The RTE sends and receives HTML formatted data using HTTP through Ethernet LANs to a client application running on the client machine. The

client application processes the request, sends the transaction to a Tuxedo TPC-C application server queue, waits for the transaction response (except for delivery), and returns an appropriately formatted HTML form back to the (emulated) web browser (RTE). The Tuxedo TPC-C application server retrieves a message from its queue, invokes request processing via a stored procedure on the database server using Microsoft SQL Server DBLIB and RPC through sockets over another Ethernet LAN, accepts the response, and returns a result to the client application (via Tuxedo). For delivery transactions, the client application does not wait for the Tuxedo TPC-C delivery server to respond. Each delivery server logs its results to its own file. The delivery report files are consolidated for reports.

To perform checkpoints at specific intervals, SQL Server's checkpoint interval was set to the maximum allowable value and a script was written to schedule checkpoints at 30 minute intervals and record the start and end time of each checkpoint. The checkpoint script was started manually on one of the client machines after the RTE had all users logged in and sending transactions and a steady state had been achieved. Using this information, the positioning of the checkpoint within the measurement interval was verified to be clear of the guard zones.

At each checkpoint, SQL Server wrote to disk all database pages in memory that had been updated but not yet physically written to the disk. Upon completion of the checkpoint, SQL Server also wrote records to the transaction log indicating that a checkpoint had completed.

## 5.10. Reproducibility

*A description of the method used to determine the reproducibility of the measurement results must be reported.*

In a repeat test, carried out in the same manner as the primary test, a throughput of 13,063.47 tpmC was achieved on the same database during a 30-minute, steady state run. All required transaction statistics were met. See the Auditor's attestation letter for details.

## 5.11. Measurement Interval Duration

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

The measurement interval was 30 minutes.

## 5.12. Regulation of Transaction Mix

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

The RTE was given a weighed random distribution which could not be adjusted during the run.

## 5.13. Transaction Statistics

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

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

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

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

*The percentage of remote Payment transactions must be disclosed.*

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

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

Table 5.4 shows this information.

**Table 5.4: Transaction Statistics**

<b>Transaction Type</b>	<b>Statistics</b>	<b>Value</b>
New Order	Rollback transactions	1.01%
	Home warehouse	98.99%
	Remote warehouse	1.01%
	Average Items per Order	9.99
Payment	Home warehouse	84.96%
	Remote warehouse	15.04%
	Non-primary key access	60.03%
Order Status	Non-primary key access	60.10%
Delivery	Skipped transactions (Interactive)	0
	Skipped transaction counts (Deferred)	0
	Skipped District counts (Deferred)	0
Transaction Mix	New Order	44.75%
	Payment	43.17%
	Delivery	4.04%
	Stock-Level	4.03%
	Order-Status	4.01%

## 5.14. Checkpoint Statistics

*The number of checkpoints in the measurement interval, the time in seconds from the start of the measurement interval to the first checkpoint, and the Checkpoint Interval must be disclosed.*

There is one checkpoint in the measurement interval. The checkpoint starts 671 seconds into the measurement interval. The checkpoint interval is 30 minutes (from the start of one to the start of the next) and a checkpoint lasts approximately 6.5 minutes. In conformance with Clause 5.2.2 there is no checkpoint within a span of 7.5 minutes before or after the beginning or end of the measurement interval.

## **6. Clause 6: SUT, Driver & Communications Definition**

### **6.1. Remote Terminal Emulator (RTE) Description**

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

The RTE used is proprietary to Unisys. Appendix D contains the profile used as input to this RTE.

### **6.2. 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.*

There were no emulated components in the benchmark configuration other than the emulated web browsers on the users' PCs.

### **6.3. Functional Diagrams**

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

Section 0.7 describes and shows functional diagrams of the benchmarked and priced systems.

### **6.4. Network Configuration**

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

Figures 0.1 and 0.2 in Section 0.7 also diagram the network configurations of the benchmark and configured systems and represent the RTEs connected via LAN replacing the user PCs that are directly connected via LAN.

### **6.5. Network Bandwidth**

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

Ethernet local area networks (LAN) with a bandwidth of 10 megabits per second are used in the tested/priced configurations between RTE/emulated web browsers and the client machines. A single Ethernet LAN with a bandwidth of 100 megabits per second is used between the client machines and the database server (SUT).

Each of the clients contains one 100 megabit per second LAN adapter and two 10 megabit per second LAN adapters. The 100 megabit per second LAN adapter is connected to a single LAN segment and to the database server in both priced and tested configurations.

In the priced configuration, the clients are each connected via two 10Mbit LAN segments to workstations (PCs running web browsers).

In the tested configuration, each client also contains two 10 megabit per second LAN adapters. Each LAN adapter connects to a LAN adapter on an RTE (driver) machine.

## **6.6. Operator Intervention**

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

No operator intervention was required to sustain eight hours of operation at the reported throughput.



# 7.

## Clause 7: Pricing

### **7.1. Pricing**

*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) must also be reported.*

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

*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.*

*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.*

A detailed list of hardware and software components along with their part numbers and prices are given in the Executive Summary near the beginning of this document.

### **7.1.1. System Pricing**

Each priced configuration consists of an integrated system package, additional options, and components. Prices for all ALR products are US list prices.

### **7.1.2. Maintenance Pricing**

The ALR standard factory warranty covers major components for five (5) years, with associated labor costs covered for thirty-six (36) months. All other peripheral components (excluding monitors) are warranted for thirty-six (36) months from time of delivery to the original purchaser. The Microsoft support pricing is based on sixty (60) months of monthly support costs.

ALR ProCare extended coverage plan "G" is a five-year, four-hour response time, same business day plan.

Netlux provide return-to-factory replacement within seven (7) days. Appropriate spares are included in the priced configuration.

### **7.1.3. Discounts**

No discounts were applied to the priced configuration.

## 7.2. Availability

*The committed delivery date for general availability (availability date) of products used in the price calculation 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.*

The hardware, software and support/maintenance products priced in this benchmark are detailed on page vi.

Microsoft NT Server 4.0 Enterprise Edition and SQL Server 6.5 Enterprise Edition will be available by November 30<sup>th</sup>, 1997. All Server Hardware will be available by December 31<sup>st</sup>, 1997. All other components are available now.

## 7.3. Measured tpmC, Price/Performance, and Availability Date

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

Advanced Logic Research, Inc.Revolution 6X6 Server, with Microsoft Windows NT Server 4.0 Enterprise Edition and SQL Server 6.5 Enterprise Edition, achieved 13,089.30 tpmC at \$35.11 per tpmC. All components will be available by November 30<sup>th</sup>, 1997.

## 7.4. 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.*

None.

## 7.5. Usage Pricing

*For any usage pricing, the sponsor must disclose:*

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

The component pricing based on usage is shown below:

- One (1) Microsoft Windows NT Server 4.0 Enterprise Edition license
- One (1) Microsoft SQL 6.50 Server Enterprise Edition license
- Five (5) Microsoft Windows NT 4.0 Licenses
- One (1) Microsoft SQL Server Programmers Toolkit
- One (1) Microsoft Visual C++ Subscription
- Five (5) BEA Tuxedo 6.3 CFS for NT licenses

Microsoft SQL Server & Internet Information Server and BEA Tuxedo were priced for an unlimited number of users.

## 8.

### ***Clause 8 : Full Disclosure Availability***

#### **8.1. Availability**

*The Full Disclosure Report must be readily available to the public at a reasonable charge, similar to charges for similar documents by that test sponsor.*

Copies of this Full Disclosure Report may be obtained by contacting:

TPC Benchmark Administrator  
Advanced Logic Research, Inc.  
9401 Jeronimo Road  
Irvine, CA 92618  
USA



## **9.**

## ***Clause 9 : Audit***

### **9.1. Auditor's Report**

*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.*

This implementation of the TPC Benchmark C on the ALR Revolution 6X6 Server was audited by Richard Gimarc, a TPC certified auditor of:

Performance Metrics Inc.,  
2229 Benita Drive, Suite 101,  
Rancho Cordova, CA 95670.

(916)635-2822 Fax: (916) 858-0109  
e-mail: Richard@PerfMetrics.com

The attestation letter is shown on the next page.

---

**PERFORMANCE METRICS INC.**  
**TPC Certified Auditors**

---

October 29, 1997

Cameron Spears  
Software Engineering Manager  
Advanced Logic Research, Inc.  
9401 Jeronimo  
Irvine, CA 92618

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

Platform: ALR Revolution 6X6 Server  
Database Manager: Microsoft SQL Server 6.5 Enterprise Edition (6.50.258)  
Operating System: Microsoft Windows NT Server 4.0 Enterprise Edition  
Transaction Manager: BEA Tuxedo CFS 6.3 for NT

CPU's	Memory	Disks	New-Order Response Time @ 90%	tpmC
Server: Unisys Aquanta HS/6 Server				
6 Pentium Pro @ 200 MHz	Main: 4 GB L2 Cache: 1 MB	88 @ 4.05 GB 62 @ 8.48 GB	0.78 sec.	13,089.30
6 Clients: Unisys Aquanta DM/6 II				
1 Pentium Pro @ 200 MHz	Main: 256 MB L2 Cache: 256 KB	1 @ 1.51 GB	n.a.	n.a.

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

The following attributes of the benchmark were given special attention:

- The transactions were correctly implemented.
- The database files were properly sized and populated.
- The database was properly scaled with 1,110 warehouses. Only 1,065 warehouses were used during measurement.
- The ACID properties were met, including phantom protection.
- The durability data loss and log loss tests were performed on a 10-warehouse database.
- Input data was generated according to the specified percentages.

---

2229 Benita Drive, Suite 101, Rancho Cordova, CA 95670  
(916) 635-2822 Fax: (916) 858-0109 e-mail: Richard@PerfMetrics.com

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**PERFORMANCE METRICS INC.**  
**TPC Certified Auditors**

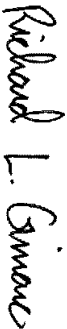
---

- Eight hours of mirrored log space was configured on the measured system.
- The following disks contained backup and other data and were not active during measurement: six 4.05 GB and fourteen 8.48 GB disks. These twenty disks were not included in the priced configuration.
- The 180-day space calculation was verified. Nine 8.48 GB disks were added to the priced configuration to satisfy this requirement.
- Measurement cycle times include a 0.1 second menu and a 0.1 second response time delay for an emulated Web browser.
- The steady state portion of the test was 30 minutes.
- One checkpoint was taken during the steady state portion of the test.
- Checkpoints were verified to be clear of the guard zones.
- There were 10,650 user contexts present on the system.
- Each emulated user started with a different random number seed.
- The NURand constants used for database load and run time were verified.
- System pricing was checked for major components and maintenance.

Additional Audit Notes:

- The benchmark was executed on a Unisys Aquanta HS/6 Server. All active components on the Unisys Aquanta HS/6 Server and the ALR Revolution 6X6 Server are identical.

Regards,



Richard L. Gimarc  
Auditor

---

2229 Benita Drive, Suite 101, Rancho Cordova, CA 95670

(916) 635-2822 Fax: (916) 858-0109 e-mail: Richard@PerfMetrics.com

Page 2





# Appendix A - Client/Server Source

## CLIENT MAKEFILE

```
# Microsoft Developer Studio Generated NMAKE File, Format Version 4.20
# ** DO NOT EDIT **
```

```
# TARGETTYPE "Win32 (x86) Dynamic-Link Library" 0x0102
```

```
!IF "$(CFG)" == ""
CFG=tpcc - Win32 Debug
!MESSAGE No configuration specified. Defaulting to tpcc - Win32 Debug.
!ENDIF
```

```
!IF "$(CFG)" != "tpcc - Win32 Release" && "$(CFG)" != "tpcc - Win32 Debug"
!MESSAGE Invalid configuration "$(CFG)" specified.
!MESSAGE You can specify a configuration when running NMAKE on this
makefile
!MESSAGE by defining the macro CFG on the command line. For example:
!MESSAGE
!MESSAGE NMAKE /f "tpcc.mak" CFG="tpcc - Win32 Debug"
!MESSAGE
!MESSAGE Possible choices for configuration are:
!MESSAGE
!MESSAGE "tpcc - Win32 Release" (based on "Win32 (x86) Dynamic-Link
Library")
!MESSAGE "tpcc - Win32 Debug" (based on "Win32 (x86) Dynamic-Link
Library")
!MESSAGE
!ERROR An invalid configuration is specified.
!ENDIF
```

```
!IF "$(OS)" == "Windows_NT"
NULL=
!ELSE
NULL=nul
!ENDIF
```

```
#####
#####
# Begin Project
# PROP Target_Last_Scanned "tpcc - Win32 Release"
CPP=cl.exe
RSC=rc.exe
MTL=mktypplib.exe
```

```
!IF "$(CFG)" == "tpcc - Win32 Release"
```

```
# PROP BASE Use_MFC 0
# PROP BASE Use_Debug_Libraries 0
# PROP BASE Output_Dir "Release"
# PROP BASE Intermediate_Dir "Release"
```

```
# PROP BASE Target_Dir ""
# PROP Use_MFC 0
# PROP Use_Debug_Libraries 0
# PROP Output_Dir "Release"
# PROP Intermediate_Dir "Release"
# PROP Target_Dir ""
OUTDIR=.\Release
INTDIR=.\Release
```

```
ALL : "$(OUTDIR)\tpcc.dll"
```

```
CLEAN :
-@erase "$(INTDIR)\term.obj"
-@erase "$(INTDIR)\timesupp.obj"
-@erase "$(INTDIR)\TPCC.OBJ"
-@erase "$(INTDIR)\tpcchandler.obj"
-@erase "$(OUTDIR)\tpcc.dll"
-@erase "$(OUTDIR)\tpcc.exp"
-@erase "$(OUTDIR)\tpcc.lib"
```

```
"$(OUTDIR)" :
if not exist "$(OUTDIR)/$(NULL)" mkdir "$(OUTDIR)"
```

```
# ADD BASE CPP /nologo /MT /W3 /GX /O2 /D "WIN32" /D "NDEBUG" /D
" _WINDOWS" /YX /c
# ADD CPP /nologo /MT /W3 /GX /O2 /D "WIN32" /D "NDEBUG" /D "_WINDOWS" /YX
/c
CPP_PROJ=/nologo /MT /W3 /GX /O2 /D "WIN32" /D "NDEBUG" /D "_WINDOWS" \
/Fp"$(INTDIR)/tpcc.pch" /YX /Fo"$(INTDIR)/" /c
CPP_OBJS=.\Release/
CPP_SBRS=.\.
# ADD BASE MTL /nologo /D "NDEBUG" /win32
# ADD MTL /nologo /D "NDEBUG" /win32
MTL_PROJ=/nologo /D "NDEBUG" /win32
# ADD BASE RSC /l 0x409 /d "NDEBUG"
# ADD RSC /l 0x409 /d "NDEBUG"
BSC32=bscmake.exe
# ADD BASE BSC32 /nologo
# ADD BSC32 /nologo
BSC32_FLAGS=/nologo /o"$(OUTDIR)/tpcc.bsc"
BSC32_SBRS= \

LINK32=link.exe
# ADD BASE LINK32 kernel32.lib user32.lib gdi32.lib winspool.lib
comdlg32.lib advapi32.lib shell32.lib ole32.lib oleaut32.lib uuid.lib
odbc32.lib odbccp32.lib /nologo /subsystem:windows /dll /machine:I386
# ADD LINK32 kernel32.lib user32.lib gdi32.lib winspool.lib comdlg32.lib
advapi32.lib shell32.lib ole32.lib oleaut32.lib uuid.lib odbc32.lib
odbccp32.lib libtux.lib libbuft.lib libtux2.lib libfml.lib libfml32.lib
libgp.lib tmon.lib /nologo /subsystem:windows /dll /machine:I386
# SUBTRACT LINK32 /verbose /nodefaultlib
LINK32_FLAGS=kernel32.lib user32.lib gdi32.lib winspool.lib comdlg32.lib \
advapi32.lib shell32.lib ole32.lib oleaut32.lib uuid.lib odbc32.lib \
odbccp32.lib libtux.lib libbuft.lib libtux2.lib libfml.lib libfml32.lib \
libgp.lib tmon.lib /nologo /subsystem:windows /dll /incremental:no \
/pdb:"$(OUTDIR)/tpcc.pdb" /machine:I386 /def:".tpcc.def" \
/out:"$(OUTDIR)/tpcc.dll" /implib:"$(OUTDIR)/tpcc.lib"
DEF_FILE= \
".\tpcc.def"
LINK32_OBJS= \
```

```

    "$(INTDIR)\term.obj" \
    "$(INTDIR)\timesupp.obj" \
    "$(INTDIR)\TPCC.OBJ" \
    "$(INTDIR)\tpcchandler.obj"

$(OUTDIR)\tpcc.dll" : "$(OUTDIR)" $(DEF_FILE) $(LINK32_OBJS)
    $(LINK32) @<<
    $(LINK32_FLAGS) $(LINK32_OBJS)
<<

!ELSEIF "$(CFG)" == "tpcc - Win32 Debug"

# PROP BASE Use_MFC 0
# PROP BASE Use_Debug_Libraries 1
# PROP BASE Output_Dir "Debug"
# PROP BASE Intermediate_Dir "Debug"
# PROP BASE Target_Dir ""
# PROP Use_MFC 0
# PROP Use_Debug_Libraries 1
# PROP Output_Dir "Debug"
# PROP Intermediate_Dir "Debug"
# PROP Target_Dir ""
OUTDIR=.\Debug
INTDIR=.\Debug

ALL : "$(OUTDIR)\tpcc.dll"

CLEAN :
-@erase "$(INTDIR)\term.obj"
-@erase "$(INTDIR)\timesupp.obj"
-@erase "$(INTDIR)\TPCC.OBJ"
-@erase "$(INTDIR)\tpcchandler.obj"
-@erase "$(INTDIR)\vc40.idb"
-@erase "$(INTDIR)\vc40.pdb"
-@erase "$(OUTDIR)\tpcc.dll"
-@erase "$(OUTDIR)\tpcc.exp"
-@erase "$(OUTDIR)\tpcc.ilk"
-@erase "$(OUTDIR)\tpcc.lib"
-@erase "$(OUTDIR)\tpcc.pdb"

"$ (OUTDIR)" :
    if not exist "$(OUTDIR)/$(NULL)" mkdir "$(OUTDIR)"

# ADD BASE CPP /nologo /MTd /W3 /Gm /GX /Zi /Od /D "WIN32" /D "_DEBUG" /D
" WINDOWS" /YX /c
# ADD CPP /nologo /MT /W3 /Gm /GX /Zi /Od /D "WIN32" /D "_DEBUG" /D
" WINDOWS" /YX /c
CPP_PROJ=/nologo /MT /W3 /Gm /GX /Zi /Od /D "WIN32" /D "_DEBUG" /D
" WINDOWS" \
  /Fp "$(INTDIR)\tpcc.pch" /YX /Fo "$(INTDIR)\" /Fd "$(INTDIR)\" /c
CPP_OBJS=.\Debug/
CPP_SBRS=.\.
# ADD BASE MTL /nologo /D " _DEBUG" /win32
# ADD MTL /nologo /D " _DEBUG" /win32
MTL_PROJ=/nologo /D " _DEBUG" /win32
# ADD BASE RSC /l 0x409 /d " _DEBUG"
# ADD RSC /l 0x409 /d " _DEBUG"
BSC32=bscmake.exe
# ADD BASE BSC32 /nologo
# ADD BSC32 /nologo
BSC32_FLAGS=/nologo /o "$(OUTDIR)\tpcc.bsc"

```

```

BSC32_SBRS= \

LINK32=link.exe
# ADD BASE LINK32 kernel32.lib user32.lib gdi32.lib winspool.lib
comdlg32.lib advapi32.lib shell32.lib ole32.lib oleaut32.lib uuid.lib
odbc32.lib odbccp32.lib /nologo /subsystem:windows /dll /debug
/machine:I386
# ADD LINK32 kernel32.lib user32.lib gdi32.lib winspool.lib comdlg32.lib
advapi32.lib shell32.lib ole32.lib oleaut32.lib uuid.lib odbc32.lib
odbccp32.lib libtux.lib libbuft.lib libtux2.lib libfml.lib libfml32.lib
libgp.lib tmon.lib /nologo /subsystem:windows /dll /debug /machine:I386
# SUBTRACT LINK32 /verbose /nodefaultlib
LINK32_FLAGS=kernel32.lib user32.lib gdi32.lib winspool.lib comdlg32.lib\
advapi32.lib shell32.lib ole32.lib oleaut32.lib uuid.lib odbc32.lib\
odbccp32.lib libtux.lib libbuft.lib libtux2.lib libfml.lib libfml32.lib\
libgp.lib tmon.lib /nologo /subsystem:windows /dll /incremental:yes\
/pdb:"$(OUTDIR)\tpcc.pdb" /debug /machine:I386 /def:".\tpcc.def" \
/out:"$(OUTDIR)\tpcc.dll" /implib:"$(OUTDIR)\tpcc.lib"
DEF_FILE= \
    ".\tpcc.def"
LINK32_OBJS= \
    "$(INTDIR)\term.obj" \
    "$(INTDIR)\timesupp.obj" \
    "$(INTDIR)\TPCC.OBJ" \
    "$(INTDIR)\tpcchandler.obj"

"$ (OUTDIR)\tpcc.dll" : "$(OUTDIR)" $(DEF_FILE) $(LINK32_OBJS)
    $(LINK32) @<<
    $(LINK32_FLAGS) $(LINK32_OBJS)
<<

!ENDIF

.c{$ (CPP_OBJS)}.obj:
    $(CPP) $(CPP_PROJ) <<

.cpp{$ (CPP_OBJS)}.obj:
    $(CPP) $(CPP_PROJ) <<

.cxx{$ (CPP_OBJS)}.obj:
    $(CPP) $(CPP_PROJ) <<

.c{$ (CPP_SBRS)}.sbr:
    $(CPP) $(CPP_PROJ) <<

.cpp{$ (CPP_SBRS)}.sbr:
    $(CPP) $(CPP_PROJ) <<

.cxx{$ (CPP_SBRS)}.sbr:
    $(CPP) $(CPP_PROJ) <<

#####
#####
# Begin Target

# Name "tpcc - Win32 Release"
# Name "tpcc - Win32 Debug"

!IF "$(CFG)" == "tpcc - Win32 Release"

!ELSEIF "$(CFG)" == "tpcc - Win32 Debug"

```

```

!ENDIF

#####
#####
# Begin Source File

SOURCE=. \term.c
DEP_CPP_TERM=\
    ". \term.h" \
    ". \timesupp.h" \
    ". \diagio.h" \

"$ (INTDIR) \term.obj" : $ (SOURCE) $ (DEP_CPP_TERM_) "$ (INTDIR) "

# End Source File
#####
#####
# Begin Source File

SOURCE=. \timesupp.c
DEP_CPP_TIMES=\
    ". \timesupp.h" \

"$ (INTDIR) \timesupp.obj" : $ (SOURCE) $ (DEP_CPP_TIMES) "$ (INTDIR) "

# End Source File
#####
#####
# Begin Source File

SOURCE=. \TPCC.C
DEP_CPP_TPCC=\
    ". \term.h" \
    ". \tpcc.h" \
    ". \tpcchandler.h" \
    ". \diagio.h" \
    { $ (INCLUDE) } "\SQLDB.H" \
    { $ (INCLUDE) } "\SQLFRONT.H" \
    { $ (INCLUDE) } "\tmon.h" \

"$ (INTDIR) \TPCC.OBJ" : $ (SOURCE) $ (DEP_CPP_TPCC_) "$ (INTDIR) "

# End Source File
#####
#####
# Begin Source File

SOURCE=. \tpcchandler.c
DEP_CPP_TPCCCH=\
    ". \term.h" \
    ". \tpcc.h" \
    ". \tpcchandler.h" \
    ". \diagio.h" \

```

```

{ $ (INCLUDE) } "\SQLDB.H" \
{ $ (INCLUDE) } "\SQLFRONT.H" \
{ $ (INCLUDE) } "\tmon.h" \

"$ (INTDIR) \tpcchandler.obj" : $ (SOURCE) $ (DEP_CPP_TPCCCH) "$ (INTDIR) "

# End Source File
#####
#####
# Begin Source File

SOURCE=. \tpcc.def

!IF "$ (CFG)" == "tpcc - Win32 Release"

!ELSEIF "$ (CFG)" == "tpcc - Win32 Debug"

!ENDIF

# End Source File
# End Target
# End Project
#####
#####

                                tpcc.def

EXPORTS
    GetExtensionVersion
    HttpExtensionProc

                                tpcc.h

// tpcc.h

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

// TPCCHandler return codes
#define TPCCSEND 1
#define TPCCSENDEND 2
#define TPCCENDNOW 3

// TPC Service return codes
#define SVC_BADITEMID 1
#define SVC_NOERROR 0
#define SVCERR_DEADLOCK -1
#define SVCERR_NOCUSTOMER -2
#define SVCERR_NOORDERS -3
#define SVCERR_DBLIB -4

// Min/Max transaction data definitions
#define MIN_DID 1
#define MAX_DID 10
#define MIN_OL 5

```

```

#define MAX_OL 15
#define MIN_QUANTITY 1
#define MAX_QUANTITY 10
#define MIN_ITEM_ID 1
#define MAX_ITEM_ID 100000
#define MIN_CUST_ID 1
#define MAX_CUST_ID 3000
#define MIN_CARRIER 1
#define MAX_CARRIER 10
#define MIN_THRESHOLD 10
#define MAX_THRESHOLD 20

// pTPCC->iStatusId codes
#define INVALID_IID 1
#define STATUS_OK 0
#define ERR_CMD_UNKNOWN -10
#define ERRTXT_CMD_UNKNOWN "Unrecognized Command"
#define ERR_ALREADY_LOGGEDIN -11
#define ERRTXT_ALREADY_LOGGEDIN "Already Logged In"
#define ERR_TERMID -12
#define ERRTXT_TERMID "TermId or SyncId in Error"
#define ERR_FORM_UNKNOWN -13
#define ERRTXT_FORM_UNKNOWN "Unrecognized FormId"
#define ERR_WID_INVALID -14
#define ERR_DID_INVALID -15
#define ERR_MISSING_KEY -16
#define ERR_NOT_NUMERIC -17
#define ERR_THRESHOLD_RANGE -18
#define ERR_EMBEDDED_EMPTY_OL -19
#define ERR_QUANTITY_INVALID -20
#define ERR_OL_INVALID -21
#define ERR_OL_COUNT -22
#define ERR_TM_INTERFACE -23
#define ERR_SERVICE_RSLT -24
#define ERR_INPUT_TOOLONG -25
#define ERR_IDANDNAME_EMPTY -26
#define ERR_IDANDNAME_ENTERED -27
#define ERR_AMOUNT_BADFORM -28
#define ERR_AMOUNT_INVALID -29
#define ERR_CARRIER_INVALID -30
#define ERR_TERM_ALLOC -31

#define STATUS_LEN 200
#define NAME_LEN 16
#define ADDR_LEN 20
#define STATE_LEN 2
#define ZIP_LEN 9

#define MAX_MSG_SZ 5000

typedef struct
{
    short ol_supply_w_id;
    long ol_i_id;
    char ol_i_name[25];
    short ol_quantity;
    char ol_brand_generic[2];
    double ol_i_price;
    double ol_amount;
    short ol_stock;
} OL_NEW_ORDER_DATA;

```

```

typedef struct
{
    short w_id;
    short d_id;
    long c_id;
    short o_ol_cnt;
    char c_last[NAME_LEN + 1];
    char c_credit[3];
    double c_discount;
    double w_tax;
    double d_tax;
    long o_id;
    short o_commit_flag;
    DBDATEREc o_entry_d;
    short o_all_local;
    double total_amount;
    char execution_status[STATUS_LEN];
    OL_NEW_ORDER_DATA Ol[MAX_OL];
} NEW_ORDER_DATA;

typedef struct
{
    short w_id;
    short d_id;
    long c_id;
    short c_d_id;
    short c_w_id;
    double h_amount;
    DBDATEREc h_date;
    char w_street_1[ADDR_LEN + 1];
    char w_street_2[ADDR_LEN + 1];
    char w_city[ADDR_LEN + 1];
    char w_state[STATE_LEN + 1];
    char w_zip[ZIP_LEN + 1];
    char d_street_1[ADDR_LEN + 1];
    char d_street_2[ADDR_LEN + 1];
    char d_city[ADDR_LEN + 1];
    char d_state[STATE_LEN + 1];
    char d_zip[ZIP_LEN + 1];
    char c_first[NAME_LEN + 1];
    char c_middle[3];
    char c_last[NAME_LEN + 1];
    char c_street_1[ADDR_LEN + 1];
    char c_street_2[ADDR_LEN + 1];
    char c_city[ADDR_LEN + 1];
    char c_state[STATE_LEN + 1];
    char c_zip[ZIP_LEN + 1];
    char c_phone[16];
    DBDATEREc c_since;
    char c_credit[3];
    double c_credit_lim;
    double c_discount;
    double c_balance;
    char c_data[200+1];
    char execution_status[STATUS_LEN];
} PAYMENT_DATA;

typedef struct
{
    long ol_i_id;

```

```

    short ol_supply_w_id;
    short ol_quantity;
    double ol_amount;
    DBDATEREC ol_delivery_d;
} OL_ORDER_STATUS_DATA;

typedef struct
{
    short w_id;
    short d_id;
    long c_id;
    char c_first[NAME_LEN + 1];
    char c_middle[3];
    char c_last[NAME_LEN + 1];
    double c_balance;
    long o_id;
    DBDATEREC o_entry_d;
    short o_carrier_id;
    OL_ORDER_STATUS_DATA OlOrderStatusData[MAX_OL];
    short o_ol_cnt;
    char execution_status[STATUS_LEN];
} ORDER_STATUS_DATA;

typedef struct
{
    short w_id;
    short o_carrier_id;
    long o_id[10];
    int iComplete;
    SYSTEMTIME QTime;           // time delivery was queued
    SYSTEMTIME EndTime;       // time delivery completed
    char execution_status[STATUS_LEN];
} DELIVERY_DATA;

typedef struct
{
    short w_id;
    short d_id;
    short thresh_hold;
    long low_stock;
    char execution_status[STATUS_LEN];
} STOCK_LEVEL_DATA;

typedef struct
{
    LPVOID ConnID;           // Active Connection Id
    SHORT sWid;             // TPCC Warehouse Id
    SHORT sDId;             // TPCC District Id
    INT iSyncId;            // TPCC Sync Id
    INT iTermId;            // TPCC Term Id
    UINT uFormId;           // TPCC Form Id
    INT iStatusId;          // TPCC Status Id
    CHAR ErrTxt[500];       // Error text
    CHAR szWork[200];        // Thread work area
    CHAR szHeader[100];     // HTTP work area
    CHAR * RecvMsg;         // HTML message from ECB
    CHAR SendMsg[MAX_MSG_SZ]; // HTML work area
    TMON_STATE tsTMon;      // TMon Interface
} TPCC_STATE;

```

## tpcc.c

```

// tpcc.c
//
// Copyright Unisys, 1997
//
#include <windows.h>
#include <stdio.h>
#include <malloc.h>
#include <stdlib.h>
#include <string.h>
#include <winreg.h>
#include <httpext.h>
#include <tmon.h>

#include "diagio.h"
#include "term.h"
#include "tpcchandler.h"

#define EXTN_VERSION MAKELONG(HSE_VERSION_MINOR,HSE_VERSION_MAJOR)
#define TLS_NULL 0xFFFFFFFF
DWORD dwTlsInx;
CHAR * pTitle = "IIS TPCC DLL";
CRITICAL_SECTION csDllMain;

// Diagnostic logging settings
BOOL bEventLog = TRUE;
BOOL bConsole = FALSE;
UINT uDiagLevel = DIAG_INFO;

// TMon Interface Settings
INT iTMSyncWait = DEFAULTSYNCAWAIT;
INT iTMMaxMsg = 0;

// Term Interface Settings
INT iMaxTerms = 3000;

static CHAR * szTPCCError =
"<HTML>"
"<HEAD><TITLE>Welcome To TPC-C</TITLE></HEAD><BODY>"
"<B>TPCC Extension Error (TPCC Array Not Allocated)</B><BR>"
"</BODY></HTML>";

static CHAR * szTMinInitError =
"<HTML>"
"<HEAD><TITLE>Welcome To TPC-C</TITLE></HEAD><BODY>"
"<B>TPCC Extension Error (TMinInit Failed)</B><BR>"
"</BODY></HTML>";

BOOL ThreadAttach(TPCC_STATE * pTPCC, CHAR * pDiag);
VOID ThreadDetach(TPCC_STATE * pTPCC);
VOID SendResponse(EXTENSION_CONTROL_BLOCK * pECB, CHAR * pMsg, CHAR *
pWork);
BOOL ReadRegistry(VOID);

//=====
//
// Function name: DllMain
//
//=====

```

```

BOOL APIENTRY DllMain(HANDLE hInst, ULONG ul_reason_for_call,
                    LPVOID lpReserved)
{
    TPCC_STATE * pTPCC = NULL;
    CHAR szDiag[MAX_DIAG_SZ];
    UINT iTMMMaxSz = 0;
    switch(ul_reason_for_call)
    {
        case DLL_PROCESS_ATTACH:
            // Process initialization

            InitializeCriticalSection(&csDllMain);
            ReadRegistry();
            DiagIoInit(pTitle, bConsole, bEventLog, uDiagLevel);
            sprintf(szDiag,
                "EventLog = %d, Console = %d, DiagLevel = %d\n",
                "SyncWait = %d, MaxTerms = %d\n",
                bEventLog, bConsole, uDiagLevel, iTMSyncWait, iMaxTerms);
            DiagIoWrite(szDiag, DIAG_FORCE);
            dwTlsInx = TlsAlloc();
            if (dwTlsInx == TLS_NULL)
            {
                sprintf(szDiag, "PAttach(%d): Tls Alloc Failed (%d)\n",
                    GetCurrentThreadId(), GetLastError());
                DiagIoWrite(szDiag, DIAG_ERROR);
                return (FALSE);
            };
            if (TermInit(iMaxTerms))
                return (FALSE);
            iTMMMaxSz = max(iTMMMaxSz, sizeof(NEW_ORDER_DATA));
            iTMMMaxSz = max(iTMMMaxSz, sizeof(PAYMENT_DATA));
            iTMMMaxSz = max(iTMMMaxSz, sizeof(ORDER_STATUS_DATA));
            iTMMMaxSz = max(iTMMMaxSz, sizeof(DELIVERY_DATA));
            iTMMMaxSz = max(iTMMMaxSz, sizeof(STOCK_LEVEL_DATA));
            iTMMMaxSz += 10;
            TMonInit(iTMMMaxSz, iTMSyncWait);
            break;
        case DLL_THREAD_ATTACH:
            // Move ThreadAttach call to HttpExt since the DllMain call
            // for Thread Attach did not reliably come before the first
            // call to HttpExtProc.
            break;
        case DLL_THREAD_DETACH:
            ThreadDetach(pTPCC);
            break;
        case DLL_PROCESS_DETACH:
            ThreadDetach(pTPCC);
            DeleteCriticalSection(&csDllMain);
            TMonTerm();
            TermTerm();
            TlsFree(dwTlsInx);
            dwTlsInx = TLS_NULL;
            DiagIoTerm();
            break;
    };
    return TRUE;
}; // DllMain

//=====
//
// Function name: ThreadAttach

```

```

//
// Result:
// FALSE Thread state structure initialized
// TRUE Thread state structure initialization failure
//
//=====
BOOL ThreadAttach(TPCC_STATE * pTPCC, CHAR * pDiag)
{
    BOOL bRslt;
    UINT uLabelNoOp;
    EnterCriticalSection(&csDllMain);
    try
    {
        pTPCC = (TPCC_STATE *) calloc(1, sizeof(TPCC_STATE));
        if (pTPCC == NULL)
        {
            sprintf(pDiag, "ThrAtt(%d): pTPCC Alloc Failed (%d)\n",
                GetCurrentThreadId(), GetLastError());
            DiagIoWrite(pDiag, DIAG_ERROR);
            bRslt = TRUE;
            goto TAttachXit;
        };
        TlsSetValue(dwTlsInx, pTPCC);
        pTPCC->tsTMon.pTMDData = NULL;
        pTPCC->tsTMon.pszErrTxt = pTPCC->ErrTxt;
        if (TMinInit(&pTPCC->tsTMon))
        {
            sprintf(pDiag, "ThrAtt(%d): TMinInit %s\n",
                GetCurrentThreadId(), pTPCC->ErrTxt);
            DiagIoWrite(pDiag, DIAG_ERROR);
            bRslt = TRUE;
            goto TAttachXit;
        };
        bRslt = FALSE;
    }
    TAttachXit:
        uLabelNoOp = 0;
    finally
    {
        LeaveCriticalSection(&csDllMain);
    };
    return(bRslt);
}; // ThreadAttach

//=====
//
// Function name: ThreadDetach
//
//=====
VOID ThreadDetach(TPCC_STATE * pTPCC)
{
    EnterCriticalSection(&csDllMain);
    try
    {
        pTPCC = TlsGetValue(dwTlsInx);
        if (pTPCC != NULL)
        {
            TMDone(&pTPCC->tsTMon);
            free(pTPCC);
        }
    }
}

```

```

        pTPCC = NULL;
        TlsSetValue(dwTlsInx, pTPCC);
    };
}
finally
{
    LeaveCriticalSection(&csDllMain);
};
}; // ThreadDetach

//=====
//
// Function name: GetExtensionVersion
//
//=====
BOOL WINAPI GetExtensionVersion(HSE_VERSION_INFO *pVersion)
{
    pVersion->dwExtensionVersion = EXTN_VERSION;
    strncpy(pVersion->lpszExtensionDesc, pTitle, HSE_MAX_EXT_DLL_NAME_LEN);
    return TRUE;
}; // GetExtensionVersion

//=====
//
// Function name: HttpExtensionProc
//
// Returns:
// HSE_STATUS_SUCCESS          send msg, drop connection
// HSE_STATUS_SUCCESS_AND_KEEP_CONN  send msg, keep connection
//
//=====
DWORD WINAPI HttpExtensionProc(EXTENSION_CONTROL_BLOCK * pECB)
{
    TPCC_STATE * pTPCC;
    DWORD dwRslt = HSE_STATUS_SUCCESS;
    UINT uRslt;

    pTPCC = TlsGetValue(dwTlsInx);
    if (pTPCC == NULL)
    {
        CHAR szWork[200];
        ThreadAttach(pTPCC, szWork);
        pTPCC = TlsGetValue(dwTlsInx);
        if (pTPCC == NULL)
        {
            SendResponse(pECB, szTPCCError, szWork);
            goto HttpXit;
        };
    };
    if (pTPCC->tsTMon.pTMDData == NULL)
        SendResponse(pECB, szTMInitError, pTPCC->szHeader);
    TPCCClear(pTPCC);
    pTPCC->ConnID = pECB->ConnID;
    pTPCC->RecvMsg = pECB->lpszQueryString;
    uRslt = TPCCHandler(pTPCC);
    switch (uRslt)
    {
        case TPCCSEND:
            SendResponse(pECB, pTPCC->SendMsg, pTPCC->szHeader);

```

```

        dwRslt = HSE_STATUS_SUCCESS_AND_KEEP_CONN;
        break;
    case TPCCSENDEND:
        SendResponse(pECB, pTPCC->SendMsg, pTPCC->szHeader);
        break;
    case TPCCENDNOW:
    default:
        break;
    }; // switch (TPCCHandler result)

HttpXit:
    return(dwRslt);
}; // HttpExtensionProc

//=====
//
// Function name: SendResponse
//
//=====
VOID SendResponse(EXTENSION_CONTROL_BLOCK * pECB, CHAR * pMsg, CHAR * pWork)
{
    DWORD dwHdrBytes;
    DWORD dwMsgBytes;
    dwMsgBytes = strlen(pMsg);
    sprintf(pWork,
        "Connection: keep-alive\r\nContent-type: text/html\r\n"
        "Content-length: %d\r\n\r\n",
        dwMsgBytes);
    dwHdrBytes = strlen(pWork);
    (*pECB->ServerSupportFunction)
        (pECB->ConnID,
        HSE_REQ_SEND_RESPONSE_HEADER,
        NULL,
        &dwHdrBytes,
        (LPDWORD)pWork);
    (*pECB->WriteClient)
        (pECB->ConnID,
        pMsg,
        &dwMsgBytes,
        0);
}; // SendResponse

//=====
//
// Function name: ReadRegistry
//
// Sets global operational parameters from registry if they exist.
// Otherwise, compiled in defaults apply.
//
// Result:
// FALSE Registry entry found
// TRUE Registry entry does not exist
//
//=====
BOOL ReadRegistry(VOID)
{
    HKEY hkTPCC;
    DWORD dwMax;

```

```

DWORD      dwRT;
INT i;
CHAR szValue[100];
if (RegOpenKeyEx(HKEY_LOCAL_MACHINE,"SOFTWARE\\Unisys\\TPCC",0,
  KEY_READ, &hkTPCC) != ERROR_SUCCESS )
  return(TRUE);
dwMax = sizeof(szValue);
if (RegQueryValueEx(hkTPCC,"EVENTLOG",0,&dwRT,szValue,&dwMax)
  == ERROR_SUCCESS)
{
  if (abs(atoi(szValue) == 0))
    bEventLog = FALSE;
  else
    bEventLog = TRUE;
};
dwMax = sizeof(szValue);
if (RegQueryValueEx(hkTPCC,"CONSOLE",0,&dwRT,szValue,&dwMax)
  == ERROR_SUCCESS )
{
  if (abs(atoi(szValue) == 0))
    bConsole = FALSE;
  else
    bConsole = TRUE;
};
dwMax = sizeof(szValue);
if (RegQueryValueEx(hkTPCC,"DIAGLEVEL",0,&dwRT,szValue,&dwMax)
  == ERROR_SUCCESS )
{
  i = atoi(szValue);
  if (i < DIAG_FORCE)
    i = DIAG_FORCE;
  else
    if (i > DIAG_INFO)
      i = DIAG_INFO;
  uDiagLevel = i;
};
dwMax = sizeof(szValue);
if (RegQueryValueEx(hkTPCC,"SYNCWAIT",0,&dwRT,szValue,&dwMax)
  == ERROR_SUCCESS )
{
  iTMSyncWait = abs(atoi(szValue));
};
dwMax = sizeof(szValue);
if (RegQueryValueEx(hkTPCC,"MAXTERMS",0,&dwRT,szValue,&dwMax)
  == ERROR_SUCCESS )
{
  iMaxTerms = abs(atoi(szValue));
};
RegCloseKey(hkTPCC);
return(FALSE);
}; // ReadRegistry

```

## tpcchandler.h

```

// tpcchandler.h
#include "tpcc.h"

BOOL TPCCclear(TPCC_STATE * pTPCC);
UINT TPCCHandler(TPCC_STATE * pTPCC);

```

## tpcchandler.c

```

// tpcchandler.c
//
// Copyright Unisys, 1997
//
#include <windows.h>
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <tmon.h>

#include "diagio.h"
#include "tpcchandler.h"
#include "term.h"

// pTPCC->iFormId - TPCC forms enumeration.
#define FORM_NULL 0
#define FORM_LOGON 1
#define FORM_MENU 2
#define FORM_NEWORDER 3
#define FORM_PAYMENT 4
#define FORM_DELIVERY 5
#define FORM_ORDERSTATUS 6
#define FORM_STOCKLEVEL 7
#define FORM_EXIT 8
#define FORM_MAX 9

// CMD= HTML Command Enumeration and Name
#define CMD_NULL 0
#define CMD_PROCESS 1
#define CMD_NEWORDER_FORM 2
#define CMD_PAYMENT_FORM 3
#define CMD_DELIVERY_FORM 4
#define CMD_ORDERSTATUS_FORM 5
#define CMD_STOCKLEVEL_FORM 6
#define CMD_EXIT 7
#define CMD_SUBMIT 8
#define CMD_MENU_FORM 9
#define CMD_MAX 10

static CHAR * szCmds[] =
{
  "Unknown",
  "Process",
  "..NewOrder..",
  "..Payment..",
  "..Delivery..",
  "..Order-Status..",
  "..Stock-Level..",
  "..Exit..",
  "Submit",
  "Menu"
};

static CHAR * szFormLogin =
"<HTML>"
"<HEAD><TITLE>Welcome To TPC-C</TITLE></HEAD><BODY>"
"Please Identify your Warehouse and District for this session.<BR>"
"<FORM ACTION=\\\"tpcc.dll\\\" METHOD=\\\"GET\\\">"

```



```

"<INPUT TYPE=\\"hidden\\" NAME=\\"STATUSID\\" VALUE=\\"0\\">"
"<INPUT TYPE=\\"hidden\\" NAME=\\"FORMID\\" VALUE=\\"1\\">"
"<INPUT TYPE=\\"hidden\\" NAME=\\"TERMINID\\" VALUE=\\"-2\\">"
"<INPUT TYPE=\\"hidden\\" NAME=\\"SYNCID\\" VALUE=\\"0\\">"
"Warehouse ID <INPUT NAME=\\"w_id\\" SIZE=4><BR>"
"District ID <INPUT NAME=\\"d_id\\" SIZE=2><BR>"
"<HR>"
"<INPUT TYPE=\\"submit\\" NAME=\\"CMD\\" VALUE=\\"Submit\\">"
"</FORM>";

static CHAR * szMenuList =
"<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..\\>";

static CHAR * HTMLTrailer =
"</BODY></HTML>";

static CHAR * TERMINDTOKEN = "TERMINID=";
static CHAR * SYNCIDTOKEN = "SYNCID=";
static CHAR * FORMIDTOKEN = "FORMID=";
static CHAR * STATUSIDTOKEN = "STATUSID=";
static CHAR * CMDTOKEN = "CMD=";
static CHAR * NEWORDER_SERVICE = "NEWORDER=";
static CHAR * PAYMENT_SERVICE = "PAYMENT=";
static CHAR * ORDERSTATUS_SERVICE = "ORDERSTS=";
static CHAR * DELIVERY_SERVICE = "DELIVERY=";
static CHAR * STOCKLEVEL_SERVICE = "STOCKLVL=";
static CHAR * ZIPPIC = "XXXXX-XXXX";

BOOL ProcessLogin(CHAR * pIn,CHAR * pOut,TPCC_STATE * pTPCC);
BOOL ProcessForm(CHAR * pIn,CHAR * pOut,TPCC_STATE * pTPCC);
BOOL ProcessNewOrder(CHAR * pIn,CHAR * pOut,TPCC_STATE * pTPCC);
BOOL ProcessPayment(CHAR * pIn,CHAR * pOut,TPCC_STATE * pTPCC);
BOOL ProcessDelivery(CHAR * pIn,CHAR * pOut,TPCC_STATE * pTPCC);
BOOL ProcessOrderStatus(CHAR * pIn,CHAR * pOut,TPCC_STATE * pTPCC);
BOOL ProcessStockLevel(CHAR * pIn,CHAR * pOut,TPCC_STATE * pTPCC);
VOID FormatLogin(CHAR * pMsg,CHAR * pAddText);
BOOL GetHidden(CHAR * pMsg,UINT * uFormId,INT * iSyncId,INT * iTermId);
BOOL GetCmd(CHAR * pMsg,CHAR * pWork,UINT uLen);
BOOL GetLongKey(LONG * lRslt,CHAR * pHTML,CHAR * pKey,TPCC_STATE * pTPCC);
BOOL GetIntKey(INT * iRslt,CHAR * pHTML,CHAR * pKey,TPCC_STATE * pTPCC);
BOOL GetShortKey(SHORT * sRslt,CHAR * pHTML,CHAR * pKey,TPCC_STATE * pTPCC);
BOOL GetStringKey(CHAR * szRslt,CHAR * pHTML,CHAR * pKey,TPCC_STATE * pTPCC,UINT uMax);
BOOL GetAmountKey(DOUBLE * dRslt,CHAR * pHTML,CHAR * pKey,TPCC_STATE * pTPCC);
BOOL GetKeyValue(CHAR * pHTML,CHAR * pKey,CHAR * pValue,UINT uMax);
VOID FormatLogin(CHAR * pOut,CHAR * pAddText);
VOID FormatMenu(CHAR * pOut,TPCC_STATE * pTPCC);
VOID FormatNewOrder(CHAR * pOut,TPCC_STATE * pTPCC);
VOID FormatPayment(CHAR * pOut,TPCC_STATE * pTPCC);
VOID FormatDelivery(CHAR * pOut,TPCC_STATE * pTPCC);
VOID FormatOrderStatus(CHAR * pOut,TPCC_STATE * pTPCC);
VOID FormatStockLevel(CHAR * pOut,TPCC_STATE * pTPCC);
VOID FormatFormHdr(CHAR * pOut,CHAR * pTitle,TPCC_STATE * pTPCC);

```

```

VOID FormatRespHdr(CHAR * pOut,CHAR * pTitle,TPCC_STATE * pTPCC);
VOID FormatHTMLString(CHAR * pOut,CHAR * pIn,UINT uLen);
VOID FormatString(CHAR * pOut,CHAR * pPic,CHAR * pIn);
VOID UtilStrCpy(CHAR * pDest,CHAR * pSrc,INT n);
BOOL CheckNumeric(CHAR * pNum);

//=====
//
// Function name: TPCCclear
//
//=====
BOOL TPCCclear(TPCC_STATE * pTPCC)
{
    pTPCC->ConnID = 0;
    pTPCC->sWID = 0;
    pTPCC->sDId = 0;
    pTPCC->iSyncId = 0;
    pTPCC->iTermId = -2;
    pTPCC->uFormId = FORM_NULL;
    pTPCC->iStatusId = 0;
    pTPCC->tsTMon.lTMDDataLen = 0;
    strcpy(pTPCC->ErrTxt,"");
    return(FALSE);
}; // TPCCclear

//=====
//
// Function name: TPCCHandler
//
//=====
UINT TPCCHandler(TPCC_STATE * pTPCC)
{
    INT iSyncId;
    INT iTermId;
    UINT uCmdId;
    UINT uRslt = TPCCSENDEND; // default error handling
    TERM_STATE * pTerm;

    pTPCC->iStatusId = STATUS_OK;
    if (GetHidden(pTPCC->RecvMsg,&pTPCC->uFormId,&iSyncId,&iTermId))
    {
        uRslt = TPCCSEND;
        FormatLogin(pTPCC->SendMsg,pTPCC->ErrTxt);
        goto HdlrXit;
    };
    if (iTermId > 0)
    {
        pTerm = TermGet(iTermId);
        if (pTerm == NULL)
        {
            uRslt = TPCCSEND;
            strcpy(pTPCC->ErrTxt,"Invalid Term Id");
            FormatLogin(pTPCC->SendMsg,pTPCC->ErrTxt);
            goto HdlrXit;
        };
        if (pTerm->ConnID != pTPCC->ConnID)
        {
            uRslt = TPCCSEND;
            strcpy(pTPCC->ErrTxt,"TermId vs ConnId Mismatch");
            FormatLogin(pTPCC->SendMsg,pTPCC->ErrTxt);
        };
    };
}

```

```

        goto HdlrXit;
    };
    pTPCC->sWid = pTerm->sWid;
    pTPCC->sDid = pTerm->sDid;
    pTPCC->iSyncId = pTerm->iSyncId;
    pTPCC->iTermId = pTerm->iTermId;
};
uCmdId = GetCmd(pTPCC->RecvMsg,pTPCC->szWork,sizeof(pTPCC->szWork));
// Except for Submit(log in), sWid must already be set
if (pTPCC->sWid == 0 && uCmdId != CMD_SUBMIT)
{
    strcpy(pTPCC->ErrTxt,"Must log in first!");
    FormatLogin(pTPCC->SendMsg,pTPCC->ErrTxt);
    uRslt = TPCCSEND;
    goto HdlrXit;
};
// Check for multiple log in attempts
if (pTPCC->sWid != 0 && uCmdId == CMD_SUBMIT)
{
    strcpy(pTPCC->ErrTxt,ERRTXT_ALREADY_LOGGEDIN);
    pTPCC->iStatusId = ERR_ALREADY_LOGGEDIN;
    FormatMenu(pTPCC->SendMsg,pTPCC);
    uRslt = TPCCSEND;
    goto HdlrXit;
};
// If not logging in, validate hidden fields
if (uCmdId != CMD_SUBMIT)
{
    if (iTermId != pTPCC->iTermId || iTermId != iSyncId)
    {
        sprintf(pTPCC->ErrTxt,"%s: Received %ld, %ld (%ld)",
            ERRTXT_TERMID,iTermId,iSyncId,pTPCC->iTermId);
        pTPCC->iStatusId = ERR_TERMID;
        FormatMenu(pTPCC->SendMsg,pTPCC);
        goto HdlrXit;
    }
};
// Process the command
switch (uCmdId)
{
    case CMD_SUBMIT:
        ProcessLogin(pTPCC->RecvMsg,pTPCC->SendMsg,pTPCC);
        break;
    case CMD_MENU_FORM:
        FormatMenu(pTPCC->SendMsg,pTPCC);
        break;
    case CMD_PROCESS:
        ProcessForm(pTPCC->RecvMsg,pTPCC->SendMsg,pTPCC);
        break;
    case CMD_NEWORDER_FORM:
        FormatNewOrder(pTPCC->SendMsg,pTPCC);
        break;
    case CMD_PAYMENT_FORM:
        FormatPayment(pTPCC->SendMsg,pTPCC);
        break;
    case CMD_DELIVERY_FORM:
        FormatDelivery(pTPCC->SendMsg,pTPCC);
        break;
    case CMD_ORDERSTATUS_FORM:
        FormatOrderStatus(pTPCC->SendMsg,pTPCC);
        break;
};

```

```

    case CMD_STOCKLEVEL_FORM:
        FormatStockLevel(pTPCC->SendMsg,pTPCC);
        break;
    case CMD_EXIT:
        TermFree(pTPCC->iTermId);
        strcpy(pTPCC->ErrTxt,"Logged Off");
        FormatLogin(pTPCC->SendMsg,pTPCC->ErrTxt);
        goto HdlrXit;
    default:
        strcpy(pTPCC->ErrTxt,ERRTXT_CMD_UNKNOWN);
        pTPCC->iStatusId = ERR_CMD_UNKNOWN;
        if (pTPCC->sWid == 0)
            FormatLogin(pTPCC->SendMsg,pTPCC->ErrTxt);
        else
            FormatMenu(pTPCC->SendMsg,pTPCC);
        break;
}; // switch (uCmdId)

uRslt = TPCCSEND;

```

HdlrXit:

```

    return(uRslt);
}; // TPCCHandler

```

```

//=====
//
// Function name: ProcessLogin
//
// ProcessLogin extracts WId and DId from the incoming form. Assumes
// log in has not previously completed (sWid == 0 already verified).
//
// Result:
// FALSE - log in successful, sWid and sDid set in pTPCC,
//         pOut contains menu.
// TRUE  - log in failed, pOut contains log in form with
//         error message.
//
//=====

```

```

BOOL ProcessLogin(CHAR * pIn,CHAR * pOut,TPCC_STATE * pTPCC)
{

```

```

    SHORT sWid;
    SHORT sDid;
    TERM_STATE * pTerm;

    if (GetShortKey(&sWid,pIn,"w_id",pTPCC))
    {
        FormatLogin(pOut,pTPCC->ErrTxt);
        return(TRUE);
    };
    if (sWid < 1)
    {
        sprintf(pTPCC->ErrTxt,"Warehouse Id (%d) Invalid",sWid);
        pTPCC->iStatusId = ERR_WID_INVALID;
        FormatLogin(pOut,pTPCC->ErrTxt);
        return(TRUE);
    };
    if (GetShortKey(&sDid,pIn,"d_id",pTPCC))
    {
        FormatLogin(pOut,pTPCC->ErrTxt);
    };
}

```

```

    return(TRUE);
};
if (sDId < MIN_DID || sDId > MAX_DID)
{
    sprintf(pTPCC->ErrTxt,"DID Out of Range(%ld,%ld) - %ld",
        MIN_DID,MAX_DID,sDId);
    pTPCC->iStatusId = ERR_DID_INVALID;
    FormatLogin(pOut,pTPCC->ErrTxt);
    return(TRUE);
};
pTerm = TermAlloc();
if (pTerm == NULL)
{
    sprintf(pTPCC->ErrTxt,"Unable to Allocate Terminal Entry");
    pTPCC->iStatusId = ERR_TERM_ALLOC;
    FormatLogin(pOut,pTPCC->ErrTxt);
    return(TRUE);
};
pTerm->ConnID = pTPCC->ConnID;
pTerm->iSyncId = pTerm->iTermId;
pTerm->sWId = abs(sWId);
pTerm->sDId = abs(sDId);
pTPCC->iTermId = pTerm->iTermId;
pTPCC->iSyncId = pTerm->iSyncId;
pTPCC->sWId = pTerm->sWId;
pTPCC->sDId = pTerm->sDId;
FormatMenu(pOut,pTPCC);
return(FALSE);
}; // ProcessLogin

//=====
//
// Function name: ProcessForm
//
// ProcessForm uses pTPCC->uFormId to determine which form input is
// present and ready for processing. Actual processing is done by
// the form specific routine.
//
// Result:
// FALSE - form processed, pOut contains response.
// TRUE - error processing form input, pOut contains reason.
//=====
BOOL ProcessForm(CHAR * pIn,CHAR * pOut,TPCC_STATE * pTPCC)
{
    switch (pTPCC->uFormId )
    {
        case FORM_NEWORDER:
            return(ProcessNewOrder(pIn,pOut,pTPCC));
        case FORM_PAYMENT:
            return(ProcessPayment(pIn,pOut,pTPCC));
        case FORM_DELIVERY:
            return(ProcessDelivery(pIn,pOut,pTPCC));
        case FORM_ORDERSTATUS:
            return(ProcessOrderStatus(pIn,pOut,pTPCC));
        case FORM_STOCKLEVEL:
            return(ProcessStockLevel(pIn,pOut,pTPCC));
        default:
            sprintf(pTPCC->ErrTxt,"%s (%ld)",
                ERRTXT_FORM_UNKNOWN,pTPCC->uFormId);

```

```

        pTPCC->iStatusId = ERR_FORM_UNKNOWN;
        FormatMenu(pOut,pTPCC);
        break;
    }
    return(TRUE);
}; // ProcessForm

//=====
//
// Function name: ProcessNewOrder
//
// ProcessNewOrder extracts the input data fields from pIn, processes
// the data, and returns a response in pOut.
//
// Result:
// FALSE - NewOrder processed successfully.
// TRUE - NewOrder processing failed.
//=====
BOOL ProcessNewOrder(CHAR * pIn,CHAR * pOut,TPCC_STATE * pTPCC)
{
    NEW_ORDER_DATA * pnod;
    TMON_STATE * pTMon;
    CHAR szKey[20];
    CHAR szCredit[14];
    UINT u;
    BOOL bDone = FALSE;
    BOOL bTMRslt;
    BOOL bTPRslt;
    INT iTPrslt;

    pTMon = &pTPCC->tsTMon;
    pTMon->lTMDDataLen = sizeof(NEW_ORDER_DATA);
    memset(pTMon->pTMDData,0,pTMon->lTMDDataLen);
    pnod = (NEW_ORDER_DATA *) pTMon->pTMDData;
    pnod->w_id = pTPCC->sWId;
    if (GetShortKey(&pnod->d_id,pIn,"DID*",pTPCC))
    {
        FormatMenu(pOut,pTPCC);
        return(TRUE);
    };
    if (pnod->d_id < MIN_DID || pnod->d_id > MAX_DID)
    {
        sprintf(pTPCC->ErrTxt,"DID Out of Range(%ld,%ld) - %ld",
            MIN_DID,MAX_DID,pnod->d_id);
        pTPCC->iStatusId = ERR_DID_INVALID;
        FormatMenu(pOut,pTPCC);
        return(TRUE);
    };
    if (GetLongKey(&pnod->c_id,pIn,"CID*",pTPCC))
    {
        FormatMenu(pOut,pTPCC);
        return(TRUE);
    };
    pnod->o_ol_cnt = 0;
    for(u=0; u < MAX_OL; u++)
    {
        sprintf(szKey,"IID%2.2d*",u);
        if (GetLongKey(&pnod->ol[u].ol_i_id,pIn,szKey,pTPCC))
        {

```

```

    FormatMenu(pOut, pTPCC);
    return(TRUE);
};
sprintf(szKey, "SP%2.2d*", u);
if (GetShortKey(&pnod->Ol[u].ol_supply_w_id, pIn, szKey, pTPCC))
{
    FormatMenu(pOut, pTPCC);
    return(TRUE);
};
sprintf(szKey, "Qty%2.2d*", u);
if (GetShortKey(&pnod->Ol[u].ol_quantity, pIn, szKey, pTPCC))
{
    FormatMenu(pOut, pTPCC);
    return(TRUE);
};
if (pnod->Ol[u].ol_i_id != 0)
{
    // Check for prior blank lines
    if (bDone)
    {
        strcat(pTPCC->ErrTxt, "Embedded Empty Order Lines");
        pTPCC->iStatusId = ERR_EMBEDDED_EMPTY_OL;
        FormatMenu(pOut, pTPCC);
        return(TRUE);
    };
    if (pnod->Ol[u].ol_supply_w_id < 1)
    {
        sprintf(pTPCC->ErrTxt,
            "Order Line %ld Contains Invalid WID %d",
            u, pnod->Ol[u].ol_supply_w_id);
        pTPCC->iStatusId = ERR_WID_INVALID;
        FormatMenu(pOut, pTPCC);
        return(TRUE);
    };
    if (pnod->Ol[u].ol_quantity < MIN_QUANTITY ||
        pnod->Ol[u].ol_quantity > MAX_QUANTITY)
    {
        sprintf(pTPCC->ErrTxt,
            "Order Line %ld Contains Invalid Qty %d",
            u, pnod->Ol[u].ol_quantity);
        pTPCC->iStatusId = ERR_QUANTITY_INVALID;
        FormatMenu(pOut, pTPCC);
        return(TRUE);
    };
    pnod->o_ol_cnt++;
} // if (ol_i_id !=0)
else
{
    if (pnod->Ol[u].ol_supply_w_id != 0)
    {
        sprintf(pTPCC->ErrTxt,
            "Order Line %ld WID Supplied with No Item", u);
        pTPCC->iStatusId = ERR_OL_INVALID;
        FormatMenu(pOut, pTPCC);
        return(TRUE);
    };
    if (pnod->Ol[u].ol_quantity != 0)
    {
        sprintf(pTPCC->ErrTxt,
            "Order Line %ld Qty Supplied with No Item", u);
        pTPCC->iStatusId = ERR_OL_INVALID;

```

```

    FormatMenu(pOut, pTPCC);
    return(TRUE);
};
    bDone = TRUE;
}; // empty order line
}; // for (u < MAX_OL)

if (pnod->o_ol_cnt < MIN_OL)
{
    sprintf(pTPCC->ErrTxt, "Too Few Order Lines %d", pnod->o_ol_cnt);
    pTPCC->iStatusId = ERR_OL_COUNT;
    FormatMenu(pOut, pTPCC);
    return(TRUE);
};
bTMRslt = TMTran(NEWORDER_SERVICE, pTMon, &bTPRslt, &iTPRslt);
pnod = (NEW_ORDER_DATA *) pTMon->pTMDData;
if (bTMRslt)
{
    pTPCC->iStatusId = ERR_TM_INTERFACE;
    FormatMenu(pOut, pTPCC);
    return(TRUE);
};
// Exclude invalid item id case
if (bTPRslt && iTPRslt < SVC_NOERROR)
{
    sprintf(pTPCC->ErrTxt,
        "New Order Service Returned Error(%ld): %s",
        iTPRslt, pnod->execution_status);
    pTPCC->iStatusId = ERR_SERVICE_RSLT;
    FormatMenu(pOut, pTPCC);
    return(TRUE);
};
if (iTPrslt == SVC_BADITEMID)
    pTPCC->iStatusId = INVALID_IID;

FormatRespHdr(pOut, "TPC-C New Order", pTPCC);
sprintf(pOut + strlen(pOut),
    "<PRE>                               New Order<BR>"
    "Warehouse: %4.4d   District: %2.2d",
    pnod->w_id, pnod->d_id);
if (!bTPRslt)
{
    sprintf(pOut + strlen(pOut),
        "Date: %2.2d-%2.2d-%4.4d %2.2d:%2.2d:%2.2d <BR>",
        pnod->o_entry_d.day, pnod->o_entry_d.month,
        pnod->o_entry_d.year, pnod->o_entry_d.hour,
        pnod->o_entry_d.minute, pnod->o_entry_d.second);
}
else
{
    sprintf(pOut + strlen(pOut), "Date:<BR>");
};
FormatHTMLString(pTPCC->szWork, pnod->c_last, NAME_LEN);
FormatHTMLString(szCredit, pnod->c_credit, 2);
sprintf(pOut + strlen(pOut),
    "Customer: %4.4d   Name: %s   Credit: %s   ",
    pnod->c_id, pTPCC->szWork, szCredit);
if (!bTPRslt)
{
    sprintf(pOut + strlen(pOut),
        "%Disc: %5.2f           <BR>", pnod->c_discount * 100);

```

```

    sprintf(pOut + strlen(pOut),
        "Order Number: %8.8d Number of Lines: %2.2d          W_tax: %5.2f
D_tax: %5.2f <BR><BR>",
        pnod->o_id, pnod->o_ol_cnt, pnod->>w_tax * 100, pnod->d_tax * 100);
    strcat(pOut, " Supp_W Item_Id Item Name                      Qty Stock
B/G Price      Amount<BR>");
    for (u = 0; u < (UINT) pnod->o_ol_cnt; u++)
    {
        FormatHTMLString(pTPCC->szWork, pnod->Ol[u].ol_i_name, 24);
        sprintf(pOut + strlen(pOut),
            " %4.4d %6.6d %s %2.2d %3.3d %1.1s %6.2f
$%7.2f <BR>",
            pnod->Ol[u].ol_supply_w_id, pnod->Ol[u].ol_i_id,
            pTPCC->szWork, pnod->Ol[u].ol_quantity, pnod->Ol[u].ol_stock,
            pnod->Ol[u].ol_brand_generic, pnod->Ol[u].ol_i_price,
            pnod->Ol[u].ol_amount );
    }
} // if (!bTPRslt)
else
{
    strcat(pOut, "%Disc:<BR>");
    sprintf(pOut + strlen(pOut),
        "Order Number: %8.8d Number of Lines:          W_tax:
D_tax:<BR><BR>",
        pnod->o_id);
    strcat(pOut,
        " Supp_W Item_Id Item Name                      Qty Stock B/G
Price      Amount<BR>");
    u = 0;
};
for(; u < MAX_OL; u++)
    strcat(pOut, "<BR>");
if (!bTPRslt)
{
    sprintf(pOut + strlen(pOut),
        "Execution Status: %24.24s          Total:  $%8.2f ",
        pnod->execution_status, pnod->total_amount);
}
else
{
    sprintf(pOut + strlen(pOut),
        "Execution Status: %24.24s          Total:",
        pnod->execution_status);
};
sprintf(pOut + strlen(pOut),
    "</PRE><HR><BR>%s</FORM>%s", szMenuList, HTMLTrailer);

return (FALSE);
}; // ProcessNewOrder

//=====
//
// Function name: ProcessPayment
//
// ProcessPayment extracts the input data fields from pIn, processes
// the data, and returns a response in pOut.
//
// Result:
// FALSE - Payment processed successfully.

```

```

// TRUE - Payment processing failed.
//
//=====
BOOL ProcessPayment (CHAR * pIn, CHAR * pOut, TPCC_STATE * pTPCC)
{
    PAYMENT_DATA * ppd;
    TMON_STATE * pTMon;
    BOOL bTMRslt;
    BOOL bTPRslt;
    INT iTPRslt;
    CHAR * pCredit;
    INT iCDLines;
    CHAR szWork2[60];
    CHAR szWork3[60];
    CHAR szWork4[60];
    CHAR szZip1[20];
    CHAR szZip2[20];
    INT i;

    pTMon = &pTPCC->tsTMon;
    pTMon->lTMDDataLen = sizeof(PAYMENT_DATA);
    memset(pTMon->pTMDData, 0, pTMon->lTMDDataLen);
    ppd = (PAYMENT_DATA *) pTMon->pTMDData;
    ppd->w_id = pTPCC->swId;
    // Get and validate DID
    if (GetShortKey(&ppd->d_id, pIn, "DID*", pTPCC))
    {
        FormatMenu(pOut, pTPCC);
        return (TRUE);
    };
    if (ppd->d_id < MIN_DID || ppd->d_id > MAX_DID)
    {
        sprintf(pTPCC->ErrTxt, "DID Out of Range(%ld,%ld) - %ld",
            MIN_DID, MAX_DID, ppd->d_id);
        pTPCC->iStatusId = ERR_DID_INVALID;
        FormatMenu(pOut, pTPCC);
        return (TRUE);
    };
    // Get and validate customer Id and name
    if (GetLongKey(&ppd->c_id, pIn, "CID*", pTPCC))
    {
        FormatMenu(pOut, pTPCC);
        return (TRUE);
    };
    if (GetStringKey(ppd->c_last, pIn, "CLT*", pTPCC, NAME_LEN))
    {
        FormatMenu(pOut, pTPCC);
        return (TRUE);
    };
    if (ppd->c_id == 0 && ppd->c_last[0] == 0)
    {
        strcpy(pTPCC->ErrTxt, "Error - Customer Id and Name Empty");
        pTPCC->iStatusId = ERR_IDANDNAME_EMPTY;
        FormatMenu(pOut, pTPCC);
        return (TRUE);
    };
    if (ppd->c_id != 0 && ppd->c_last[0] != 0)
    {
        strcpy(pTPCC->ErrTxt,
            "Error - Specify Customer Id or Name, not Both");
    }
}

```

```

    pTPCC->iStatusId = ERR_IDANDNAME_ENTERED;
    FormatMenu(pOut,pTPCC);
    return(TRUE);
};
// Get and validate customer DId
if (GetShortKey(&ppd->c_d_id,pIn,"CDI*",pTPCC))
{
    FormatMenu(pOut,pTPCC);
    return(TRUE);
};
if (ppd->c_d_id < MIN_DID || ppd->c_d_id > MAX_DID)
{
    sprintf(pTPCC->ErrTxt,"Cust DId Out of Range(%ld,%ld) - %ld",
        MIN_DID,MAX_DID,ppd->d_id);
    pTPCC->iStatusId = ERR_DID_INVALID;
    FormatMenu(pOut,pTPCC);
    return(TRUE);
};
// Get and validate customer WId
if (GetShortKey(&ppd->c_w_id,pIn,"CWI*",pTPCC))
{
    FormatMenu(pOut,pTPCC);
    return(TRUE);
};
if (ppd->c_w_id < 1)
{
    sprintf(pTPCC->ErrTxt,
        "Payment Contains Invalid Customer WId %d",
        ppd->c_w_id);
    pTPCC->iStatusId = ERR_WID_INVALID;
    FormatMenu(pOut,pTPCC);
    return(TRUE);
};
// Get and validate amount
if (GetAmountKey(&ppd->h_amount,pIn,"HAM*",pTPCC))
{
    FormatMenu(pOut,pTPCC);
    return(TRUE);
};
if (ppd->h_amount <= 0)
{
    sprintf(pTPCC->ErrTxt,
        "Payment Amount Negative or Missing");
    pTPCC->iStatusId = ERR_AMOUNT_INVALID;
    FormatMenu(pOut,pTPCC);
    return(TRUE);
};
bTMRslt = TMTran(PAYMENT_SERVICE,pTMon,&bTPRslt,&iTPRslt);
ppd = (PAYMENT_DATA *) pTMon->pTMDData;
if (bTMRslt)
{
    pTPCC->iStatusId = ERR_TM_INTERFACE;
    FormatMenu(pOut,pTPCC);
    return(TRUE);
};
if (bTPRslt)
{
    sprintf(pTPCC->ErrTxt,
        "Payment Service Returned Error(%ld): %s",
        iTPRslt,ppd->execution_status);
    pTPCC->iStatusId = ERR_SERVICE_RSLT;

```

```

    FormatMenu(pOut,pTPCC);
    return(TRUE);
};
FormatRespHdr(pOut,"TPC-C Payment",pTPCC);
sprintf(pOut + strlen(pOut),
    "<PRE>
    Date: %2.2d-%2.2d-%4.4d %2.2d:%2.2d:%2.2d <BR><BR>"
    "Warehouse: %4.4d
    District: %2.2d<BR>",
    ppd->h_date.day,ppd->h_date.month,
    ppd->h_date.year,ppd->h_date.hour,
    ppd->h_date.minute,ppd->h_date.second,
    ppd->w_id,ppd->d_id);

FormatHTMLString(szWork2,ppd->w_street_1,ADDR_LEN);
FormatHTMLString(szWork3,ppd->d_street_1,ADDR_LEN);
sprintf(pOut + strlen(pOut),
    "%s %s<BR>",szWork2,szWork3);
FormatHTMLString(szWork2,ppd->w_street_2,ADDR_LEN);
FormatHTMLString(szWork3,ppd->d_street_2,ADDR_LEN);
sprintf(pOut + strlen(pOut),
    "%s %s<BR>",szWork2,szWork3);
FormatHTMLString(pTPCC->szWork,ppd->w_city,ADDR_LEN);
FormatHTMLString(szWork2,ppd->d_city,ADDR_LEN);
FormatHTMLString(szWork3,ppd->w_state,STATE_LEN);
FormatHTMLString(szWork4,ppd->d_state,STATE_LEN);
FormatString(szZip1,ZIPPIC,ppd->w_zip);
FormatString(szZip2,ZIPPIC,ppd->d_zip);
sprintf(pOut + strlen(pOut),
    "%s %s %10.10s %s %s %10.10s<BR><BR>",
    pTPCC->szWork,szWork3,szZip1,szWork2,szWork4,szZip2);
FormatHTMLString(szWork2,ppd->c_first,NAME_LEN);
FormatHTMLString(szWork3,ppd->c_middle,2);
FormatHTMLString(szWork4,ppd->c_last,NAME_LEN);
sprintf(pOut + strlen(pOut),
    "Customer: %4.4d Cust-Warehouse: %4.4d Cust-District: %2.2d<BR>"
    "Name: %s %s %s Since: %2.2d-%2.2d-%4.4d<BR>",
    ppd->c_id,ppd->c_w_id,ppd->c_d_id,
    szWork2,szWork3,szWork4,
    ppd->c_since.day,ppd->c_since.month,ppd->c_since.year);
FormatHTMLString(pTPCC->szWork,ppd->c_street_1,ADDR_LEN);
FormatHTMLString(szWork2,ppd->c_credit,2);
FormatHTMLString(szWork3,ppd->d_street_2,ADDR_LEN);
sprintf(pOut + strlen(pOut),
    " %s Credit: %s<BR>"
    " %s %sDisc: %5.2f<BR>",
    pTPCC->szWork,szWork2,szWork3,ppd->c_discount * 100);
FormatHTMLString(szWork2,ppd->c_city,ADDR_LEN);
FormatHTMLString(szWork3,ppd->c_state,STATE_LEN);
FormatString(szZip1,ZIPPIC,ppd->c_zip);
FormatString(szWork4,"XXXXXX-XXX-XXX-XXXX",ppd->c_phone);
sprintf(pOut + strlen(pOut),
    " %s %s %10.10s Phone: %-19.19s<BR><BR>"
    "Amount Paid: $%7.2f New Cust Balance: $%14.2f<BR>"
    "Credit Limit: $%13.2f<BR><BR>",
    szWork2,szWork3,szZip1,szWork4,
    ppd->h_amount,ppd->c_balance,ppd->c_credit_lim);
pCredit = ppd->c_credit;
if (*pCredit == 'B' && *(pCredit + 1) == 'C')
{
    pCredit = ppd->c_data;

```

```

iCDLines = strlen(pCredit) / 50;
for(i = 0; i < 4; i++, pCredit += 50)
{
    if (i <= iCDLines)
        UtilStrCpy(szWork2,pCredit,50);
    else
        szWork2[0] = 0;
    FormatHTMLString(szWork3,szWork2,50);
    if (!i)
        sprintf(pOut + strlen(pOut),
            "Cust-Data: %s<BR>",szWork3);
    else
        sprintf(pOut + strlen(pOut),
            "                %s<BR>",szWork3);
};
}
else
    strcat(pOut,"Cust-Data: <BR><BR><BR><BR>");
sprintf(pOut + strlen(pOut),
    "</PRE><HR><BR>%s</FORM>%s",szMenuList,HTMLTrailer);

return(FALSE);
}; // ProcessPayment

//=====
//
// Function name: ProcessDelivery
//
// ProcessDelivery extracts the input data fields from pIn, processes
// the data, and returns a response in pOut.
//
// Result:
// FALSE - Delivery processed successfully.
// TRUE - Delivery processing failed.
//=====
BOOL ProcessDelivery(CHAR * pIn,CHAR * pOut,TPCC_STATE * pTPCC)
{
    DELIVERY_DATA * pdd;
    TMON_STATE * pTMon;
    BOOL bTMRslt;

    pTMon = &pTPCC->tsTMon;
    pTMon->lTMDDataLen = sizeof(DELIVERY_DATA);
    memset(pTMon->pTMDData,0,pTMon->lTMDDataLen);
    pdd = (DELIVERY_DATA *) pTMon->pTMDData;
    pdd->w_id = pTPCC->swId;
    // Get and validate carrier id
    if (GetShortKey(&pdd->o_carrier_id,pIn,"OCD*",pTPCC)
    {
        FormatMenu(pOut,pTPCC);
        return(TRUE);
    };
    if (pdd->o_carrier_id < MIN_CARRIER ||
        pdd->o_carrier_id > MAX_CARRIER)
    {
        sprintf(pTPCC->ErrTxt,"Carrier Id Out of Range(%ld,%ld) - %ld",
            MIN_CARRIER,MAX_CARRIER,pdd->o_carrier_id);
        pTPCC->iStatusId = ERR_CARRIER_INVALID;

```

```

        FormatMenu(pOut,pTPCC);
        return(TRUE);
    };
    GetLocalTime(&pdd->QTime);
    bTMRslt = TMPost(DELIVERY_SERVICE,pTMon);
    if (bTMRslt)
    {
        pTPCC->iStatusId = ERR_TM_INTERFACE;
        FormatMenu(pOut,pTPCC);
        return(TRUE);
    };
    strcpy(pdd->execution_status,"Delivery has been queued.");
    FormatRespHdr(pOut,"TPC-C Delivery",pTPCC);
    sprintf(pOut + strlen(pOut),
        "<PRE>                                Delivery<BR>"
        "Warehouse: %4.4d<BR><BR>"
        "Carrier Number: %2.2d<BR><BR>"
        "Execution Status: %25.25s<BR>",
        pdd->w_id,pdd->o_carrier_id,pdd->execution_status);
    sprintf(pOut + strlen(pOut),
        "</PRE><HR><BR>%s</FORM>%s",szMenuList,HTMLTrailer);

return(FALSE);
}; // ProcessDelivery

//=====
//
// Function name: ProcessOrderStatus
//
// ProcessOrderStatus extracts the input data fields from pIn,
// processes the data, and returns a response in pOut.
//
// Result:
// FALSE - OrderStatus processed successfully.
// TRUE - OrderStatus processing failed.
//=====
BOOL ProcessOrderStatus(CHAR * pIn,CHAR * pOut,TPCC_STATE * pTPCC)
{
    ORDER_STATUS_DATA * posd;
    TMON_STATE * pTMon;
    INT i;
    CHAR szWork2[50];
    CHAR szWork3[50];
    BOOL bTMRslt;
    BOOL bTPRslt;
    INT iTPRslt;

    pTMon = &pTPCC->tsTMon;
    pTMon->lTMDDataLen = sizeof(ORDER_STATUS_DATA);
    memset(pTMon->pTMDData,0,pTMon->lTMDDataLen);
    posd = (ORDER_STATUS_DATA *) pTMon->pTMDData;
    posd->w_id = pTPCC->swId;
    if (GetShortKey(&posd->d_id,pIn,"DID*",pTPCC)
    {
        FormatMenu(pOut,pTPCC);
        return(TRUE);
    };
    if (posd->d_id < MIN_DId || posd->d_id > MAX_DId)

```

```

{
    sprintf(pTPCC->ErrTxt, "Did Out of Range(%ld,%ld) - %ld",
        MIN_Did,MAX_Did,posd->d_id);
    pTPCC->iStatusId = ERR_DID_INVALID;
    FormatMenu(pOut,pTPCC);
    return(TRUE);
};
if (GetLongKey(&posd->c_id,pIn,"CID*",pTPCC))
{
    FormatMenu(pOut,pTPCC);
    return(TRUE);
};
if (GetStringKey(posd->c_last,pIn,"CLT*",pTPCC,NAME_LEN))
{
    FormatMenu(pOut,pTPCC);
    return(TRUE);
};
if (posd->c_id == 0 && posd->c_last[0] == 0)
{
    strcpy(pTPCC->ErrTxt,"Error - Customer Id and Name Empty");
    pTPCC->iStatusId = ERR_IDANDNAME_EMPTY;
    FormatMenu(pOut,pTPCC);
    return(TRUE);
};
if (posd->c_id != 0 && posd->c_last[0] != 0)
{
    strcpy(pTPCC->ErrTxt,
        "Error - Specify Customer Id or Name, not Both");
    pTPCC->iStatusId = ERR_IDANDNAME_ENTERED;
    FormatMenu(pOut,pTPCC);
    return(TRUE);
};
bTMRslt = TMTran(ORDERSTATUS_SERVICE,pTMon,&bTPRslt,&iTPRslt);
posd = (ORDER_STATUS_DATA *) pTMon->pTMDData;
if (bTMRslt)
{
    pTPCC->iStatusId = ERR_TM_INTERFACE;
    FormatMenu(pOut,pTPCC);
    return(TRUE);
};
if (bTPRslt)
{
    sprintf(pTPCC->ErrTxt,
        "Order Status Service Returned Error(%ld): %s",
        iTPRslt,posd->execution_status);
    pTPCC->iStatusId = ERR_SERVICE_RSLT;
    FormatMenu(pOut,pTPCC);
    return(TRUE);
};
FormatRespHdr(pOut,"TPC-C Order-Status",pTPCC);
sprintf(pOut + strlen(pOut),
    "<PRE>                Order-Status<BR>"
    "Warehouse: %4.4d  District: %2.2d<BR>",
    posd->w_id,posd->d_id);
FormatHTMLString(pTPCC->szWork,posd->c_first,NAME_LEN);
FormatHTMLString(szWork2,posd->c_middle,2);
FormatHTMLString(szWork3,posd->c_last,NAME_LEN);
sprintf(pOut + strlen(pOut),
    "Customer: %4.4d  Name: %s %s %s<BR>"
    "Cust-Balance: $%9.2f<BR><BR>",
    posd->c_id,pTPCC->szWork,szWork2,szWork3,posd->c_balance);

```

```

    sprintf(pOut + strlen(pOut),
        "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>",
        posd->o_id,posd->o_entry_d.day,posd->o_entry_d.month,
        posd->o_entry_d.year,posd->o_entry_d.hour,
        posd->o_entry_d.minute,posd->o_entry_d.second,
        posd->o_carrier_id);
    for(i = 0; i < posd->o_ol_cnt; i++)
    {
        sprintf(pOut + strlen(pOut),
            " %4.4d      %6.6d  %2.2d      %8.2f      %2.2d-%2.2d-
%4.4d<BR>",
            posd->OlOrderStatusData[i].ol_supply_w_id,
            posd->OlOrderStatusData[i].ol_i_id,
            posd->OlOrderStatusData[i].ol_quantity,
            posd->OlOrderStatusData[i].ol_amount,
            posd->OlOrderStatusData[i].ol_delivery_d.day,
            posd->OlOrderStatusData[i].ol_delivery_d.month,
            posd->OlOrderStatusData[i].ol_delivery_d.year);
    };
    sprintf(pOut + strlen(pOut),
        "<BR></PRE><HR><BR>%s</FORM>%s",szMenuList,HTMLTrailer);

    return(FALSE);
}; // ProcessOrderStatus

//=====
//
// Function name: ProcessStockLevel
//
// ProcessStockLevel extracts the input data fields from pIn,
// processes the data, and returns a response in pOut.
//
// Result:
// FALSE - StockLevel processed successfully.
// TRUE - StockLevel processing failed.
//
//=====
BOOL ProcessStockLevel(CHAR * pIn,CHAR * pOut,TPCC_STATE * pTPCC)
{
    STOCK_LEVEL_DATA * psld;
    TMON_STATE * pTMon;
    BOOL bTMRslt;
    BOOL bTPRslt;
    INT iTPRslt;

    pTMon = &pTPCC->tsTMon;
    pTMon->lTMDDataLen = sizeof(STOCK_LEVEL_DATA);
    memset(pTMon->pTMDData,0,pTMon->lTMDDataLen);
    psld = (STOCK_LEVEL_DATA *) pTMon->pTMDData;
    psld->w_id = pTPCC->swid;
    psld->d_id = pTPCC->sdid;
    psld->low_stock = 0;
    psld->execution_status[0] = 0;
    if (GetShortKey(&psld->thresh_hold,pIn,"TT*",pTPCC))
    {
        FormatMenu(pOut,pTPCC);
        return(TRUE);
    };
};

```



```

if (psld->thresh_hold < MIN_THRESHOLD ||
    psld->thresh_hold > MAX_THRESHOLD)
{
    sprintf(pTPCC->ErrTxt, "Threshold Out of Range(%ld,%ld) - %ld",
        MIN_THRESHOLD, MAX_THRESHOLD, psld->thresh_hold);
    pTPCC->iStatusId = ERR_THRESHOLD_RANGE;
    FormatMenu(pOut, pTPCC);
    return(TRUE);
};

bTMRslt = TMTran(STOCKLEVEL_SERVICE, pTMon, &bTPRslt, &iTPRslt);
psld = (STOCK_LEVEL_DATA *) pTMon->pTMDData;
if (bTMRslt)
{
    pTPCC->iStatusId = ERR_TM_INTERFACE;
    FormatMenu(pOut, pTPCC);
    return(TRUE);
};
if (bTPRslt)
{
    sprintf(pTPCC->ErrTxt,
        "Stock Level Service Returned Error(%ld): %s",
        iTPRslt, psld->execution_status);
    pTPCC->iStatusId = ERR_SERVICE_RSLT;
    FormatMenu(pOut, pTPCC);
    return(TRUE);
};

FormatRespHdr(pOut, "TPC-C Stock Level", pTPCC);
sprintf(pOut + strlen(pOut),
    "<PRE>                               Stock-Level<BR>"
    "Warehouse: %4.4d   District: %2.2d<BR><BR>"
    "Stock Level Threshold: %2.2d<BR><BR>"
    "low stock: %3.3ld</PRE><BR><HR>"
    "%s</FORM>%s",
    pTPCC->sWId, pTPCC->sDId, psld->thresh_hold, psld->low_stock,
    szMenuList, HTMLTrailer);

return(FALSE);
}; // ProcessStockLevel

//=====
//
// Function name: GetHidden
//
//=====
BOOL GetHidden(CHAR * pMsg, UINT * uFormId, INT * iSyncId, INT * iTermId)
{
    CHAR * pPtr;
    BOOL bRslt = TRUE;

    // Extract TERMID
    pPtr = strstr(pMsg, TERMIDTOKEN);
    if (pPtr == NULL)
        goto xit;
    pPtr += strlen(TERMIDTOKEN);
    *iTermId = atoi(pPtr);

    // Extract SYNCID

```

```

    pPtr = strstr(pMsg, SYNCIDTOKEN);
    if (pPtr == NULL)
        goto xit;
    pPtr += strlen(SYNCIDTOKEN);
    *iSyncId = atoi(pPtr);

    // Extract FORMID
    pPtr = strstr(pMsg, FORMIDTOKEN);
    if (pPtr == NULL)
        goto xit;
    pPtr += strlen(FORMIDTOKEN);
    *uFormId = abs(atoi(pPtr));

    bRslt = FALSE;
xit:
    return(bRslt);
}; // GetHidden

//=====
//
// Function name: GetCmd
//
//=====
BOOL GetCmd(CHAR * pMsg, CHAR * pWork, UINT uLen)
{
    UINT u;
    CHAR * ptr;
    CHAR * pUpd;

    // Check for CMD key
    if (!(ptr = strstr(pMsg, CMDTOKEN)))
        return(CMD_NULL);
    ptr += sizeof(CMDTOKEN);
    pUpd = pWork;
    while (*ptr && *ptr != '&')
        *pUpd++ = *ptr++;
    *pUpd = 0;

    // Convert command name into command index
    for(u=0; u < CMD_MAX; u++)
    {
        if (!strcmp(szCmds[u], pWork))
            return(u);
    };

    // Command string not found
    return(CMD_NULL);
}; // GetCmd

//=====
//
// Function name: GetLongKey
//
//=====
BOOL GetLongKey(LONG * lRslt, CHAR * pHTML, CHAR * pKey, TPCC_STATE * pTPCC)
{

```

```

if (GetKeyValue (pHTML,pKey,pTPCC->szWork,sizeof (pTPCC->szWork)))
{
    sprintf(pTPCC->ErrTxt,"Error - Missing %s Key",pKey);
    pTPCC->iStatusId = ERR_MISSING_KEY;
    return(TRUE);
};
if (pTPCC->szWork[0] != 0 )
{
    if (CheckNumeric(pTPCC->szWork))
    {
        sprintf(pTPCC->ErrTxt,"Error - %s Value Not Numeric",pKey);
        pTPCC->iStatusId = ERR_NOT_NUMERIC;
        return(TRUE);
    };
};
*lrslt = atol(pTPCC->szWork);
return(FALSE);
}; // GetLongKey

//=====
//
// Function name: GetIntKey
//
//=====
BOOL GetIntKey(INT * irslt,CHAR * pHTML,CHAR * pKey,TPCC_STATE * pTPCC)
{
    if (GetKeyValue (pHTML,pKey,pTPCC->szWork,sizeof (pTPCC->szWork)))
    {
        sprintf(pTPCC->ErrTxt,"Error - Missing %s Key",pKey);
        pTPCC->iStatusId = ERR_MISSING_KEY;
        return(TRUE);
    };
    if (pTPCC->szWork[0] != 0 )
    {
        if (CheckNumeric(pTPCC->szWork))
        {
            sprintf(pTPCC->ErrTxt,"Error - %s Value Not Numeric",pKey);
            pTPCC->iStatusId = ERR_NOT_NUMERIC;
            return(TRUE);
        };
    };
    *irslt = atoi(pTPCC->szWork);
    return(FALSE);
}; // GetIntKey

//=====
//
// Function name: GetShortKey
//
//=====
BOOL GetShortKey(SHORT * srslt,CHAR * pHTML,CHAR * pKey,TPCC_STATE *
pTPCC)
{
    if (GetKeyValue (pHTML,pKey,pTPCC->szWork,sizeof (pTPCC->szWork)))
    {
        sprintf(pTPCC->ErrTxt,"Error - Missing %s Key",pKey);
        pTPCC->iStatusId = ERR_MISSING_KEY;
        return(TRUE);
    };
    if (pTPCC->szWork[0] != 0 )
    {

```

```

if (CheckNumeric(pTPCC->szWork))
{
    sprintf(pTPCC->ErrTxt,"Error - %s Value Not Numeric",pKey);
    pTPCC->iStatusId = ERR_NOT_NUMERIC;
    return(TRUE);
};
};
*srslt = (SHORT) atoi(pTPCC->szWork);
return(FALSE);
}; // GetShortKey

//=====
//
// Function name: GetStringKey
//
//=====
BOOL GetStringKey(CHAR * szRslt,CHAR * pHTML,CHAR * pKey,
TPCC_STATE * pTPCC,UINT uMax)
{
    UINT uLen;
    if (GetKeyValue (pHTML,pKey,pTPCC->szWork,sizeof (pTPCC->szWork)))
    {
        sprintf(pTPCC->ErrTxt,"Error - Missing %s Key",pKey);
        pTPCC->iStatusId = ERR_MISSING_KEY;
        return(TRUE);
    };
    uLen = strlen(pTPCC->szWork);
    if (uLen > uMax)
    {
        sprintf(pTPCC->ErrTxt,
            "Error - %s Key Input (%ld) Too Long (%ld)"
            ,pKey,uLen,uMax);
        pTPCC->iStatusId = ERR_INPUT_TOOLONG;
        return(TRUE);
    };
    _strupr(pTPCC->szWork);
    strcpy(szRslt,pTPCC->szWork);
    return(FALSE);
}; // GetStringKey

//=====
//
// Function name: GetAmountKey
//
//=====
BOOL GetAmountKey(DOUBLE * drslt,CHAR * pHTML,CHAR * pKey,
TPCC_STATE * pTPCC)
{
    CHAR * ptr;
    BOOL bInvalid = FALSE;

    if (GetKeyValue (pHTML,pKey,pTPCC->szWork,sizeof (pTPCC->szWork)))
    {
        sprintf(pTPCC->ErrTxt,"Error - Missing %s Key",pKey);
        pTPCC->iStatusId = ERR_MISSING_KEY;
        return(TRUE);
    };
    ptr = pTPCC->szWork;
    while(*ptr)
    {
        if (*ptr == '.')

```

```

    {
        ptr++;
        if (!*ptr)
            break;
        if (*ptr < '0' || *ptr > '9')
        {
            bInvalid = TRUE;
            break;
        };
        ptr++;
        if (!*ptr)
            break;
        if (*ptr < '0' || *ptr > '9')
        {
            bInvalid = TRUE;
            break;
        };
        ptr++;
        if (*ptr)
        {
            bInvalid = TRUE;
            break;
        };
        break;
    }
    else
    if (*ptr < '0' || *ptr > '9')
    {
        bInvalid = TRUE;
        break;
    };
    ptr++;
}; // while(!*ptr)

if (!bInvalid)
    *dRslt = atof(pTPCC->szWork);
else
{
    sprintf(pTPCC->ErrTxt,
        "Error - Invalid Amount Format (%s)",pTPCC->szWork);
    pTPCC->iStatusId = ERR_AMOUNT_BADFORM;
};

return(bInvalid);
}; // GetAmountKey

//=====
//
// Function name: GetKeyValue
// This function parses an HTTP formatted string for specific key
// values. HTTP keys terminate with '='. HTTP values terminate
// with an '&' or '\0'.
//
// Result:
// FALSE - Key found, string value return in pValue
// TRUE - Key not found
//
//=====
BOOL GetKeyValue (CHAR * pHTML, CHAR * pKey, CHAR * pValue, UINT uMax)

```

```

{
    CHAR * ptr;
    if (!(ptr=strstr(pHTML,pKey)))
        return(TRUE);
    if (!(ptr=strchr(ptr,'=')))
        return(TRUE);
    ptr++;
    uMax--;
    while (*ptr && *ptr != '&' && uMax)
    {
        *pValue++ = *ptr++;
        uMax--;
    };
    *pValue = 0;
    return(FALSE);
}; // GetKeyValue

//=====
//
// Function name: FormatLogin
//
//=====
VOID FormatLogin(CHAR * pOut,CHAR * pAddText)
{
    sprintf(pOut,"%s<BR>%s<BR>%s",szFormLogin,pAddText,HTMLTrailer);
}; // FormatLogin

//=====
//
// Function name: FormatMenu
//
//=====
VOID FormatMenu (CHAR * pOut,TPCC_STATE * pTPCC)
{
    strcpy(pOut,"<HTML><HEAD><TITLE>TPC-C MainMenu</TITLE></HEAD><BODY>"
        "Select Desired Transaction.<BR><HR>"
        "<FORM ACTION=\"tpcc.dll\"METHOD=\"GET\">");
    sprintf(pOut + strlen(pOut),
        "<INPUT TYPE=\"hidden\" NAME=\"STATUSID\" VALUE=\"%d\">"
        "<INPUT TYPE=\"hidden\" NAME=\"TERMID\" VALUE=\"%d\">"
        "<INPUT TYPE=\"hidden\" NAME=\"SYNCID\" VALUE=\"%d\">"
        "<INPUT TYPE=\"hidden\" NAME=\"FORMID\" VALUE=\"%d\">",
        pTPCC->iStatusId,pTPCC->iTermId,pTPCC->iSyncId,FORM_MENU);
    sprintf(pOut + strlen(pOut),"</FORM><BR>%s<BR>%s",
        szMenuList,pTPCC->ErrTxt,HTMLTrailer);
}; // FormatMenu

//=====
//
// Function name: FormatNewOrder
//
//=====
VOID FormatNewOrder(CHAR * pOut,TPCC_STATE * pTPCC)
{
    pTPCC->uFormId = FORM_NEWORDER;
    FormatFormHdr(pOut,"TPC-C New Order",pTPCC);
    sprintf(pOut + strlen(pOut),
        "<PRE>
        Warehouse: %4.4d 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><HR>"
"<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Process\">"
"<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Menu\">"
"</FORM>%s",
pTPCC->swId,HTMLTrailer);
}; // FormatNewOrder

//=====
//
// Function name: FormatPayment
//
//=====
VOID FormatPayment (CHAR * pOut,TPCC_STATE * pTPCC)
{
pTPCC->uFormId = FORM_PAYMENT;
FormatFormHdr (pOut, "TPC-C Payment",pTPCC);
sprintf (pOut + strlen(pOut),
"<PRE> Payment<BR>"
"Date:<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></PRE><HR>"
"<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Process\">"
"<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Menu\">"
"</FORM>%s",
pTPCC->swId,HTMLTrailer);
}; // FormatPayment

//=====
//
// Function name: FormatDelivery
//
//=====
VOID FormatDelivery (CHAR * pOut,TPCC_STATE * pTPCC)
{
pTPCC->uFormId = FORM_DELIVERY;
FormatFormHdr (pOut, "TPC-C Delivery",pTPCC);
sprintf (pOut + strlen(pOut),
"<PRE> Delivery<BR>"
"Warehouse: %4.4d<BR><BR>"
"Carrier Number: <INPUT NAME=\"OCD*\" SIZE=1><BR><BR>"
"Execution Status:<BR></PRE><HR>"
"<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Process\">"
"<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Menu\">"
"</FORM>%s",
pTPCC->swId,HTMLTrailer);
}; // FormatDelivery

//=====
//
// Function name: FormatOrderStatus
//
//=====
VOID FormatOrderStatus (CHAR * pOut,TPCC_STATE * pTPCC)
{
pTPCC->uFormId = FORM_ORDERSTATUS;
FormatFormHdr (pOut, "TPC-C Order-Status",pTPCC);
sprintf (pOut + strlen(pOut),
"<PRE> Order-Status<BR>"
"Warehouse: %4.4d "
"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></PRE><HR>"
"<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Process\">"
"<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Menu\">"
"</FORM>%s",
pTPCC->swId,HTMLTrailer);
}; // FormatOrderStatus

```

```

//=====
//
// Function name: FormatStockLevel
//
//=====
VOID FormatStockLevel (CHAR * pOut,TPCC_STATE * pTPCC)
{
    pTPCC->uFormId = FORM_STOCKLEVEL;
    FormatFormHdr (pOut,"TPC-C Stock Level",pTPCC);
    sprintf (pOut + strlen (pOut),
        "<PRE>
        Warehouse: %4.4d District: %2.2d<BR><BR>"
        "Stock Level Threshold: <INPUT NAME=\"TT*\" SIZE=2><BR><BR>"
        "low stock: <BR><HR>"
        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Process\">"
        "<INPUT TYPE=\"submit\" NAME=\"CMD\" VALUE=\"Menu\">"
        "</FORM>%s",
        pTPCC->sWId,pTPCC->sDId,HTMLTrailer);
}; // FormatStockLevel

//=====
//
// Function name: FormatFormHdr
//
//=====
VOID FormatFormHdr (CHAR * pOut,CHAR * pTitle,TPCC_STATE * pTPCC)
{
    sprintf (pOut,
        "<HTML><HEAD><TITLE>%s</TITLE></HEAD>"
        "<FORM ACTION=\"tpcc.dll\" METHOD=\"GET\">"
        "<INPUT TYPE=\"hidden\" NAME=\"PI*\" VALUE=\"\">"
        "<INPUT TYPE=\"hidden\" NAME=\"STATUSID\" VALUE=\"0\">"
        "<INPUT TYPE=\"hidden\" NAME=\"FORMID\" VALUE=\"%d\">"
        "<INPUT TYPE=\"hidden\" NAME=\"TERMINID\" VALUE=\"%d\">"
        "<INPUT TYPE=\"hidden\" NAME=\"SYNCID\" VALUE=\"%d\">",
        pTitle,pTPCC->uFormId,pTPCC->iTermId,pTPCC->iSyncId);
}; // FormatFormHdr

//=====
//
// Function name: FormatRespHdr
//
//=====
VOID FormatRespHdr (CHAR * pOut,CHAR * pTitle,TPCC_STATE * pTPCC)
{
    sprintf (pOut,
        "<HTML><HEAD><TITLE>%s</TITLE></HEAD>"
        "<FORM ACTION=\"tpcc.dll\" METHOD=\"GET\">"
        "<INPUT TYPE=\"hidden\" NAME=\"STATUSID\" VALUE=\"%d\">"
        "<INPUT TYPE=\"hidden\" NAME=\"FORMID\" VALUE=\"%d\">"
        "<INPUT TYPE=\"hidden\" NAME=\"TERMINID\" VALUE=\"%d\">"
        "<INPUT TYPE=\"hidden\" NAME=\"SYNCID\" VALUE=\"%d\">",
        pTitle,pTPCC->iStatusId,pTPCC->uFormId,
        pTPCC->iTermId,pTPCC->iSyncId);
}; // FormatRespHdr

//=====
//
// Function name: FormatHTMLString
//
//=====

```

```

// Encodes HTML special characters. If necessary, space fills
// to pOut to total uLen characters.
//
//=====
VOID FormatHTMLString (CHAR * pOut,CHAR * pIn,UINT uLen)
{
    while (uLen && *pIn)
    {
        switch (*pIn)
        {
            case '>':
                *pOut++ = '&';
                *pOut++ = 'g';
                *pOut++ = 't';
                *pOut++ = ';';
                pIn++;
                break;
            case '<':
                *pOut++ = '&';
                *pOut++ = 'l';
                *pOut++ = 't';
                *pOut++ = ';';
                pIn++;
                break;
            case '&':
                *pOut++ = '&';
                *pOut++ = 'a';
                *pOut++ = 'm';
                *pOut++ = 'p';
                *pOut++ = ';';
                pIn++;
                break;
            case '\\':
                *pOut++ = '&';
                *pOut++ = 'q';
                *pOut++ = 'u';
                *pOut++ = 'o';
                *pOut++ = 't';
                *pOut++ = ';';
                pIn++;
                break;
            default:
                *pOut++ = *pIn++;
                break;
        }; // switch (*pIn)
        uLen--;
    }; // while (uLen && *pIn)
    while (uLen-->0)
        *pOut++ = ' ';
}; // FormatHTMLString

//=====
//
// Function name: FormatString
//
// Encodes formatted string for HTML transmission.
//
//=====
VOID FormatString (CHAR * pOut,CHAR * pPic,CHAR * pIn)

```

```

{
while(*pPic)
{
if (*pPic == 'X' )
{
if (*pIn)
*pOut++ = *pIn++;
else
*pOut++ = ' ';
}
else
*pOut++ = *pPic;
pPic++;
};
*pOut = 0;
}; // FormatString

//=====
// FUNCTION: UtilStrCpy
//
// Copies n characters from string pSrc to pDst and places a null
// null character at the end of the destination string. Unlike
// strncpy this function ensures that the result string is always
// null terminated.
//
//=====
VOID UtilStrCpy(CHAR * pDest,CHAR * pSrc,INT n)
{
strncpy(pDest,pSrc,n);
pDest[n] = '\0';
return;
}; // UtilStrCpy

//=====
//
// Function name: CheckNumeric
//
// Result
// FALSE - string is all numeric
// TRUE - sting contains non-numeric characters
//
//=====
BOOL CheckNumeric(CHAR * pNum)
{
if (*pNum == 0 )
return(TRUE);
while (*pNum && isdigit(*pNum))
pNum++;
return(*pNum);
}; // CheckNumeric

```

## term.h

```

// term.h
#include <timeb.h>

#define TMILLI_TIMEOUT 3600000 // One hour

typedef struct

```

```

{
BOOL bInUse; // In use flag
INT iTermId; // TermId
LPVOID ConnID; // Connection Id
INT iSyncId; // Sync Id
SHORT sWId; // TPCC WareHouse Id
SHORT sDId; // TPCC District Id
struct _timeb tbLastAccess; // Last activity timestamp
} TERM_STATE;

BOOL TermInit(INT iSetMaxTerm);
VOID TermTerm(VOID);
TERM_STATE * TermAlloc(VOID);
TERM_STATE * TermGet(INT iTermId);
BOOL TermFree(INT iTermId);

```

## term.c

```

// term.c
//
// Copyright Unisys, 1997
//
#include <windows.h>
#include <stdio.h>
#include "diagio.h"
#include "timesupp.h"
#include "term.h"

TERM_STATE * pTArray;
INT iNextTerm = 0;
INT iMaxTerm = 0;
CRITICAL_SECTION csTerm;

VOID TermMaint(VOID);

//=====
//
// Function name: TermInit
//
// Creates and initializes the first TERMINITIAL TArray entries.
// Initializes critical section to control access to TArray. Assumes
// access to function is single threaded, no other threads will start
// until this function completes and that function is called once
// (DLL_PROCESS_ATTACH).
//
// Returns:
// FALSE TArray allocated and initialized
// TRUE TArray allocation failure
//
//=====
BOOL TermInit(INT iSetMaxTerm)
{
INT iTermId;
CHAR szDiag[MAX_DIAG_SZ];
if (pTArray != NULL)
{
sprintf(szDiag,"TermInit(%ld): TArray Already Initialized\n",
GetCurrentThreadId());
DiagIoWrite(szDiag,DIAG_ERROR);
return(TRUE);
};

```

```

InitializeCriticalSection(&csTerm);
iMaxTerm = iSetMaxTerm;
pTArray = (TERM_STATE *) malloc(sizeof(TERM_STATE) * (iMaxTerm + 1));
if (pTArray == NULL)
{
    sprintf(szDiag,"TermInit(%ld): malloc failed (%ld)\n",
        GetCurrentThreadId(),GetLastError());
    DiagIoWrite(szDiag,DIAG_ERROR);
    return(TRUE);
}
for (iTermId = 1; iTermId <= iMaxTerm; iTermId++)
    TermFree(iTermId);
iNextTerm = 1;
return(FALSE);
}; // TermInit

//=====
//
// Function name: TermTerm
// Frees TArray and deletes csTerm critical section. Assumes access
// to function is single threaded and no other threads are actively
// accessing TArray entries (DLL_PROCESS_DETACH).
//
//=====
VOID TermTerm(VOID)
{
    DeleteCriticalSection(&csTerm);
    if (pTArray != NULL)
        free(pTArray);
    iNextTerm = 0;
    iMaxTerm = 0;
}; // TermTerm

//=====
//
// Function name: TermAlloc
// Allocates empty TArray. Uses iNextTerm to start search.
//
// Returns:
// > 0 TArray entry index (iTermId)
// < 0 Empty TArray entry not available
//
//=====
TERM_STATE * TermAlloc(VOID)
{
    INT iTermId = -1;
    if (pTArray == NULL)
    {
        CHAR szDiag[MAX_DIAG_SZ];
        sprintf(szDiag,"TermAlloc(%ld): Term Array Not Allocated\n",
            GetCurrentThreadId());
        DiagIoWrite(szDiag,DIAG_ERROR);
        return(NULL);
    };
    EnterCriticalSection(&csTerm);
    _try
    {
        while(iNextTerm <= iMaxTerm)
        {
            if (!pTArray[iNextTerm].bInUse)

```

```

{
    pTArray[iNextTerm].bInUse = TRUE;
    _ftime(&pTArray[iNextTerm].tbLastAccess);
    iTermId = iNextTerm;
    iNextTerm++;
    break;
};
iNextTerm++;
}; // while(iNextTerm <= iMaxTerm) (1st Try)
if (iTermId <= 0)
{
    // No entry found. Perform maint and try again
    TermMaint();
    iNextTerm = 1;
    while(iNextTerm <= iMaxTerm)
    {
        if (!pTArray[iNextTerm].bInUse)
        {
            pTArray[iNextTerm].bInUse = TRUE;
            _ftime(&pTArray[iNextTerm].tbLastAccess);
            iTermId = iNextTerm;
            iNextTerm++;
            break;
        };
        iNextTerm++;
    }; // while(iNextTerm <= iMaxTerm) (2nd Try)
}; // if (iTermId <= 0)
if (iTermId <= 0)
    iNextTerm = 1;
}
finally
{
    LeaveCriticalSection(&csTerm);
};

if (iTermId > 0)
    return(&pTArray[iTermId]);
else
    return(NULL);
}; // TermAlloc

//=====
//
// Function name: TermMaint
// Clears entries whose last access time exceeds TMILLI_TIMEOUT.
// Assumes caller has entered csTerm.
//
//=====
VOID TermMaint(VOID)
{
    INT iTermId;
    TMILLI tmElapsed;
    // Free entries that have timed out
    for (iTermId = 1; iTermId <= iMaxTerm; iTermId++)
    {
        if (pTArray[iTermId].bInUse)
        {
            tmElapsed = TimebElapsed(&pTArray[iTermId].tbLastAccess);

```

```

        if (tmElapsed > TMILLI_TIMEOUT)
            TermFree(iTermId);
    };
}; // TermMaint

//=====
//
// Function name: TermGet
// Returns pointer to TArray slot at iTermId.
//
// Returns:
// FALSE TArray entry made available
// TRUE iTermId invalid.
//
//=====
TERM_STATE * TermGet(INT iTermId)
{
    TERM_STATE * pTerm;
    TMILLI tmElapsed;
    if (iTermId <= 0 || iTermId > iMaxTerm)
    {
        CHAR szDiag[MAX_DIAG_SZ];
        sprintf(szDiag,"TermGet(%ld): Invalid TermId (%ld)\n",
            GetCurrentThreadId(),iTermId);
        DiagIoWrite(szDiag,DIAG_ERROR);
        return(NULL);
    };
    pTerm = &pTArray[iTermId];
    if (!pTerm->bInUse)
        return(NULL);
    tmElapsed = TimebElapsed(&pTerm->tbLastAccess);
    if (tmElapsed > TMILLI_TIMEOUT)
        return(NULL); // Entry destined to be freed by maint
    _ftime(&pTArray[iTermId].tbLastAccess);
    return(&pTArray[iTermId]);
}; // TermGet

//=====
//
// Function name: TermFree
// Initializes contents of TArray slot at iTermId.
//
// Returns:
// FALSE TArray entry made available
// TRUE iTermId invalid.
//
//=====
BOOL TermFree(INT iTermId)
{
    TERM_STATE * pTerm;
    if (iTermId <= 0 || iTermId > iMaxTerm)
    {
        CHAR szDiag[MAX_DIAG_SZ];
        sprintf(szDiag,"TermFree(%ld): Invalid TermId (%ld)\n",
            GetCurrentThreadId(),iTermId);
        DiagIoWrite(szDiag,DIAG_ERROR);
        return(TRUE);
    };
    pTerm = &pTArray[iTermId];
    pTerm->ConnID = 0;

```

```

    pTerm->sWid = 0;
    pTerm->sDId = 0;
    pTerm->iSyncId = 0;
    pTerm->iTermId = iTermId;
    TimebClear(&pTerm->tbLastAccess);
    pTerm->bInUse = FALSE;
}; // TermFree

```

## timesupp.h

```

// timesupp.h

#include <windows.h>
#include <time.h>
#include <timeb.h>

#define TIMEB_STRING_SZ 23
#define TIMEB_STRING_DATESZ 10
#define TIMEB_STRING_TIMEOFFSET 11
#define TIMEB_STRING_TIMESZ 12

typedef ULONG TMILLI;

TMILLI TimebDiff(struct _timeb * p_tb1, struct _timeb * p_tb2);
VOID TimebCopy(struct _timeb * p_tbDest, struct _timeb * p_tbSource);
TMILLI TimebElapsed(struct _timeb * p_tb1);
VOID TimebClear(struct _timeb * p_tb1);
CHAR * TimebToString(struct _timeb * p_tb1,CHAR * psz,BOOL bMillis);
BOOL TimebFromString(struct _timeb * p_tb1,CHAR * psz);
VOID TimebAddSecs(struct _timeb * p_tb1,INT iSeconds);

```

## timesupp.c

```

// timesupp.c
//
// Copyright Unisys, 1997
//

#include <stdio.h>
#include "timesupp.h"

//=====
//
// Function name: TimebCopy
// Structure contents copy of _timeb source to _timeb dest.
//
//=====
VOID TimebCopy(struct _timeb * p_tbDest, struct _timeb * p_tbSource)
{
    p_tbDest->time = p_tbSource->time;
    p_tbDest->millitm = p_tbSource->millitm;
    p_tbDest->dstflag = p_tbSource->dstflag;
    p_tbDest->timezone = p_tbSource->timezone;
}; // TimebCopy

//=====
//
// Function name: TimebDiff

```



```

// Time difference in milliseconds between _timeb_t1 and _timeb_t2.
//
//=====
TMILLI TimebDiff(struct _timeb * p_tb1, struct _timeb * p_tb2)
{
    LONG lRslt;
    lRslt = ((p_tb2->time - p_tb1->time) * 1000) +
            (p_tb2->millitm - p_tb1->millitm);
    if (lRslt < 0)
        return(0);
    else
        return((TMILLI) lRslt);
}; // TimebDiff

//=====
//
// Function name: TimebElapsed
//
//=====
TMILLI TimebElapsed(struct _timeb * p_tb1)
{
    struct _timeb _tb2;
    _ftime(&_tb2);
    return (TimebDiff(p_tb1,&_tb2));
}; // TimebElapsed

//=====
//
// Function name: TimebClear
//
//=====
VOID TimebClear(struct _timeb * p_tb1)
{
    p_tb1->time = 0;
    p_tb1->millitm = 0;
}; // TimebClear

//=====
//
// Function name: TimebToString
// Converts timeb to yyyy:mm:dd,hh:mm:ss.sss format
//
//=====
CHAR * TimebToString(struct _timeb * p_tb1,CHAR * psz,BOOL bMillis)
{
    struct tm * ptm;
    ptm = localtime(&p_tb1->time);
    sprintf(psz,"%4.4d/%2.2d/%2.2d,%2.2d:%2.2d:%2.2d",
            ptm->tm_year + 1900,ptm->tm_mon + 1,ptm->tm_mday,
            ptm->tm_hour,ptm->tm_min,ptm->tm_sec);
    if (bMillis)
        sprintf(psz + strlen(psz),".%3.3d",p_tb1->millitm);
    return(psz);
}; // TimebToString

//=====
//

```

```

// Function name: TimebFromString
// Converts yyyy:mm:dd,hh:mm:ss.sss (TimebToString) format to timeb
//
//=====
BOOL TimebFromString(struct _timeb * p_tb1,CHAR * psz)
{
    struct tm tmTime;
    struct tm * ptm;
    UINT uLen;

    ptm = &tmTime;
    uLen = strlen(psz);
    if (uLen < (TIMEB_STRING_SZ - 4)) // millis are optional
    {
        p_tb1->time = 0;
        p_tb1->millitm = 0;
        return (TRUE);
    };
    // Clear fields that won't be set
    ptm->tm_wday = 0;
    ptm->tm_yday = 0;
    ptm->tm_isdst = -1;
    // Set tm struct fields from string
    ptm->tm_year = (atoi(psz)) - 1900;
    psz += 5;
    ptm->tm_mon = (atoi(psz)) - 1;
    psz += 3;
    ptm->tm_mday = atoi(psz);
    psz += 3;
    ptm->tm_hour = atoi(psz);
    psz += 3;
    ptm->tm_min = atoi(psz);
    psz +=3;
    ptm->tm_sec = atoi(psz);
    if (uLen >= TIMEB_STRING_SZ) // Millis present
    {
        psz += 3;
        p_tb1->millitm = atoi(psz);
    };
    p_tb1->time = mktime(ptm);
    return (FALSE);
}; // TimebFromString

//=====
//
// Function name: TimebAddSecs
//
//=====
VOID TimebAddSecs(struct _timeb * p_tb1,INT iSeconds)
{
    p_tb1->time += iSeconds;
}; // TimebAddSecs

//=====
//

```

## diagio.h

```

// diagio.h
// Environment variable defaults
#define DEFAULTDIAGLEVEL DIAG_INFO

```

```

#define DEFAULTTEVENTLOG 0

#define DIAGNOSTICS TRUE
#define MAX_DIAG_SZ 2000

// Severity level of diagnostic report
#define DIAG_FORCE 1
#define DIAG_ERROR 2
#define DIAG_STATE 3
#define DIAG_INFO 4

VOID DiagIoInit(CHAR * pDiagId,BOOL bConsole,BOOL bEvent,UINT uLevel);
VOID DiagIoTerm(VOID);
VOID DiagIoWrite(CHAR * pDiagBuffer, UINT uSeverity);

```

## diagio.c

```

// diagio.c
//
// Copyright Unisys, 1997
//
#include <windows.h>
#include <stdio.h>
#include "diagio.h"

CRITICAL_SECTION csDiagIo;
HANDLE hEventLog = NULL;
UINT uDiagLevel;
BOOL bEventLog;
BOOL bConsoleLog;
CHAR * pDiagHdr;
CHAR * pEventHost;
CHAR * pErrHdr =
    {"*** ERROR *** ERROR *** ERROR *** ERROR *** ERROR ***"};

INT WriteEventLog(CHAR * pDMsgs[],UINT uMsgCnt,UINT uSeverity);

//=====
//
// Function name: DiagIoInit
//
//=====
VOID DiagIoInit(CHAR * pDiagId,BOOL bConsole,BOOL bEvent,UINT uLevel)
{
    if (DIAGNOSTICS)
    {
        InitializeCriticalSection(&csDiagIo);

        uDiagLevel = uLevel;
        bEventLog = bEvent;
        bConsoleLog = bConsole;
        pEventHost = (CHAR *) malloc(10);
        strcpy(pEventHost,""); // local host
        pDiagHdr = (CHAR *) malloc(strlen(pDiagId) + 1);
        strcpy(pDiagHdr,pDiagId);
        if (bEventLog)
        {
            hEventLog = RegisterEventSource(pEventHost,pDiagId);
            if (hEventLog == NULL)
            {

```

```

                bEventLog = FALSE;
                if (bConsoleLog)
                    fprintf(stdout,
                        "%s: Event Log Register Failed (%ld)\n"
                        "Event Log Will NOT be Used\n",
                        pDiagHdr,GetLastError());
            }
        }
        else
        {
            if (bConsoleLog)
                fprintf(stdout,"%s: Event Logging to LocalHost as %s\n",
                    pDiagHdr,pDiagHdr);
        }
    }; // if bEventLog
}; // if Diagnostics
}; // DiagIoInit

//=====
//
// Function name: DiagIoTerm
//
//=====
VOID DiagIoTerm(VOID)
{
    if (DIAGNOSTICS)
    {
        DeleteCriticalSection(&csDiagIo);
        if (hEventLog != NULL)
            DeregisterEventSource(hEventLog);
        free(pDiagHdr);
        free(pEventHost);
    }
}; // DiagIoTerm

//=====
//
// Function name: DiagIoWrite
//
//=====
VOID DiagIoWrite(CHAR * pDiagBuffer, UINT uSeverity)
{
    CHAR * pDMsgs[3];
    UINT uMsgCnt = 0;
    INT iErslt = 0;
    if (DIAGNOSTICS)
    {
        if (uDiagLevel >= uSeverity)
        {
            EnterCriticalSection(&csDiagIo);
            try
            {
                if (uSeverity == DIAG_ERROR)
                {
                    pDMsgs[0] = pDiagHdr;
                    pDMsgs[1] = pErrHdr;
                    pDMsgs[2] = pDiagBuffer;
                    uMsgCnt = 3;
                }
            }
            else
            {

```

```

    pDMsgs[0] = pDiagHdr;
    pDMsgs[1] = pDiagBuffer;
    uMsgCnt = 2;
};
if (bEventLog)
    iERslt = WriteEventLog(pDMsgs, uMsgCnt, uSeverity);
if (bConsoleLog)
{
    if (uMsgCnt == 3)
        fprintf(stdout, "\n%s:
%s\n%s", pDMsgs[0], pDMsgs[1], pDMsgs[2]);
    else
        fprintf(stdout, "\n%s: %s", pDMsgs[0], pDMsgs[1]);
    if (iERslt != 0)
        fprintf(stdout,
            "EventLog Write Failed (%ld), No Longer in Use\n",
            iERslt);
};
}
finally
{
    LeaveCriticalSection(&csDiagIo);
};
}; // if uDiagLevel >= uSeverity
}; // if Diagnostics
}; // DiagIoWrite

```

```

INT WriteEventLog(CHAR * pDMsgs[], UINT uMsgCnt, UINT uSeverity)
{
    WORD wType;
    WORD wCount;
    wCount = uMsgCnt;
    switch (uSeverity)
    {
        case DIAG_ERROR:
            wType = EVENTLOG_ERROR_TYPE;
            break;
        default:
            wType = EVENTLOG_INFORMATION_TYPE;
            break;
    };
    if (wType != 0)
    {
        if (!ReportEvent(hEventLog, // event log handle
            wType, // event type
            0, // category zero
            uSeverity, // no event identifier
            NULL, // no user security identifier
            wCount, // # of substitution strings
            0, // no binary data
            (LPCTSTR *) pDMsgs, // address of string array
            NULL)) // address of binary
        {
            DeregisterEventSource(hEventLog);
            hEventLog = NULL;
            bEventLog = FALSE;
            return(GetLastError());
        }; // ReportEvent failed
    }; // if wType != 0
    return(0);
}

```

```
}; // WriteEventLog
```

## SERVER MAKEFILES

```

SVR = tpccsvr
SRC = tpccsvr.c
DBG = /f "/Zi"
$(SVR).exe: $(SRC)
    erase $(SVR).exe
    $(TUXDIR)\bin\buildserver /f "$(SRC)" /o $(SVR).exe /s
NEWORDER:NEWORDER /s PAYMENT:PAYMENT /s ORDERSTS:ORDERSTS /s
STOCKLVL:STOCKLVL -l d:\mssql\dblib\lib\ntwdblib.lib
    copy $(SVR).exe $(APPDIR)

```

```

SVR = tpccdelv
SRC = tpccdelv.c
DBG = /f "/Zi"
$(SVR).exe: $(SRC)
    erase $(SVR).exe
    $(TUXDIR)\bin\buildserver /f "$(SRC)" /o $(SVR).exe /s
DELIVERY:DELIVERY -l d:\mssql\dblib\lib\ntwdblib.lib
    copy $(SVR).exe $(APPDIR)

```

### tpccsvr.h

```

// tpccsvr.h
//
// Copyright Unisys, 1997
// Copyright Microsoft, 1996

#include "tpcc.h"

#define DEFCLPACKSIZE          2000
#define DEADLOCKWAIT          10
#define LOGFILE_NAME          "delilog"

// 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

```

### tpccsvr.c

```

// tpccsvr.c
//
// Copyright Unisys, 1997
// Copyright Microsoft, 1996

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

```

```

#include <atmi.h>
#include <userlog.h>

#include "tpccsvr.h"

char  szServer[32]   = "tpccserver";
char  szUser[32]    = { 0 };
char  szPassword[32] = { 0 };
char  szDatabase[32] = "tpcc";
char  szService[16] = "tpccsvr";
char  szWork[200];
PDBPROCESS dbproc;
int  spid; // spid assigned from dblink
BOOL bFailed;
BOOL bDeadlock;
short DeadlockRetry = (short)3;

int err_handler(DBPROCESS *dbproc, int severity, int dberr, int oserr,
char *dberrstr, char *oserrstr);
int msg_handler(DBPROCESS *dbproc, DBINT msgno, int msgstate, int
severity, char *msgtext);
int SQLStockLevel(STOCK_LEVEL_DATA *psld);
int SQLNewOrder(NEW_ORDER_DATA * pnod);
int SQLPayment(PAYMENT_DATA *ppd);
int SQLOrderStatus(ORDER_STATUS_DATA * pOrderStatus);
void UtilStrCpy(char * pDest, char * pSrc, int n);
VOID GetArgs(INT argc, CHAR **argv);

//=====
//
// Function name: tpsvrinit
//
//=====
tpsvrinit(int argc, char *argv[])
{
    GetArgs(argc,argv);
    sprintf(szWork,"%s Started, DBServer=%s,DB=%s",
            szService,szServer,szDatabase);
    userlog(szWork);
    if (SQLInit(szServer,szDatabase,szUser,szPassword)
        return(-1);
    userlog("Database open, initialization complete");
    return(0);
}; // tpsvrinit

//=====
//
// Function name: tpsvrdone
//
//=====
void tpsvrdone()
{
    userlog("Shutdown request for tpcc server");
    dbclose(dbproc);
    dbexit();
}; // tpsvrdone

//=====
//
// Function name: NEWORDER

```

```

//
// Entry point called by tuxedo for NEWORDER service requests.
//
//=====
void NEWORDER(TPSVCINFO * svcinfo)
{
    int iRslt;
    NEW_ORDER_DATA * pnod;

    pnod = (NEW_ORDER_DATA *) svcinfo->data;
    iRslt = SQLNewOrder(pnod);

    // Check for DBLib termination error
    if (bFailed)
    {
        strcpy(pnod->execution_status,szWork);
        tpreturn(TPFAIL,SVCEERR_DBLIB,svcinfo->data,svcinfo->len,0);
    }
    else
    if (iRslt == 0)
        tpreturn(TPSUCCESS,0,svcinfo->data,svcinfo->len,0);
    else
        tpreturn(TPFAIL,iRslt,svcinfo->data,svcinfo->len,0);
}; // NEWORDER

//=====
//
// Function name: PAYMENT
//
// Entry point called by tuxedo for PAYMENT service requests.
//
//=====
void PAYMENT(TPSVCINFO * svcinfo)
{
    int iRslt;
    PAYMENT_DATA * ppd;

    ppd = (PAYMENT_DATA *) svcinfo->data;

    iRslt = SQLPayment(ppd);

    if (bFailed)
    {
        strcpy(ppd->execution_status,szWork);
        tpreturn(TPFAIL,SVCEERR_DBLIB,svcinfo->data,svcinfo->len,0);
    }
    else
    if (iRslt == 0)
        tpreturn(TPSUCCESS,0,svcinfo->data,svcinfo->len,0);
    else
        tpreturn(TPFAIL,iRslt,svcinfo->data,svcinfo->len,0);
}; // PAYMENT

//=====
//
// Function name: ORDERSTS
//
// Entry point called by tuxedo for ORDERSTS service requests.
//
//=====
void ORDERSTS(TPSVCINFO * svcinfo)

```

```

{
    int iRslt;
    ORDER_STATUS_DATA * posd;

    posd = (ORDER_STATUS_DATA *) svcinfo->data;
    iRslt = SQLOrderStatus(posd);

    // Check for DBLib termination error
    if (bFailed)
    {
        strcpy(posd->execution_status,szWork);
        tpreturn(TPFAIL,SVCERR_DBLIB,svcinfo->data,svcinfo->len,0);
    }
    else
    if (iRslt == 0)
        tpreturn(TPSUCCESS,0,svcinfo->data,svcinfo->len,0);
    else
        tpreturn(TPFAIL,iRslt,svcinfo->data,svcinfo->len,0);
}; // ORDERSTS

//=====
//
// Function name: STOCKLVL
//
// Entry point called by tuxedo for STOCKLVL service requests.
//
//=====
void STOCKLVL(TPSVCINFO * svcinfo)
{
    int iRslt;
    STOCK_LEVEL_DATA * psld;

    psld = (STOCK_LEVEL_DATA *) svcinfo->data;
    iRslt = SQLStockLevel(psld);

    // Check for DBLib termination error
    if (bFailed)
    {
        strcpy(psld->execution_status,szWork);
        tpreturn(TPFAIL,SVCERR_DBLIB,svcinfo->data,svcinfo->len,0);
    }
    else
    if (iRslt == 0)
        tpreturn(TPSUCCESS,0,svcinfo->data,svcinfo->len,0);
    else
        tpreturn(TPFAIL,iRslt,svcinfo->data,svcinfo->len,0);
}; // STOCKLVL

//=====
//
// Function name: SQLInit
//
// Set global dbproc and spid.
//
// Result:
// FALSE - database open, dbproc valid
// TRUE - database open failed
//=====

```

```

BOOL SQLInit(CHAR * pSvr,CHAR * pDB,CHAR * pUsr,CHAR * pPW,CHAR * pSvc)
{
    char szApp[32];
    char server[256];
    char database[256];
    char user[256];
    char password[256];
    LOGINREC *login;

    dbinit();
    // install error and message handlers
    dbmsghandle((DBMSGHANDLE_PROC)msg_handler);
    dberrhandle((DBERRHANDLE_PROC)err_handler);

    dbproc = NULL;
    strcpy(server,pSvr);
    strcpy(database,pDB);
    strcpy(user,pUsr);
    strcpy(password,pPW);
    sprintf(szApp,"%s%d",pSvc,_getpid());

    login = dblogin();
    if (!*user)
        DBSETLUSER(login,"sa");
    else
        DBSETLUSER(login,user);
    DBSETLPWD(login,password);
    DBSETLHOST(login,szApp);
    // DBSETLPACKET(login,(unsigned short)DEFCLPACKSIZE);

    if ((dbproc = dbopen(login,server)) == NULL)
    {
        userlog("dbopen failed");
        return TRUE;
    };
    // Use the the right database
    dbuse(dbproc,database);
    dbcmd(dbproc,"select @@spid");
    dbsqlxexec(dbproc);
    while (dbresults(dbproc) != NO_MORE_RESULTS)
    {
        dbbind(dbproc,1,SMALLBIND,(DBINT) 0,(BYTE *) spid);
        while (dbnextrow(dbproc) != NO_MORE_ROWS)
            ;
    };

    dbcmd(dbproc,"set nocount on");
    dbsqlxexec(dbproc);
    while (dbresults(dbproc) != NO_MORE_RESULTS)
    {
        while (dbnextrow(dbproc) != NO_MORE_ROWS)
            ;
    };

    //rollback transaction on abort
    dbcmd(dbproc,"set XACT_ABORT ON");
    dbsqlxexec(dbproc);
    while (dbresults(dbproc) != NO_MORE_RESULTS)
    {
        while (dbnextrow(dbproc) != NO_MORE_ROWS)
            ;
    };
}

```

```

};
return(FALSE);
}; // SQLInit

//=====
// FUNCTION: err_handler
//
// Handles DB-Library errors
//
// ARGUMENTS:
// DBPROCESS *dbproc DBPROCESS id pointer
// int severity severity of error
// int dberr error id
// int oserr operating system specific error code
// char *dberrstr printable error description of dberr
// char *oserrstr printable error description of oserr
//
// RETURNS:
// int INT_CANCEL
//
// COMMENTS: None
//=====
int err_handler(DBPROCESS *dbproc, int severity, int dberr, int oserr,
char *dberrstr, char *oserrstr)
{
if ((dbproc == NULL) || (DBDEAD(dbproc)))
{
userlog("ErrHandler: DBPROC is invalid");
return INT_CANCEL;
};
if (bFailed)
return INT_CANCEL;
if (oserr != DBNOERR)
{
sprintf(szWork,"ErrHandler: OSErr(%ld) - %s",oserr,oserrstr);
userlog(szWork);
bFailed = TRUE;
};

return INT_CANCEL;
}; // err_handler

//=====
// FUNCTION: msg_handler
//
// 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 operation
// INT_CANCEL cancel operation

```

```

//
// COMMENTS: This function also sets the dead lock dbproc
// variable if necessary.
//
//=====
int msg_handler(DBPROCESS *dbproc, DBINT msgno, int msgstate, int
severity, char *msgtext)
{
if ((msgno == 5701) || (msgno == 2528) ||
(msgno == 5703) || (msgno == 6006))
return INT_CONTINUE;

// deadlock message
if (msgno == 1205)
{
// set the deadlock indicator
bDeadlock = TRUE;
return INT_CONTINUE;
};

if (bFailed)
return INT_CANCEL;

if (msgno == 0)
return INT_CONTINUE;
else
{
sprintf(szWork,"MsgHandler: MsgNo(%ld) - %s",msgno,msgtext);
userlog(szWork);
bFailed = TRUE;
};

return INT_CANCEL;
}; // msg_handler

//=====
// FUNCTION: SQLStockLevel
//
// Handles the stock level transaction.
//
// ARGUMENTS:
// STOCK_LEVEL_DATA StockLevel input / output data structure
// dbdata (global)
// bDeadlock (global)
//
// RETURNS:
// SVC_NOERROR success
// !SVC_NOERROR failure
//
// COMMENTS: None
//=====
int SQLStockLevel(STOCK_LEVEL_DATA * psld)
{
int tryit;
short num_deadlocks = 0;
RETCODE rc;
BYTE * pData;

```

```

bFailed = FALSE;
bDeadlock = FALSE;

for (tryit=0; tryit < DeadlockRetry; tryit++)
{
    if (dbrpcinit(dbproc,"tpcc_stocklevel",0) == SUCCEED)
    {
        dbrpcparam(dbproc, NULL, 0, SQLINT2, -1, -1,
            (BYTE *) &psld->w_id);
        dbrpcparam(dbproc, NULL, 0, SQLINT1, -1, -1,
            (BYTE *) &psld->d_id);
        dbrpcparam(dbproc, NULL, 0, SQLINT2, -1, -1,
            (BYTE *) &psld->thresh_hold);

        if (dbrpcexec(dbproc) == SUCCEED)
        {
            while (((rc = dbresults(dbproc)) != NO_MORE_RESULTS) &&
                (rc != FAIL))
            {
                if (DBROWS(dbproc))
                {
                    while (((rc = dbnextrow(dbproc)) != NO_MORE_ROWS) &&
                        (rc != FAIL))
                    {
                        if (pData=dbdata(dbproc,1))
                            psld->low_stock = *((long *) pData);
                    };
                }; // if (DBROWS(dbproc))
            }; // while (dbresults)
        }; // if (dbrpcexec)
    }; // if (dbrpcinit)
    if (bDeadlock)
    {
        num_deadlocks++;
        bDeadlock = FALSE;
        userlog("StockLevel Deadlock Retry (%d)",num_deadlocks);
        Sleep(10 * tryit);
    }
    else
    {
        strcpy(psld->execution_status,"Transaction committed.");
        return(SVC_NOERROR);
    };
}; // for (tryit)

// If we reached here, it means we quit after MAX_RETRY deadlocks
strcpy(psld->execution_status,"Hit deadlock max.");
userlog("StockLevel Deadlock Failure (%d)",num_deadlocks);
return(SVCERR_DEADLOCK);

}; // SQLStockLevel

//=====
// FUNCTION: SQLNewOrder
//
// Handles the new order transaction.
//
// ARGUMENTS:
// NEW_ORDER_DATA NewOrder structure for input/output data
// dbdata (global)

```

```

// bDeadlock (global)
//
// RETURNS:
// SVC_NOERROR success
// !SVC_NOERROR failure
//
// COMMENTS: None
//
//=====
int SQLNewOrder(NEW_ORDER_DATA * pnod)
{
    RETCODE rc;
    int i;
    DBINT commit_flag;
    short num_deadlocks = 0;
    int tryit;
    DBDATETIME datetime;
    BYTE * pData;

    bFailed = FALSE;
    bDeadlock = FALSE;

    for (tryit=0; tryit < DeadlockRetry; tryit++)
    {
        if (dbrpcinit(dbproc,"tpcc_neworder",0) == SUCCEED)
        {
            dbrpcparam(dbproc, NULL, 0, SQLINT2, -1, -1,
                (BYTE *) &pnod->w_id);
            dbrpcparam(dbproc, NULL, 0, SQLINT1, -1, -1,
                (BYTE *) &pnod->d_id);
            dbrpcparam(dbproc, NULL, 0, SQLINT4, -1, -1,
                (BYTE *) &pnod->c_id);
            dbrpcparam(dbproc, NULL, 0, SQLINT1, -1, -1,
                (BYTE *) &pnod->o_ol_cnt);

            pnod->o_all_local = 1;
            for (i = 0; i < pnod->o_ol_cnt; i++)
            {
                if (pnod->o_all_local &&
                    pnod->Ol[i].ol_supply_w_id != pnod->w_id )
                    pnod->o_all_local = 0;
            };
            dbrpcparam(dbproc, NULL, 0, SQLINT1, -1, -1,
                (BYTE *) &pnod->o_all_local);

            for (i = 0; i < pnod->o_ol_cnt; i++)
            {
                dbrpcparam(dbproc, NULL, 0, SQLINT4, -1, -1,
                    (BYTE *) &pnod->Ol[i].ol_i_id);
                dbrpcparam(dbproc, NULL, 0, SQLINT2, -1, -1,
                    (BYTE *) &pnod->Ol[i].ol_supply_w_id);
                dbrpcparam(dbproc, NULL, 0, SQLINT2, -1, -1,
                    (BYTE *) &pnod->Ol[i].ol_quantity);
            };

            if (dbrpcexec(dbproc) == SUCCEED)
            {
                pnod->total_amount=0;
                // Get results from order line
                for (i = 0; i<pnod->o_ol_cnt; i++)

```

```

{
  if (((rc = dbresults(dbproc)) != NO_MORE_RESULTS) &&
      (rc != FAIL))
  {
    if (DBROWS(dbproc) && (dbnumcols(dbproc) == 5))
    {
      while (dbnextrow(dbproc) != NO_MORE_ROWS)
      {
        if(pData=dbdata(dbproc, 1))
          UtilStrCpy(pnod-
>Ol[i].ol_i_name,pData,dbdatlen(dbproc, 1));
        if(pData=dbdata(dbproc, 2))
          pnod->Ol[i].ol_stock = (*(DBSMALLINT *) pData);
        if(pData=dbdata(dbproc, 3))
          UtilStrCpy(pnod-
>Ol[i].ol_brand_generic,pData,dbdatlen(dbproc, 3));
        if(pData=dbdata(dbproc, 4))
          pnod->Ol[i].ol_i_price = *(DBFLT8 *) pData);
        if(pData=dbdata(dbproc, 5))
          pnod->Ol[i].ol_amount = *(DBFLT8 *) pData);
          pnod->total_amount = pnod->total_amount + pnod-
>Ol[i].ol_amount;
        }; // while (dbnextrow)
      }; // if (DBROWS && dbnumcols)
    }; // if (dbresults)
  }; // for (o_ol_cnt)
  while (((rc = dbresults(dbproc)) != NO_MORE_RESULTS) &&
      (rc != FAIL))
  {
    if (DBROWS(dbproc) && (dbnumcols(dbproc) == 8))
    {
      while (((rc = dbnextrow(dbproc)) != NO_MORE_ROWS) &&
          (rc != FAIL))
      {
        if(pData=dbdata(dbproc, 1))
          pnod->w_tax = *(DBFLT8 *) pData);
        if(pData=dbdata(dbproc, 2))
          pnod->d_tax = *(DBFLT8 *) pData);
        if(pData=dbdata(dbproc, 3))
          pnod->o_id = *(DBINT *) pData);
        if(pData=dbdata(dbproc, 4))
          UtilStrCpy(pnod->c_last,pData,dbdatlen(dbproc,4));
        if(pData=dbdata(dbproc, 5))
          pnod->c_discount = *(DBFLT8 *) pData);
        if(pData=dbdata(dbproc, 6))
          UtilStrCpy(pnod-
>c_credit,pData,dbdatlen(dbproc,6));
          if(pData=dbdata(dbproc, 7))
          {
            datetime = (*(DBDATETIME *) pData);
            dbdatecrack(dbproc,&pnod->o_entry_d,&datetime);
          };
          if(pData=dbdata(dbproc, 8))
            commit_flag = *(DBTINYINT *) pData);
        }; // while (dbnextrow)
      }; // if (DBROWS && dbnumcols)
    }; // while (dbresults)
  }; // if (dbrcpexec)
}; // if (dbrcpcinit)
if (bDeadlock)
{

```

```

num_deadlocks++;
bDeadlock = FALSE;
userlog("NewOrder Deadlock Retry (%d)",num_deadlocks);
Sleep(10 * tryit);
}
else
{
  if (commit_flag == 1)
  {
    pnod->total_amount = pnod->total_amount *
      ((1 + pnod->w_tax + pnod->d_tax) * (1 - pnod->c_discount));
    strcpy(pnod->execution_status,"Transaction committed.");
    return(SVC_NOERROR);
  }
  else
  {
    strcpy(pnod->execution_status,"Item number is not valid.");
    return(SVC_BADITEMID);
  }
}; // !bDeadlock
}; // for (tryit)

// If we reached here, it means we quit after MAX_RETRY deadlocks
strcpy(pnod->execution_status,"Hit deadlock max.");
userlog("NewOrder Deadlock Failure (%d)",num_deadlocks);
return(SVCERR_DEADLOCK);
}; // SQLNewOrder

```

```

//=====
// FUNCTION: SQLPayment
//
// Handles the payment transaction.
//
// ARGUMENTS:
// PAYMENT_DATA Payment input/output data structure
// dbdata (global)
// bDeadlock (global)
//
// RETURNS:
// SVC_NOERROR success
// !SVC_NOERROR failure
//
// COMMENTS: None
//
//=====
int SQLPayment(PAYMENT_DATA *ppd)
{
  RETCODE rc;
  int tryit;
  short num_deadlocks = 0;
  DBDATETIME datetime;
  BYTE * pData;

  bFailed = FALSE;
  bDeadlock = FALSE;

  for (tryit=0; tryit < DeadlockRetry; tryit++)
  {
    if (dbrcpcinit(dbproc,"tpcc_payment",0) == SUCCEED)
    {

```



```

dbrpcparam(dbproc, NULL, 0, SQLINT2, -1, -1, (BYTE *) &ppd->w_id);
dbrpcparam(dbproc, NULL, 0, SQLINT2, -1, -1, (BYTE *) &ppd->c_w_id);
dbrpcparam(dbproc, NULL, 0, SQLFLT8, -1, -1, (BYTE *) &ppd->h_amount);
dbrpcparam(dbproc, NULL, 0, SQLINT1, -1, -1, (BYTE *) &ppd->d_id);
dbrpcparam(dbproc, NULL, 0, SQLINT1, -1, -1, (BYTE *) &ppd->c_d_id);
dbrpcparam(dbproc, NULL, 0, SQLINT4, -1, -1, (BYTE *) &ppd->c_id);
if (ppd->c_id == 0)
{
    dbrpcparam(dbproc, NULL, 0, SQLCHAR, -1, strlen(ppd->c_last), ppd-
>c_last);
};
};
if (dbrpcexec(dbproc) == SUCCEED)
{
    while ((rc = dbresults(dbproc)) != NO_MORE_RESULTS) && (rc !=
FAIL))
    {
        if (DBROWS(dbproc) && (dbnumcols(dbproc) == 27))
        {
            while ((rc = dbnextrow(dbproc)) != NO_MORE_ROWS) && (rc !=
FAIL))
            {
                if (pData=dbdata (dbproc, 1))
                    ppd->c_id = *((DBINT *) pData);
                if (pData=dbdata (dbproc, 2))
                    UtilStrCpy (ppd->c_last, pData, dbdatlen (dbproc, 2));
                if (pData=dbdata (dbproc, 3))
                {
                    datetime = *((DBDATETIME *) pData);
                    dbdatecrack (dbproc, &ppd->h_date, &datetime);
                };
                if (pData=dbdata (dbproc, 4))
                    UtilStrCpy (ppd->w_street_1, pData, dbdatlen (dbproc, 4));
                if (pData=dbdata (dbproc, 5))
                    UtilStrCpy (ppd->w_street_2, pData, dbdatlen (dbproc, 5));
                if (pData=dbdata (dbproc, 6))
                    UtilStrCpy (ppd->w_city, pData, dbdatlen (dbproc, 6));
                if (pData=dbdata (dbproc, 7))
                    UtilStrCpy (ppd->w_state, pData, dbdatlen (dbproc, 7));
                if (pData=dbdata (dbproc, 8))
                    UtilStrCpy (ppd->w_zip, pData, dbdatlen (dbproc, 8));
                if (pData=dbdata (dbproc, 9))
                    UtilStrCpy (ppd->d_street_1, pData, dbdatlen (dbproc, 9));
                if (pData=dbdata (dbproc, 10))
                    UtilStrCpy (ppd-
>d_street_2, pData, dbdatlen (dbproc, 10));
                if (pData=dbdata (dbproc, 11))
                    UtilStrCpy (ppd->d_city, pData, dbdatlen (dbproc, 11));
                if (pData=dbdata (dbproc, 12))
                    UtilStrCpy (ppd->d_state, pData, dbdatlen (dbproc, 12));
                if (pData=dbdata (dbproc, 13))
                    UtilStrCpy (ppd->d_zip, pData, dbdatlen (dbproc, 13));
                if (pData=dbdata (dbproc, 14))
                    UtilStrCpy (ppd->c_first, pData, dbdatlen (dbproc, 14));
                if (pData=dbdata (dbproc, 15))
                    UtilStrCpy (ppd->c_middle, pData, dbdatlen (dbproc, 15));
                if (pData=dbdata (dbproc, 16))
                    UtilStrCpy (ppd-
>c_street_1, pData, dbdatlen (dbproc, 16));
                if (pData=dbdata (dbproc, 17))

```

```

        UtilStrCpy (ppd-
>c_street_2, pData, dbdatlen (dbproc, 17));
        if (pData=dbdata (dbproc, 18))
            UtilStrCpy (ppd->c_city, pData, dbdatlen (dbproc, 18));
        if (pData=dbdata (dbproc, 19))
            UtilStrCpy (ppd->c_state, pData, dbdatlen (dbproc, 19));
        if (pData=dbdata (dbproc, 20))
            UtilStrCpy (ppd->c_zip, pData, dbdatlen (dbproc, 20));
        if (pData=dbdata (dbproc, 21))
            UtilStrCpy (ppd->c_phone, pData, dbdatlen (dbproc, 21));
        if (pData=dbdata (dbproc, 22))
        {
            datetime = *((DBDATETIME *) pData);
            dbdatecrack (dbproc, &ppd->c_since, &datetime);
        };
        if (pData=dbdata (dbproc, 23))
            UtilStrCpy (ppd->c_credit, pData, dbdatlen (dbproc, 23));
        if (pData=dbdata (dbproc, 24))
            ppd->c_credit_lim = *((DBFLT8 *) pData);
        if (pData=dbdata (dbproc, 25))
            ppd->c_discount = *((DBFLT8 *) pData);
        if (pData=dbdata (dbproc, 26))
            ppd->c_balance = *((DBFLT8 *) pData);
        if (pData=dbdata (dbproc, 27))
            UtilStrCpy (ppd->c_data, pData, dbdatlen (dbproc, 27));
    }; // while (dbnextrow)
}; // if (DBROWS && dbnumcols)
}; // while (dbresults)
}; // if (dbrpcexe)
if (bDeadlock)
{
    num_deadlocks++;
    bDeadlock = FALSE;
    userlog ("Payment Deadlock Retry (%d)", num_deadlocks);
    Sleep(10 * tryit);
}
else
{
    if (ppd->c_id == 0)
    {
        strcpy (ppd->execution_status, "Invalid Customer id,name.");
        return (SVCERR_NOCUSTOMER);
    }
    else
        strcpy (ppd->execution_status, "Transaction committed.");
    return (SVC_NOERROR);
}; // !bDeadlock
}; // for (tryit)

// If we reached here, it means we quit after MAX_RETRY deadlocks
strcpy (ppd->execution_status, "Hit deadlock max.");
userlog ("Payment Deadlock Failure (%d)", num_deadlocks);
return (SVCERR_DEADLOCK);
}; // SQLPayment

//=====
// FUNCTION: SQLOrderStatus
//
// Handles the Order Status transaction.

```

```

//
// ARGUMENTS:
// ORDER_STATUS_DATA      Payment input/output data structure
// dbdata (global)
// bDeadlock (global)
//
// RETURNS:
// SVC_NOERROR success
// !SVC_NOERROR failure
//
// COMMENTS:  None
//
//=====
int SQLOrderStatus(ORDER_STATUS_DATA * posd)
{
    RETCODE rc;
    int tryit;
    short num_deadlocks = 0;
    int i;
    DBDATETIME datetime;
    BYTE * pData;

    bFailed = FALSE;
    bDeadlock = FALSE;

    for (tryit=0; tryit < DeadlockRetry; tryit++)
    {
        if (dbrpcinit(dbproc,"tpcc_orderstatus", 0) == SUCCEED)
        {
            dbrpcparam(dbproc,NULL,0,SQLINT2,-1,-1,(BYTE *) &posd->w_id);
            dbrpcparam(dbproc,NULL,0,SQLINT1,-1,-1,(BYTE *) &posd->d_id);
            dbrpcparam(dbproc,NULL,0,SQLINT4,-1,-1,(BYTE *) &posd->c_id);
            if (posd->c_id == 0)
            {
                dbrpcparam(dbproc,NULL,0,SQLCHAR,-1,strlen(posd->c_last),posd-
>c_last);
            };
        };
        if (dbrpcexec(dbproc) == SUCCEED)
        {
            while (((rc = dbresults(dbproc)) != NO_MORE_RESULTS) && (rc !=
FAIL))
            {
                if (DBROWS(dbproc) && (dbnumcols(dbproc) == 5))
                {
                    i = 0;
                    while (((rc = dbnextrow(dbproc)) != NO_MORE_ROWS) && (rc !=
FAIL))
                    {
                        if (pData=dbdata(dbproc,1))
                            posd->OlOrderStatusData[i].ol_supply_w_id =
(* (DBSMALLINT *) pData);
                        if (pData=dbdata(dbproc,2))
                            posd->OlOrderStatusData[i].ol_i_id = (* (DBINT *)
pData);
                        if (pData=dbdata(dbproc,3))
                            posd->OlOrderStatusData[i].ol_quantity =
(* (DBSMALLINT *) pData);
                        if (pData=dbdata(dbproc,4))
                            posd->OlOrderStatusData[i].ol_amount = (* (DBFLT8 *)
pData);
                    }
                }
            }
        }
    }
}

```

```

        if (pData=dbdata(dbproc,5))
        {
            datetime = *((DBDATETIME *) pData);
            dbdatecrack(dbproc,&posd-
>OlOrderStatusData[i].ol_delivery_d,&datetime);
        };
        i++;
    }; // while (dbnextrow)
    posd->o_ol_cnt = i;
} // if (DBROWS && dbnumcols == 5)
else
if (DBROWS(dbproc) && (dbnumcols(dbproc) == 8))
{
    while (((rc = dbnextrow(dbproc)) != NO_MORE_ROWS) && (rc !=
FAIL))
    {
        if (pData=dbdata(dbproc,1))
            posd->c_id = (* (DBINT *) pData);
        if (pData=dbdata(dbproc,2))
            UtilStrCpy(posd->c_last,pData,dbdatlen(dbproc,2));
        if (pData=dbdata(dbproc,3))
            UtilStrCpy(posd->c_first,pData,dbdatlen(dbproc,3));
        if (pData=dbdata(dbproc,4))
            UtilStrCpy(posd->c_middle,pData,dbdatlen(dbproc,4));
        if (pData=dbdata(dbproc,5))
        {
            datetime = *((DBDATETIME *) pData);
            dbdatecrack(dbproc,&posd->o_entry_d,&datetime);
        };
        if (pData=dbdata(dbproc,6))
            posd->o_carrier_id = (* (DBSMALLINT *) pData);
        if (pData=dbdata(dbproc,7))
            posd->c_balance = (* (DBFLT8 *) pData);
        if (pData=dbdata(dbproc,8))
            posd->o_id = (* (DBINT *) pData);
    }; // while (dbnextrow)
}; // if (DBROWS && dbnumcols == 8)
if (i==0)
    return(SVCERR_NOORDERS); // "No orders found for customer"
}; // while (dbresults)
if (bDeadlock)
{
    num_deadlocks++;
    bDeadlock = FALSE;
    userlog("OrderStatus Deadlock Retry (%d)",num_deadlocks);
    Sleep(10 * tryit);
}
else
{
    if (posd->c_id == 0 && posd->c_last[0] == 0)
    {
        strcpy(posd->execution_status,"Invalid Customer id,name.");
        return(SVCERR_NOCUSTOMER);
    }
    else
        strcpy(posd->execution_status,"Transaction committed.");
    return(SVC_NOERROR);
}; // !bDeadlock
}; // for (tryit)

```

```

// If we reached here, it means we quit after MAX_RETRY deadlocks
strcpy(posd->execution_status,"Hit deadlock max.");
userlog("OrderStatus Deadlock Failure (%d)",num_deadlocks);
return(SVCERR_DEADLOCK);

}; // SQLOrderStatus

//=====
// FUNCTION: UtilStrCpy
//
// Copies n characters from string pSrc to pDst and places a null
// null character at the end of the destination string. Unlike
// strncpy this function ensures that the result string is always
// null terminated.
//
//=====
void UtilStrCpy(char * pDest, char * pSrc, int n)
{
    strncpy(pDest, pSrc, n);
    pDest[n] = '\0';
    return;
}; // UtilStrCpy

//=====
//
// Function name: GetArgs
//
//=====
VOID GetArgs(INT argc, CHAR **argv)
{
    INT j;
    CHAR * ptr;
    BOOL bRslt = TRUE;

    for (j = 1; j < argc; ++j)
    {
        ptr = argv[j];
        switch (ptr[1])
        {
            case 's':
            case 'S':
                strcpy(szServer,ptr+2);
                break;

            case 'd':
            case 'D':
                strcpy(szDatabase,ptr+2);
                break;

        }; // switch(ptr[1])
    }; // for (j = 1; j < argc; ++j)
}; // GetArgs

```

### tpccdelv.c

```

// tpccdelv.c
//
// Copyright Unisys, 1997
// Copyright Microsoft, 1996

```

```

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

#include <atmi.h>
#include <userlog.h>

#include "tpccsvr.h"

int iServerNo = 0;
char szServer[32] = "tpccdelv";
char szUser[32] = { 0 };
char szPassword[32] = { 0 };
char szDatabase[32] = "tpcc";
char szService[16] = "tpccdelv";
char szWork[200];

PDBPROCESS dbproc;
int spid; // spid assigned from dblink
BOOL bFailed;
BOOL bDeadlock;
short DeadlockRetry = (short)10;

FILE *fpLog;
char szLogTitle[32];
BOOL bFlush = FALSE; // flush after every write

int err_handler(DBPROCESS *dbproc,int severity,int dberr,int oserr,
                char *dberrstr, char *oserrstr);
int msg_handler(DBPROCESS *dbproc,DBINT msgno,int msgstate,
                int severity,char *msgtext);
void WriteLog(DELIVERY_DATA * pdd);
BOOL OpenLogFile(void);
void CalculateElapsed(int * pElapsed,LPSYSTEMTIME lpBegin,
                     LPSYSTEMTIME lpEnd);
void UtilStrCpy(char * pDest, char * pSrc, int n);
void GetArgs(INT argc, CHAR **argv);

//=====
//
// Function name: tpsvrinit
//
//=====
tpsvrinit(int argc, char *argv[])
{
    GetArgs(argc,argv);
    if (iServerNo == 0)
    {
        userlog("Error - Server Number (-n option) Not Set");
        return(-1);
    };
    sprintf(szWork,"%s%d Started, DBServer=%s,DB=%s",
            szService,iServerNo,szServer,szDatabase);
    userlog(szWork);
}

```

```

if (OpenLogFile())
    return(-1);
if (SQLInit(szServer,szDatabase,szUser,szPassword))
    return(-1);
userlog("Database open, initialization complete");
return(0);
}; // tpsvrinit

//=====
//
// Function name: tpsvrdone
//
//=====
void tpsvrdone()
{
    userlog("Shutdown request for tpccdelv server");
    if ( fpLog )
        fclose(fpLog);
    dbclose(dbproc);
    dbexit();
}; // tpsvrdone

//=====
//
// Function name: DELIVERY
//
// Entry point called by tuxedo for DELIVERY service requests.
//
//=====
void DELIVERY(TPSVCINFO * svcinfo)
{
    int iRslt;
    DELIVERY_DATA * pdd;

    pdd = (DELIVERY_DATA *) svcinfo->data;
    iRslt = SQLDelivery(pdd);
    WriteLog(pdd);

    // Check for DBLib termination error
    if (bFailed)
    {
        strcpy(pdd->execution_status,szWork);
        userlog(szWork);
        tpreturn(TPFAIL,SVCERR_DBLIB,svcinfo->data,svcinfo->len,0);
    }
    else
    if (iRslt == 0)
        tpreturn(TPSUCCESS,0,svcinfo->data,svcinfo->len,0);
    else
        tpreturn(TPFAIL,iRslt,svcinfo->data,svcinfo->len,0);
}; // DELIVERY

//=====
//
// Function name: SQLInit
//
// Set global dbproc and spid.
//
// Result:
// FALSE - database open, dbproc valid

```

```

// TRUE - database open failed
//
//=====
BOOL SQLInit(CHAR * pSvr,CHAR * pDB,CHAR * pUsr,CHAR * pPW,CHAR * pSvc)
{
    char szApp[32];
    char server[256];
    char database[256];
    char user[256];
    char password[256];
    LOGINREC *login;

    dbinit();
    // install error and message handlers
    dbmsghandle((DBMSGHANDLE_PROC)msg_handler);
    dberrhandle((DBERRHANDLE_PROC)err_handler);

    dbproc = NULL;
    strcpy(server,pSvr);
    strcpy(database,pDB);
    strcpy(user,pUsr);
    strcpy(password,pPW);
    sprintf(szApp,"%s%d",pSvc,_getpid());

    login = dblogin();
    if (!*user )
        DBSETLUSER(login,"sa");
    else
        DBSETLUSER(login,user);
    DBSETLPWD(login,password);
    DBSETLHOST(login,szApp);
// DBSETLPACKET(login,(unsigned short)DEFCLPACKSIZE);

    if ((dbproc = dbopen(login,server)) == NULL)
    {
        userlog("dbopen failed");
        return TRUE;
    };
    // Use the the right database
    dbuse(dbproc,database);
    dbcmd(dbproc,"select @@spid");
    dbsqlexec(dbproc);
    while (dbresults(dbproc) != NO_MORE_RESULTS)
    {
        dbbind(dbproc,1,SMALLBIND,(DBINT) 0,(BYTE *) spid);
        while (dbnextrow(dbproc) != NO_MORE_ROWS)
            ;
    };

    dbcmd(dbproc,"set nocount on");
    dbsqlexec(dbproc);
    while (dbresults(dbproc) != NO_MORE_RESULTS)
    {
        while (dbnextrow(dbproc) != NO_MORE_ROWS)
            ;
    };

    //rollback transaction on abort
    dbcmd(dbproc,"set XACT_ABORT ON");
    dbsqlexec(dbproc);
    while (dbresults(dbproc) != NO_MORE_RESULTS)

```

```

{
    while (dbnextrow(dbproc) != NO_MORE_ROWS)
    ;
};

return(FALSE);

}; // SQLInit

//=====
// FUNCTION: err_handler
//
// Handles DB-Library errors
//
// ARGUMENTS:
// DBPROCESS *dbproc DBPROCESS id pointer
// int severity severity of error
// int dberr error id
// int oserr operating system specific error code
// char *dberrstr printable error description of dberr
// char *oserrstr printable error description of oserr
//
// RETURNS:
// int INT_CANCEL
//
// COMMENTS: None
//
//=====
int err_handler(DBPROCESS *dbproc, int severity, int dberr, int oserr,
char *dberrstr, char *oserrstr)
{
    if ((dbproc == NULL) || (DBDEAD(dbproc)))
    {
        userlog("ErrHandler: DBPROC is invalid");
        return INT_CANCEL;
    };
    if (bFailed)
        return INT_CANCEL;
    if (oserr != DBNOERR)
    {
        sprintf(szWork,"ErrHandler: OSErr(%ld) - %s",oserr,oserrstr);
        userlog(szWork);
        bFailed = TRUE;
    };

    return INT_CANCEL;

}; // err_handler

//=====
// FUNCTION: msg_handler
//
// 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 operation
// INT_CANCEL cancel operation
//
// COMMENTS: This function also sets the dead lock dbproc
// variable if necessary.
//
//=====
int msg_handler(DBPROCESS *dbproc, DBINT msgno, int msgstate, int
severity, char *msgtext)
{
    if ((msgno == 5701) || (msgno == 2528) ||
        (msgno == 5703) || (msgno == 6006))
        return INT_CONTINUE;

    // deadlock message
    if (msgno == 1205)
    {
        // set the deadlock indicator
        bDeadlock = TRUE;
        return INT_CONTINUE;
    };

    if (bFailed)
        return INT_CANCEL;

    if (msgno == 0)
        return INT_CONTINUE;
    else
    {
        sprintf(szWork,"MsgHandler: MsgNo(%ld) - %s",msgno,msgtext);
        userlog(szWork);
        bFailed = TRUE;
    };

    return INT_CANCEL;

}; // msg_handler

//=====
// FUNCTION: SQLDelivery
//
// ARGUMENTS:
// pdd delivery transaction structure
// dbdata (global)
// bDeadlock (global)
//
// RETURNS:
// SVC_NOERROR success
// !SVC_NOERROR failure
//
// COMMENTS: None
//
//=====
int SQLDelivery(DELIVERY_DATA * pdd)
{
    RETCODE rc;
    int i;
    short num_deadlocks = 0;

```

```

int tryit;
DBDATETIME datetime;
BYTE * pData;

bFailed = FALSE;
bDeadlock = FALSE;
pdd->iComplete = 0;

for (tryit=0; tryit < DeadlockRetry; tryit++)
{
    if (dbrpcinit(dbproc,"tpcc_delivery",0) == SUCCEED)
    {
        dbrpcparam(dbproc,NULL,0,SQLINT2,-1,-1,(BYTE *) &pdd->w_id);
        dbrpcparam(dbproc,NULL,0,SQLINT1,-1,-1,(BYTE *) &pdd-
>o_carrier_id);

        if (dbrpcexec(dbproc) == SUCCEED)
        {
            while (((rc = dbresults(dbproc)) != NO_MORE_RESULTS) && (rc !=
FAIL))
            {
                while (((rc = dbnextrow(dbproc)) != NO_MORE_ROWS) && (rc !=
FAIL))
                {
                    for (i = 0; i < 10; i++)
                    {
                        if(pData = dbdata(dbproc,i + 1))
                            pdd->o_id[i] = *((DBINT *)pData);
                        else
                            pdd->o_id[i] = 0;
                    };
                }; // while (dbnextrow)
            }; // while (dbresults)
        }; // if (dbrpcexec)
    }; // if (dbrpcinit)
    if (bDeadlock)
    {
        num_deadlocks++;
        bDeadlock = FALSE;
        userlog("Delivery Deadlock Retry (%d)",num_deadlocks);
        Sleep(10 * tryit);
    }
    else
    {
        GetLocalTime(&pdd->EndTime);
        pdd->iComplete = 1;
        strcpy(pdd->execution_status,"Transaction committed.");
        return(SVC_NOERROR);
    };
}; // for (tryit)

// If we reached here, it means we quit after MAX_RETRY deadlocks
strcpy(pdd->execution_status,"Hit deadlock max.");
userlog("Delivery Deadlock Failure (%d)",num_deadlocks);
return(SVCERR_DEADLOCK);

}; // SQLDelivery

//=====
// FUNCTION: WriteLog
//

```

```

// Writes the delivery results to a log file.
//
// ARGUMENTS:
//     pDelivery    delivery information.
//
// RETURNS:
//
// COMMENTS:
//     Record format:
//         QTime,EndTime,Elapsed,w_id,o_carrier_id,o_id1, ... o_id10
//=====
void WriteLog(DELIVERY_DATA * pdd)
{
    int elapsed = 9999999;
    if (pdd->iComplete)
        CalculateElapsed(&elapsed,&pdd->QTime,&pdd->EndTime);
    fprintf(fpLog,
"%2.2d/%2.2d/%2.2d,%2.2d:%2.2d:%2.2d:%3.3d,%2.2d:%2.2d:%2.2d:%3.3d,"
"%d,%d,%d,%d,%d,%d,%d,%d,%d,%d,%d,%d\r\n",
pdd->EndTime.wYear - 1900,pdd->EndTime.wMonth,pdd->EndTime.wDay,
pdd->QTime.wHour,pdd->QTime.wMinute,
pdd->QTime.wSecond,pdd->QTime.wMilliseconds,
pdd->EndTime.wHour,pdd->EndTime.wMinute,
pdd->EndTime.wSecond,pdd->EndTime.wMilliseconds,
elapsed,pdd->w_id,pdd->o_carrier_id,
pdd->o_id[0],pdd->o_id[1],pdd->o_id[2],pdd->o_id[3],pdd->o_id[4],
pdd->o_id[5],pdd->o_id[6],pdd->o_id[7],pdd->o_id[8],pdd->o_id[9] );
    if (bFlush)
        fflush(fpLog);
}; // WriteLog

//=====
// FUNCTION: OpenLogFile
//
// Opens the delivery log file.
//
// ARGUMENTS:
//     None.
//
// RETURNS:
//     FALSE    Log file successfully opened
//     TRUE     Failed to open log file
//
// COMMENTS:
//
//=====
BOOL OpenLogFile(void)
{
    sprintf(szLogTitle,"%s%d",LOGFILE_NAME,iServerNo);
    fpLog = fopen(szLogTitle,"ab");
    if (!fpLog)
    {
        sprintf(szWork,"LogFile %s Open Failed (%d)",
szLogTitle,GetLastError());
        userlog(szWork);
        return(TRUE);
    };
    return(FALSE);
}; // OpenLogFile

```

```

//=====
// FUNCTION: CalculateElapsed
//
// Calculates the elapsed time of the delivery transaction.
//
// ARGUMENTS:
// lpBegin time delivery was queued
// lpEnd time delivery update completed
//
// RETURNS:
// int pElapsed elapsed time result (in milliseconds)
//
// COMMENTS:
// None
//
//=====
void CalculateElapsed(int * pElapsed,LPSYSTEMTIME lpBegin,
                    LPSYSTEMTIME lpEnd)
{
    int tmBegin;
    int tmEnd;

    tmBegin = (lpBegin->wHour * 3600000) + (lpBegin->wMinute * 60000) +
              (lpBegin->wSecond * 1000) + lpBegin->wMilliseconds;
    tmEnd = (lpEnd->wHour * 3600000) + (lpEnd->wMinute * 60000) +
           (lpEnd->wSecond * 1000) + lpEnd->wMilliseconds;
    *pElapsed = tmEnd - tmBegin;

    // Check for day boundry, this will function for 24 hour period but
    // will fail over a 48 hours period.
    if (*pElapsed < 0)
        *pElapsed = *pElapsed + (24 * 60 * 60 * 1000);
    return;
}; // CalculateElapsed

//=====
// FUNCTION: UtilStrCpy
//
// Copies n characters from string pSrc to pDst and places a null
// 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.
//
//=====
void UtilStrCpy(char * pDest, char * pSrc, int n)
{
    strncpy(pDest, pSrc, n);
    pDest[n] = '\0';
    return;
}; // UtilStrCpy

```

```

//=====
//
// Function name: GetArgs
//
//=====
void GetArgs(INT argc, CHAR **argv)
{
    INT j;
    CHAR * ptr;
    BOOL bRslt = TRUE;

    for (j = 1; j < argc; ++j)
    {
        ptr = argv[j];
        switch (ptr[1])
        {
            case 's':
            case 'S':
                strcpy(szServer,ptr+2);
                break;

            case 'd':
            case 'D':
                strcpy(szDatabase,ptr+2);
                break;

            case 'n':
            case 'N':
                iServerNo = atoi(ptr+2);
                break;

            case 'F':
            case 'f':
                bFlush = TRUE; //turn on delilog flush when written.
                break;

        }; // switch(ptr[1])
    }; // for (j = 1; j < argc; ++j)
}; // GetArgs

```

## DELIVERY REPORT MAKEFILE

```

# Microsoft Developer Studio Generated NMAKE File, Format Version 4.20
# ** DO NOT EDIT **

# TARGETTYPE "Win32 (x86) Console Application" 0x0103

!IF "$(CFG)" == ""
CFG=delirpt - Win32 Debug
!MESSAGE No configuration specified. Defaulting to delirpt - Win32 Debug.
!ENDIF

!IF "$(CFG)" != "delirpt - Win32 Release" && "$(CFG)" !=\
"delirpt - Win32 Debug"
!MESSAGE Invalid configuration "$(CFG)" specified.
!MESSAGE You can specify a configuration when running NMAKE on this
makefile
!MESSAGE by defining the macro CFG on the command line. For example:
!MESSAGE

```

```

!MESSAGE NMAKE /f "delirpt.mak" CFG="delirpt - Win32 Debug"
!MESSAGE
!MESSAGE Possible choices for configuration are:
!MESSAGE
!MESSAGE "delirpt - Win32 Release" (based on "Win32 (x86) Console
Application")
!MESSAGE "delirpt - Win32 Debug" (based on "Win32 (x86) Console
Application")
!MESSAGE
!ERROR An invalid configuration is specified.
!ENDIF

!IF "$(OS)" == "Windows_NT"
NULL=
!ELSE
NULL=nul
!ENDIF
#####
# Begin Project
CPP=cl.exe
RSC=rc.exe

!IF "$(CFG)" == "delirpt - Win32 Release"

# PROP BASE Use_MFC 0
# PROP BASE Use_Debug_Libraries 0
# PROP BASE Output_Dir "delirpt_"
# PROP BASE Intermediate_Dir "delirpt_"
# PROP BASE Target_Dir ""
# PROP Use_MFC 0
# PROP Use_Debug_Libraries 0
# PROP Output_Dir "delirpt_"
# PROP Intermediate_Dir "delirpt_"
# PROP Target_Dir ""
OUTDIR=.\delirpt_
INTDIR=.\delirpt_

ALL : "$(OUTDIR)\delirpt.exe"

CLEAN :
    -@erase "$(INTDIR)\DELIRPT.OBJ"
    -@erase "$(OUTDIR)\delirpt.exe"

"$(OUTDIR)" :
    if not exist "$(OUTDIR)/$(NULL)" mkdir "$(OUTDIR)"

# ADD BASE CPP /nologo /W3 /GX /O2 /D "WIN32" /D "NDEBUG" /D "_CONSOLE"
/YX /c
# ADD CPP /nologo /W3 /GX /O2 /D "WIN32" /D "NDEBUG" /D "CONSOLE" /YX /c
CPP_PROJ=/nologo /ML /W3 /GX /O2 /D "WIN32" /D "NDEBUG" /D "_CONSOLE" \
/Fp"$(INTDIR)/delirpt.pch" /YX /Fo"$(INTDIR)/" /c
CPP_OBJS=.\delirpt_/
CPP_SBRS=.\.
# ADD BASE RSC /l 0x409 /d "NDEBUG"
# ADD RSC /l 0x409 /d "NDEBUG"
BSC32=bscmake.exe
# ADD BASE BSC32 /nologo
# ADD BSC32 /nologo
BSC32_FLAGS=/nologo /o"$(OUTDIR)/delirpt.bsc"
BSC32_SBRS= \

```

```

LINK32=link.exe
# ADD BASE LINK32 kernel32.lib user32.lib gdi32.lib winspool.lib
comdlg32.lib advapi32.lib shell32.lib ole32.lib oleaut32.lib uuid.lib
odbc32.lib odbccp32.lib /nologo /subsystem:console /machine:I386
# ADD LINK32 kernel32.lib user32.lib gdi32.lib winspool.lib comdlg32.lib
advapi32.lib shell32.lib ole32.lib oleaut32.lib uuid.lib odbc32.lib
odbccp32.lib /nologo /subsystem:console /machine:I386
LINK32_FLAGS=kernel32.lib user32.lib gdi32.lib winspool.lib comdlg32.lib \
advapi32.lib shell32.lib ole32.lib oleaut32.lib uuid.lib odbc32.lib \
odbccp32.lib /nologo /subsystem:console /incremental:no \
/pdb:"$(OUTDIR)/delirpt.pdb" /machine:I386 /out:"$(OUTDIR)/delirpt.exe"
LINK32_OBJS= \
    "$(INTDIR)\DELIRPT.OBJ"

"$(OUTDIR)\delirpt.exe" : "$(OUTDIR)" $(DEF_FILE) $(LINK32_OBJS)
    $(LINK32) @<<
    $(LINK32_FLAGS) $(LINK32_OBJS)
<<

!ELSEIF "$(CFG)" == "delirpt - Win32 Debug"

# PROP BASE Use_MFC 0
# PROP BASE Use_Debug_Libraries 1
# PROP BASE Output_Dir "Debug"
# PROP BASE Intermediate_Dir "Debug"
# PROP BASE Target_Dir ""
# PROP Use_MFC 0
# PROP Use_Debug_Libraries 1
# PROP Output_Dir "Debug"
# PROP Intermediate_Dir "Debug"
# PROP Target_Dir ""
OUTDIR=.\Debug
INTDIR=.\Debug

ALL : "$(OUTDIR)\delirpt.exe"

CLEAN :
    -@erase "$(INTDIR)\DELIRPT.OBJ"
    -@erase "$(INTDIR)\vc40.idb"
    -@erase "$(INTDIR)\vc40.pdb"
    -@erase "$(OUTDIR)\delirpt.exe"
    -@erase "$(OUTDIR)\delirpt.ilc"
    -@erase "$(OUTDIR)\delirpt.pdb"

"$(OUTDIR)" :
    if not exist "$(OUTDIR)/$(NULL)" mkdir "$(OUTDIR)"

# ADD BASE CPP /nologo /W3 /Gm /GX /Zi /Od /D "WIN32" /D "_DEBUG" /D
"CONSOLE" /YX /c
# ADD CPP /nologo /W3 /Gm /GX /Zi /Od /D "WIN32" /D "_DEBUG" /D "_CONSOLE"
/YX /c
CPP_PROJ=/nologo /MLd /W3 /Gm /GX /Zi /Od /D "WIN32" /D "_DEBUG" /D
"CONSOLE" \
/Fp"$(INTDIR)/delirpt.pch" /YX /Fo"$(INTDIR)/" /Fd"$(INTDIR)/" /c
CPP_OBJS=.\Debug/
CPP_SBRS=.\.
# ADD BASE RSC /l 0x409 /d "_DEBUG"
# ADD RSC /l 0x409 /d "_DEBUG"
BSC32=bscmake.exe
# ADD BASE BSC32 /nologo

```



```

# ADD BSC32 /nologo
BSC32_FLAGS=/nologo /o"$(OUTDIR)/delirpt.bsc"
BSC32_SBRS= \

LINK32=link.exe
# ADD BASE LINK32 kernel32.lib user32.lib gdi32.lib winspool.lib
comdlg32.lib advapi32.lib shell32.lib ole32.lib oleaut32.lib uuid.lib
odbc32.lib odbccp32.lib /nologo /subsystem:console /debug /machine:I386
# ADD LINK32 kernel32.lib user32.lib gdi32.lib winspool.lib comdlg32.lib
advapi32.lib shell32.lib ole32.lib oleaut32.lib uuid.lib odbc32.lib
odbccp32.lib /nologo /subsystem:console /debug /machine:I386
LINK32_FLAGS=kernel32.lib user32.lib gdi32.lib winspool.lib comdlg32.lib\
advapi32.lib shell32.lib ole32.lib oleaut32.lib uuid.lib odbc32.lib\
odbccp32.lib /nologo /subsystem:console /incremental:yes\
/pdb:"$(OUTDIR)/delirpt.pdb" /debug /machine:I386
/out:"$(OUTDIR)/delirpt.exe"
LINK32_OBJS= \
    "$(INTDIR)\DELIRPT.OBJ"

"$ (OUTDIR)\delirpt.exe" : "$ (OUTDIR)" $(DEF_FILE) $(LINK32_OBJS)
    $(LINK32) @<<
    $(LINK32_FLAGS) $(LINK32_OBJS)
<<

!ENDIF

.c{$ (CPP_OBJS)}.obj:
    $(CPP) $(CPP_PROJ) $<

.cpp{$ (CPP_OBJS)}.obj:
    $(CPP) $(CPP_PROJ) $<

.cxx{$ (CPP_OBJS)}.obj:
    $(CPP) $(CPP_PROJ) $<

.c{$ (CPP_SBRS)}.sbr:
    $(CPP) $(CPP_PROJ) $<

.cpp{$ (CPP_SBRS)}.sbr:
    $(CPP) $(CPP_PROJ) $<

.cxx{$ (CPP_SBRS)}.sbr:
    $(CPP) $(CPP_PROJ) $<

#####
#####
# Begin Target

# Name "delirpt - Win32 Release"
# Name "delirpt - Win32 Debug"

!IF "$(CFG)" == "delirpt - Win32 Release"

!ELSEIF "$(CFG)" == "delirpt - Win32 Debug"

!ENDIF

#####
#####
# Begin Source File

```

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```

SOURCE=.\DELIRPT.C

"$ (INTDIR)\DELIRPT.OBJ" : $(SOURCE) "$ (INTDIR)"

# End Source File
# End Target
# End Project
#####
#####

                        delirpt.c

/*      FILE:          DELIRPT.C
*
*                      Microsoft TPC-C Kit Ver. 3.00.000
*
*                      Copyright Microsoft, 1996
*
*      PURPOSE:       Delivery report processing application
*      Author:        Philip Durr
*                      philipdu@Microsoft.com
*/

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

#define LOGFILE_READ_EOF      0
                                //check log file flag return current state
#define LOGFILE_CLEAR_EOF    1
                                //clear end of log file flag
#define LOGFILE_SET_EOF      2
                                //set flag end of log file reached

#define INTERVAL                .01
                                //90th percentile calculation bucket

interval

#define ERR_SUCCESS                1000
                                //success no error
#define ERR_READING_LOGFILE        1001
                                //io errors occurred reading delivery log file
#define ERR_INSUFFICIENT_MEMORY    1002
                                //insufficient memory to process 90th percentile report
#define ERR_CANNOT_OPEN_RESULTS_FILE 1005
                                //Cannot open delivery results file delilog.

typedef struct _RPTLINE
{
    SYSTEMTIME    start;
                                //delilog report line start time
    SYSTEMTIME    end;
                                //delilog report line end time
    int           response;
                                //delilog report line time delivery
    took in milliseconds
}

```

```

        int                w_id;
for delivery                //delilog report line warehouse id
        int                o_carrier_id;
                            //delilog report line carrier id for delivery
        int                items[10];
                            //delilog report line delivery line
items
} RPTLINE, *PRPTLINE;

//error message structure used in ErrorMessage API
typedef struct _SERRORMSG
{
        int                iError;                //error id of message
        char                szMsg[80];           //message to sent to browser
} SERRORMSG;

int                versionMS = 4;
//delirpt version
int                versionMM = 0;
int                versionLS = 0;
int                iReport;
//delirpt report to process
int                iStartTime;
int                //begin times to accept for report
                    iEndTime;
//end times to accept for report
FILE                *fpLog;
//log file stream
CHAR szLogFileTitle[100];
#define DEFAULTLOGTITLE "delilog."

//Local function prototypes
void                main(int argc, char *argv[]);
static int         Init(void);
static void        Restore(void);
static int         DoReport(void);
int                AverageResponse(void);
int                SkippedDelivery(void);
int                Percentile90th(void);
BOOL               CheckTimes(PRPTLINE pRptLine);
static int         OpenLogFile(void);
static void        CloseLogFile(void);
static void        ResetLogFile(void);
static BOOL        LogEOF(int iOperation);
static BOOL        ReadReportLine(char *szBuffer, PRPTLINE pRptLine);
static BOOL        ParseReportLine(char *szLine, PRPTLINE pRptLine);
static BOOL        ParseDate(char *szDate, LPSYSTEMTIME pTime);
static BOOL        ParseTime(char *szTime, LPSYSTEMTIME pTime);
static void        ErrorMessage(int iError);
static BOOL        GetParameters(int argc, char *argv[]);
static void        PrintParameters(void);
static void        PrintHeader(void);
static void        cls(void);
static BOOL        IsNumeric(char *ptr);

/* FUNCTION: int main(int argc, char *argv[])
 *
 * PURPOSE: This function is the beginning execution point for the
delivery executable.

```

```

 *
 * ARGUMENTS: int                argc                number of command line arguments
passed to delivery
 *
 * RETURNS:    None
 *
 * COMMENTS:   None
 */

void main(int argc, char *argv[])
{
        int                iError;

        PrintHeader();

        if ( GetParameters(argc, argv) )
        {
                PrintParameters();
                return;
        }

        if ( (iError=Init()) != ERR_SUCCESS )
        {
                ErrorMessage(iError);
                Restore();
                return;
        }

        if ( (iError = DoReport()) != ERR_SUCCESS )
                ErrorMessage(iError);

        Restore();

        return;
}

/* FUNCTION: static int Init(void)
 *
 * PURPOSE: This function initializes the delirtp application.
 *
 * ARGUMENTS: None
 *
 * RETURNS:    None
 *
 * COMMENTS:   None
 */

static int Init(void)
{
        int iError;

        if ( (iError = OpenLogFile()) )
                return iError;

        return TRUE;
}

/* FUNCTION: static void Restore(void)

```

```

*
* PURPOSE:      This function cleans up the delirpt application before
termination.
*
* ARGUMENTS:   None
*
* RETURNS:     None
*
* COMMENTS:    None
*
*/

static void Restore(void)
{
    CloseLogFile();
    return;
}

/* FUNCTION: static int DoReport(void)
*
* PURPOSE:      This function dispatches the requested report.
*
* ARGUMENTS:   None
*
* RETURNS:     ERR_SUCCESS if successfull or error code if an
error occurs.
*
* COMMENTS:    None
*
*/

static int DoReport(void)
{
    int iRc;

    switch(iReport)
    {
        case 1:
            iRc = AverageResponse();
            break;
        case 2:
            iRc = Percentile90th();
            break;
        case 3:
            iRc = SkippedDelivery();
            break;
        case 4:
            if ( (iRc = AverageResponse()) != ERR_SUCCESS )
                break;
            if ( (iRc = Percentile90th()) != ERR_SUCCESS )
                break;
            if ( (iRc = SkippedDelivery()) != ERR_SUCCESS )
                break;
            break;
    }
    return iRc;
}

/* FUNCTION: int AverageResponse(void)
*

```

```

* PURPOSE:      This function processes the AverageResponse report.
*
* ARGUMENTS:   None
*
* RETURNS:     ERR_SUCCESS if successfull or error code if an
error occurs.
*
* COMMENTS:    None
*
*/

int AverageResponse(void)
{
    RPTLINE reportLine;
    int      iTotalResponse;
    int      iLines;
    double   fAverage;
    char     szDelivery[128];

    ResetLogFile();

    iTotalResponse = 0;
    iLines = 0;
    printf("\n\n***** Average Response Time Report *****\n");
    while ( !LogEOF(LOGFILE_READ_EOF) )
    {
        if ( ReadReportLine(szDelivery, &reportLine) )
            return ERR_READING_LOGFILE;
        if ( !LogEOF(LOGFILE_READ_EOF) )
        {
            if ( CheckTimes(&reportLine) )
                continue;
            iLines++;
            iTotalResponse += reportLine.response;

            if ( iLines % 10 == 0 )
                printf("Reading Report Line:\t%d\r",
iLines);
        }
    }
    printf("                                \r");
    if ( iLines == 0 )
    {
        printf("No deliveries found.\n");
    }
    else
    {
        fAverage = ((double)iTotalResponse /
(double)iLines)/(double)1000;
        printf("Total Deliveries:          %10.0f\n", (float)iLines);
        printf("Total Response Times:          %10.3f\n",
((float)iTotalResponse/(float)1000));
        printf("Average Response Time: %10.3f\n", fAverage);
    }

    return ERR_SUCCESS;
}

/* FUNCTION: int Percentile90th(void)
*

```

```

* PURPOSE:          This function processes the 90th percentile report.
*
* ARGUMENTS:       None
*
* RETURNS:         ERR_SUCCESS if successfull or error code if an
error occurs.
*
* COMMENTS:       This function requires enough space to allocate needed
buckets which will be 2 * max response time
in
*
*                 deci-seconds.
*
*/

```

```

int Percentile90th(void)
{
    RPTLINE reportLine;
    int      iBucketSize;
    int      i;
    int      iResponseSeconds;
    int      iMaxSeconds;
    int      iTotalBuckets;
    double   iTotal;
    double   i90thPercent;
    short    *psBuckets;
    char     szDelivery[128];

    printf("\n\n***** 90th Percentile *****\n");
    printf("Calculating Max Response Seconds...\n");

    ResetLogFile();

    iMaxSeconds = -1;
    while ( !LogEOF(LOGFILE_READ_EOF) )
    {
        if ( ReadReportLine(szDelivery, &reportLine) )
            return ERR_READING_LOGFILE;
        if ( szDelivery[0] == '*' )
            continue;
        if ( !LogEOF(LOGFILE_READ_EOF) )
        {
            if ( iMaxSeconds < reportLine.response )
                iMaxSeconds = reportLine.response;
        }
    }

    iTotalBuckets = iMaxSeconds + 1;

    printf("Allocating Buckets...\n");

    iBucketSize = iTotalBuckets * sizeof(short);

    if ( !(psBuckets = (short *)malloc(iBucketSize)) )
        return ERR_INSUFFICIENT_MEMORY;

    ZeroMemory(psBuckets, iBucketSize);

    iTotal = 0;

    ResetLogFile();
    printf("Calculating Distribution...\n");

```

```

        iMaxSeconds = -1;
        while ( !LogEOF(LOGFILE_READ_EOF) )
        {
            if ( ReadReportLine(szDelivery, &reportLine) )
                return ERR_READING_LOGFILE;
            if ( szDelivery[0] == '*' )
                continue;
            if ( !LogEOF(LOGFILE_READ_EOF) )
            {
                if ( CheckTimes(&reportLine) )
                    continue;
                psBuckets[reportLine.response]++;
                iTotal++;
                if ( iMaxSeconds < reportLine.response )
                    iMaxSeconds = reportLine.response;
            }
        }

        printf("Max Response Time = %d.%d\n",
(iMaxSeconds / 1000), (iMaxSeconds % 1000));

        i90thPercent = iTotal * .9;

        for(i=0, iTotal = 0.0; iTotal < i90thPercent; iTotal +=
(double)psBuckets[i] )
            i++;

        printf("90th Percentile = %d.%d\n", i/1000, (i % 1000));

        free(psBuckets);

        return ERR_SUCCESS;
    }

```

```

/* FUNCTION: int SkippedDelivery(void)
*
* PURPOSE:          This function processes the Skipped Deliveries
report.
*
* ARGUMENTS:       None
*
* RETURNS:         ERR_SUCCESS if successfull or error code if an
error occurs.
*
* COMMENTS:       None
*
*/

```

```

int SkippedDelivery(void)
{
    RPTLINE reportLine;
    char     szDelivery[128];
    int      i;
    int      items[10];

    ResetLogFile();

    printf("\n\n***** Skipped Delivery Report *****\n");
    memset(items, 0, sizeof(items));
    printf("Reading Delivery Log File...");

```

```

while ( !LogEOF(LOGFILE_READ_EOF) )
{
    if ( ReadReportLine(szDelivery, &reportLine) )
        return ERR_READING_LOGFILE;
    if ( !LogEOF(LOGFILE_READ_EOF) )
    {
        if ( CheckTimes(&reportLine) )
            continue;
        for(i=0; i<10; i++)
        {
            if ( !reportLine.items[i] )
                items[i]++;
        }
    }
    printf("\n");
    printf("Skipped delivery table.\n");
    printf(" 1      2      3      4      5      6      7      8      9     10 \n");
    printf("-----\n");
    for(i=0; i<10; i++)
        printf("%4.4d ", items[i]);
    printf("\n");

    return ERR_SUCCESS;
}

/* FUNCTION: BOOL CheckTimes(PRPTLINE pRptLine)
*
* PURPOSE: This function checks to see if the delilog record falls
withing the
*          begin and end time from the command line.
*
* ARGUMENTS: PRPTLINE      pRptLine      delilog processed report
line.
*
* RETURNS:      BOOL      FALSE  if report line is not within the
requested
start and end times.
*
*              TRUE   if the report line is
within the
*              requested
start and end times.
*
* COMMENTS:  If startTime and endTime are both 0 then the user requested
the default behavior which is all records in
delilog are
*           valid.
*/

BOOL CheckTimes(PRPTLINE pRptLine)
{
    int      iRptEndTime;
    int      iRptStartTime;

    iRptStartTime = (pRptLine->start.wHour * 3600000) + (pRptLine-
>start.wMinute * 60000) + (pRptLine->start.wSecond * 1000) + pRptLine-
>start.wMilliseconds;

```

```

        iRptEndTime = (pRptLine->end.wHour * 3600000) + (pRptLine-
>end.wMinute * 60000) + (pRptLine->end.wSecond * 1000) + pRptLine-
>end.wMilliseconds;

        if ( iStartTime == 0 && iEndTime == 0 )
            return FALSE;

        if ( iStartTime <= iRptStartTime && iEndTime >= iRptEndTime )
            return FALSE;

        return TRUE;
}

/* FUNCTION: int OpenLogFile(void)
*
* PURPOSE: This function opens the delivery log file for use.
*
* ARGUMENTS: None
*
* RETURNS:      int      ERR_CANNOT_OPEN_RESULTS_FILE  Cannot create
results log file.
*
*              ERR_SUCCESS
Log file successfully opened
*
*
* COMMENTS:  None
*/

static int OpenLogFile(void)
{
    fpLog = fopen(szLogFileTitle, "rb");

    if ( !fpLog )
        return ERR_CANNOT_OPEN_RESULTS_FILE;

    return ERR_SUCCESS;
}

/* FUNCTION: int CloseLogFile(void)
*
* PURPOSE: This function closes the delivery log file.
*
* ARGUMENTS: None
*
* RETURNS:      None
*
* COMMENTS:  None
*/

static void CloseLogFile(void)
{
    if ( fpLog )
        fclose(fpLog);

    return;
}

```

```

/* FUNCTION: static void ResetLogFile(void)
*
* PURPOSE: This function prepares the delilog. file for reading
*
* ARGUMENTS: None
*
* RETURNS: None
*
* COMMENTS: None
*/

static void ResetLogFile(void)
{
    fseek(fpLog, 0L, SEEK_SET);
    LogEOF(LOGFILE_CLEAR_EOF);

    return;
}

/* FUNCTION: static BOOL LogEOF(int iOperation)
*
* PURPOSE: This function tracks and reports the end of file condition
*          on the delilog file.
*
* ARGUMENTS: int iOperation requested operation this can be:
*
*          LOGFILE_READ_EOF    check log file flag return current state
*
*          LOGFILE_CLEAR_EOF   clear end of log file flag
*
*          LOGFILE_SET_EOF     set flag end of log file reached
*
* RETURNS: None
*
* COMMENTS: None
*/

static BOOL LogEOF(int iOperation)
{
    static BOOL bEOF;

    switch(iOperation)
    {
        case LOGFILE_READ_EOF:
            return bEOF;
            break;
        case LOGFILE_CLEAR_EOF:
            bEOF = FALSE;
            break;
        case LOGFILE_SET_EOF:
            bEOF = TRUE;
            break;
    }

    return FALSE;
}

/* FUNCTION: static BOOL ReadReportLine(char *szBuffer, PRPTLINE pRptLine)

```

```

*
* PURPOSE: This function reads a text line from the delilog file.
*          on the delilog file.
*
* ARGUMENTS: char *szBuffer    buffer to placed read delilog
*          file line into.
*          PRPTLINE pRptLine    returned
*          structure containing parsed delilog
*          report line.
*
* RETURNS: FALSE if successfull or TRUE if an error occurs.
*
* COMMENTS: None
*/

static BOOL ReadReportLine(char *szBuffer, PRPTLINE pRptLine)
{
    int i = 0;
    int ch;
    int iEof;

    while( i < 128 )
    {
        ch = fgetc(fpLog);
        if ( iEof = feof(fpLog) )
            break;
        if ( ch == '\r' )
        {
            if ( i )
                break;
            continue;
        }
        if ( ch == '\n' )
            continue;
        szBuffer[i++] = ch;
    }

    //delivery item format is to long cannot be a valid delivery item
    if ( i >= 128 )
        return TRUE;

    szBuffer[i] = 0;
    if ( iEof )
    {
        LogEOF(LOGFILE_SET_EOF);
        if ( i == 0 )
            return FALSE;
    }

    return ParseReportLine(szBuffer, pRptLine);
}

/* FUNCTION: static BOOL ParseReportLine(char *szLine, PRPTLINE pRptLine)
*
* PURPOSE: This function reads a text line from the delilog file.
*          on the delilog file.
*
* ARGUMENTS: char *szLine    buffer containing the delilog
*          file line to be parsed.

```

```

*          PRPTLINE      pRptLine      returned
structure containing parsed delilog
*
*   report line values.
*
* RETURNS:      FALSE   if successfull or TRUE if an error occurs.
*
* COMMENTS:    None
*/

static BOOL ParseReportLine(char *szLine, PRPTLINE pRptLine)
{
    int i;

    if ( ParseDate(szLine, &pRptLine->start) )
        return TRUE;

    pRptLine->end.wYear = pRptLine->start.wYear;
    pRptLine->end.wMonth = pRptLine->start.wMonth;
    pRptLine->end.wDay = pRptLine->start.wDay;

    if ( !(szLine = strchr(szLine, ',')) )
        return TRUE;
    szLine++;

    if ( ParseTime(szLine, &pRptLine->start) )
        return TRUE;

    if ( !(szLine = strchr(szLine, ',')) )
        return TRUE;
    szLine++;

    if ( ParseTime(szLine, &pRptLine->end) )
        return TRUE;

    if ( !(szLine = strchr(szLine, ',')) )
        return TRUE;
    szLine++;

    if ( !IsNumeric(szLine) )
        return TRUE;
    pRptLine->response = atoi(szLine);

    if ( !(szLine = strchr(szLine, ',')) )
        return TRUE;
    szLine++;

    if ( !IsNumeric(szLine) )
        return TRUE;
    pRptLine->w_id = atoi(szLine);

    if ( !(szLine = strchr(szLine, ',')) )
        return TRUE;
    szLine++;

    if ( !IsNumeric(szLine) )
        return TRUE;
    pRptLine->o_carrier_id = atoi(szLine);

```

```

    if ( !(szLine = strchr(szLine, ',')) )
        return TRUE;
    szLine++;

    for(i=0; i<10; i++)
    {
        if ( !IsNumeric(szLine) )
            return TRUE;
        pRptLine->items[i] = atoi(szLine);

        if ( i<9 && !(szLine = strchr(szLine, ',')) )
            return TRUE;
        szLine++;
    }

    return FALSE;
}

/* FUNCTION: static BOOL ParseDate(char *szDate, LPSYSTEMTIME pTime)
*
* PURPOSE:   This function validates and extracts a date string in the
format
*           yy/mm/dd into an SYSTEMTIME structure.
*
* ARGUMENTS: char          *szDate          buffer containing the
date to be parsed.
*           LPSYSTEMTIME  pTime            system time
structure where date will be placed.
*
* RETURNS:   FALSE if successfull or TRUE if an error occurs.
*
* COMMENTS:  None
*/

static BOOL ParseDate(char *szDate, LPSYSTEMTIME pTime)
{
    if ( !isdigit(*szDate) || !isdigit(*(szDate+1)) || *(szDate+2) !=
'/' ||
        !isdigit(*(szDate+3)) || !isdigit(*(szDate+4)) ||
*(szDate+5) != '/' ||
        !isdigit(*(szDate+6)) || !isdigit(*(szDate+7)) )
        return TRUE;

    pTime->wYear = atoi(szDate);

    pTime->wMonth = atoi(szDate+3);

    pTime->wDay = atoi(szDate+6);

    if ( pTime->wMonth > 12 || pTime->wMonth < 0 || pTime->wDay > 31
|| pTime->wDay < 0 )
        return TRUE;

    return FALSE;
}

/* FUNCTION: static BOOL ParseTime(char *szTime, LPSYSTEMTIME pTime)
*

```

```

* PURPOSE: This function validates and extracts a time string in the
format
*           hh:mm:ss:mmm into an SYSTEMTIME structure.
*
* ARGUMENTS: char          *szTime          buffer containing the
time to be parsed.
*           LPSYSTEMTIME  pTime           system time
structure where date will be placed.
*
* RETURNS: FALSE if successfull or TRUE if an error occurs.
*
* COMMENTS: None
*/

static BOOL ParseTime(char *szTime, LPSYSTEMTIME pTime)
{
    if ( !isdigit(*szTime) || !isdigit(*(szTime+1)) || *(szTime+2) !=
':' ||
        !isdigit(*(szTime+3)) || !isdigit(*(szTime+4)) ||
*(szTime+5) != ':' ||
        !isdigit(*(szTime+6)) || !isdigit(*(szTime+7)) ||
*(szTime+8) != ':' ||
        !isdigit(*(szTime+9)) || !isdigit(*(szTime+10)) ||
!isdigit(*(szTime+11)) )
        return TRUE;

    pTime->wHour = atoi(szTime);
    pTime->wMinute = atoi(szTime+3);
    pTime->wSecond = atoi(szTime+6);
    pTime->wMilliseconds = atoi(szTime+9);

    if ( pTime->wHour > 23 || pTime->wHour < 0 ||
        pTime->wMinute > 59 || pTime->wMinute < 0 ||
        pTime->wSecond > 59 || pTime->wSecond < 0 ||
        pTime->wMilliseconds < 0 )
        return TRUE;

    if ( pTime->wMilliseconds > 999 )
    {
        pTime->wSecond += (pTime->wMilliseconds/1000);
        pTime->wMilliseconds = pTime->wMilliseconds % 1000;
    }

    return FALSE;
}

/* FUNCTION: void ErrorMessage(int iError)
*
* PURPOSE: This function displays an error message in the delivery
executable's console window.
*
* ARGUMENTS: int          iError error id to be displayed
*
* RETURNS: None
*
* COMMENTS: None
*/

static void ErrorMessage(int iError)

```

```

{
    int i;

    static SERRORMSG errorMsgs[] =
    {
        { ERR_SUCCESS,
          "Success, no error."
        },
        { ERR_CANNOT_OPEN_RESULTS_FILE,
          "Cannot open delivery results log file."
        },
        { ERR_READING_LOGFILE,
          "Reading delivery log file, Delivery item format incorrect."
        },
        { ERR_INSUFFICIENT_MEMORY,
          "insufficient memory to process 90th percentile report."
        },
        { 0, ""
        }
    };

    for(i=0; errorMsgs[i].szMsg[0]; i++)
    {
        if ( iError == errorMsgs[i].iError )
        {
            printf("\nError(%d): %s\n", iError,
errorMsgs[i].szMsg);
            return;
        }
    }

    printf("Error(%d): %s", errorMsgs[0].szMsg);
    return;
}

/* FUNCTION: BOOL GetParameters(int argc, char *argv[])
*
* PURPOSE: This function parses the command line passed in to the
delivery executable, initializing
*           and filling in global variable parameters.
*
* ARGUMENTS: int          argc    number of command line arguments
passed to delivery
*           char          *argv[] array of command line
argument pointers
*
* RETURNS: BOOL FALSE parameter read successfull
TRUE user has requested
parameter information screen be displayed.
*
* COMMENTS: None
*/

static BOOL GetParameters(int argc, char *argv[])
{
    int i;
    SYSTEMTIME startTime;
    SYSTEMTIME endTime;
    UINT uLogTitleLen;

```



```

iStartTime = 0;
iEndTime = 0;
iReport = 4;
strcpy(szLogFileTitle,DEFAULTLOGTITLE);

for(i=0; i<argc; i++)
{
    if ( argv[i][0] == '-' || argv[i][0] == '/' )
    {
        switch(argv[i][1])
        {
            case 'S':
            case 's':
                if ( ParseTime(argv[i]+2,
&startTime) )
                    return TRUE;
                iStartTime = (startTime.wHour *
3600000) + (startTime.wMinute * 60000) + (startTime.wSecond * 1000) +
startTime.wMilliseconds;
                break;
            case 'E':
            case 'e':
                if ( ParseTime(argv[i]+2, &endTime)
)
                    return TRUE;
                iEndTime = (endTime.wHour * 3600000)
+ (endTime.wMinute * 60000) + (endTime.wSecond * 1000) +
endTime.wMilliseconds;
                break;
            case 'R':
            case 'r':
                iReport = atoi(argv[i]+2);
                if ( iReport > 4 || iReport < 1 )
                    iReport = 4;
                break;
            case 'F':
            case 'f':
                uLogTitleLen = strlen(argv[i] - 2);
                if (uLogTitleLen > 0 && uLogTitleLen <
sizeof(szLogFileTitle))
                {
                    strcpy(szLogFileTitle,argv[i]+2);
                    printf("Log File Title set to %s",szLogFileTitle);
                };
                break;
            case '?':
                return TRUE;
        }
    }
}
return FALSE;

/* FUNCTION: void PrintParameters(void)
*
* PURPOSE: This function displays the supported command line flags.
*
* ARGUMENTS: None
*

```

```

* RETURNS: None
*
* COMMENTS: None
*
*/

static void PrintParameters(void)
{
    PrintHeader();
    printf("DELIRPT:\n\n");
    printf("Parameter
Default\n");
    printf("-----\n");
    printf("-S Start Time HH:MM:SS:MMM
\n");
    printf("-E End Time HH:MM:SS:MMM
\n");
    printf("-R 1)Average Response, 2)90th 3) Skipped 4) All
\n");
    printf("-? This help screen\n\n");
    printf("Note: Command line switches are NOT case sensitive.\n");
    return;
}

/* FUNCTION: void PrintHeader(void)
*
* PURPOSE: This function displays the delivery report applications
banner information.
*
* ARGUMENTS: None
*
* RETURNS: None
*
* COMMENTS: None
*
*/

static void PrintHeader(void)
{
    //cls();

    printf("*****\n");
    printf("*\n");
    printf("** Microsoft SQL Server 6.5\n");
    printf("**\n");
    printf("** HTML TPC-C BENCHMARK KIT: Delivery Report\n");
    printf("** Version %d.%2.2d.%3.3d\n");
    printf("** versionMS, versionMM, versionLS);
\n");
    printf("*\n");
    printf("*****\n\n");
}

return;

/* FUNCTION: void cls(void)
*
* PURPOSE: This function clears the console window
*

```

```

* ARGUMENTS:  None
*
* RETURNS:    None
*
* COMMENTS:   None
*
*/

static void cls(void)
{
    HANDLE hConsole;
    COORD  coordScreen = { 0, 0 };           //here's where
we'll home the cursor
    DWORD  cCharsWritten;
    CONSOLE_SCREEN_BUFFER_INFO  csbi;      //to get buffer info
    DWORD  dwConSize;                     dwConSize;
    //number of character cells in the current buffer

    hConsole = GetStdHandle(STD_OUTPUT_HANDLE);

    //get the number of character cells in the current buffer

    GetConsoleScreenBufferInfo( hConsole, &csbi );
    dwConSize = csbi.dwSize.X * csbi.dwSize.Y;

    //fill the entire screen with blanks
    FillConsoleOutputCharacter( hConsole, (TCHAR) ' ', dwConSize,
coordScreen, &cCharsWritten );
    GetConsoleScreenBufferInfo( hConsole, &csbi );

    //now set the buffer's attributes accordingly
    FillConsoleOutputAttribute( hConsole, csbi.wAttributes,dwConSize,
coordScreen, &cCharsWritten );

    //put the cursor at (0, 0)
    SetConsoleCursorPosition( hConsole, coordScreen );

    return;
}

/* 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'
*
* COMMENTS:  A comma is counted as a valid delimiter.
*
*/

static BOOL IsNumeric(char *ptr)
{
    if ( *ptr == 0 )
        return FALSE;

```

```

while( *ptr && isdigit(*ptr) )
    ptr++;
if ( !*ptr || *ptr == ',' )
    return TRUE;
else
    return FALSE;
}

```

# Appendix B - Database Design

## Build Scripts

### CREATEDB.SQL

```
/* TPC-C Benchmark Kit */
/* */
/* CREATEDB.SQL */
/* */
/* This script is used to create the database */
/* for a 1110 warehouse tpcc database. */

use master
go

if exists ( select name from sysdatabases where name = "tpcc" )
    drop database tpcc
go

/* tpcc database size */
/* 3,500 MB on misc segment */
/* 63,000 MB on cs segment */
/* 22,500 MB on ol segment */
/* 32,750 MB on syslogs segment */
/* total 121,750 MB (118.896 GB) */

/* total of 17 device fragments */

create database tpcc

    on tpc_misc1 = 655, tpc_misc2 = 655,
    tpc_misc3 = 655, tpc_misc4 = 655,
    tpc_misc5 = 880,

    tpc_cs1 = 9952, tpc_cs2 = 9952,
    tpc_cs3 = 9952, tpc_cs4 = 9952,
    tpc_cs5 = 9952, tpc_cs6 = 13240,

    tpc_ol1 = 4549, tpc_ol2 = 4549,
    tpc_ol3 = 4549, tpc_ol4 = 4549,
    tpc_ol5 = 4304

    log on tpc_log = 32750
go
```

### DBOPT1.SQL

```
/* TPC-C Benchmark Kit */
/* */
/* */
/* DBOPT1.SQL */
/* */
/* */
/* Set database options for database load */
/* */

use master
go

sp_dboption tpcc,'select into/bulkcopy',true
go

sp_dboption tpcc,'trunc. log on chkpt.',true
go

use tpcc
go

checkpoint
go

use tpcc_admin
go

sp_dboption tpcc,'trunc. log on chkpt.',true
go
```

### DBOPT2.SQL

```
/* TPC-C Benchmark Kit */
/* */
/* */
/* DBOPT2.SQL */
/* */
/* */
/* Reset database options after database load */
/* */
```

```

use master
go

sp_dboption tpcc,'select ',false
go

sp_dboption tpcc,'trunc. ',false
go

use tpcc
go

checkpoint
go

```

## DISKINIT.SQL

```

/* TPC-C Benchmark Kit          */
/*                               */
/* DISKINIT.SQL                 */
/*                               */
/* This script is used create devices */
/* for 1110 warehouse tpcc database */
/*                               */

use master
go

/* devices for warehouse, district, item, history, */
/* orders and new-order tables                      */
/* 655MB = 335,360 pages of 2KB per device          */
/* 880MB = 450,560 pages of 2KB per device          */
/* 3,500MB total (3.418GB) = 4 x 655 + 880        */
/*                               */

disk init name = "tpc_misc1",
  physname     = "G:",
  vdevno       = 14,
  size         = 335360
go

disk init name = "tpc_misc2",
  physname     = "H:",
  vdevno       = 15,
  size         = 335360
go

disk init name = "tpc_misc3",
  physname     = "I:",
  vdevno       = 16,
  size         = 335360
go

disk init name = "tpc_misc4",
  physname     = "F:",
  vdevno       = 17,
  size         = 335360
go

disk init name = "tpc_misc5",

```

```

  physname     = "E:",
  vdevno       = 18,
  size         = 450560
go

/* devices for customer and stock tables          */
/* 9,952MB = 5,095,424 pages of 2KB per device    */
/* 13,240MB = 6,778,880 pages of 2KB per device   */
/* 63,000MB total (61.523GB) = 5 x 9952 + 13240  */
/*                               */
disk init name = "tpc_cs1",
  physname     = "L:",
  vdevno       = 20,
  size         = 5095424
go

disk init name = "tpc_cs2",
  physname     = "M:",
  vdevno       = 21,
  size         = 5095424
go

disk init name = "tpc_cs3",
  physname     = "N:",
  vdevno       = 22,
  size         = 5095424
go

disk init name = "tpc_cs4",
  physname     = "O:",
  vdevno       = 23,
  size         = 5095424
go

disk init name = "tpc_cs5",
  physname     = "J:",
  vdevno       = 24,
  size         = 5095424
go

disk init name = "tpc_cs6",
  physname     = "K:",
  vdevno       = 25,
  size         = 6778880
go

/* devices for order-line                          */
/* 4,549MB = 2,329,088 pages of 2KB per volume    */
/* 4,304MB = 2,203,648 pages of 2KB per volume   */
/* 22,500MB total (21.973GB) = 4 x 4549 + 4304  */
/*                               */
disk init name = "tpc_ol1",
  physname     = "T:",
  vdevno       = 27,
  size         = 2329088
go

disk init name = "tpc_ol2",
  physname     = "U:",

```

```

        vdevno = 28,
        size   = 2329088
go

disk init name = "tpc_ol3",
        physname = "R:",
        vdevno   = 29,
        size     = 2329088
go

disk init name = "tpc_ol4",
        physname = "S:",
        vdevno   = 30,
        size     = 2329088
go

disk init name = "tpc_ol5",
        physname = "P:",
        vdevno   = 31,
        size     = 2203648
go

/* Log device
/* 32,750MB = 16,768,000 pages of 2KB
/* 32,750MB total (31.982GB)
*/
*/

disk init name = "tpc_log",
        physname = "V:",
        vdevno   = 33,
        size     = 16768000
go

```

### IDXCUSCL.SQL

```

/* TPC-C Benchmark Kit
*/
/*
*/
/* IDXCUSCL.SQL
*/
/*
*/
/* Creates clustered index on customer (seg)
*/

```

```

use tpcc
go

```

```

if exists ( select name from sysindexes where name = 'customer_cl' )

```

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```

        drop index customer.customer_cl
go

select getdate()
go
create unique clustered index customer_cl on customer(c_w_id, c_d_id,
c_id)
        with sorted_data on cs_seg
go
select getdate()
go

```

### IDXCUSNC.SQL

```

/* TPC-C Benchmark Kit
*/
/*
*/
/* IDXCUSNC.SQL
*/
/*
*/
/* Creates non-clustered index on customer (seg)
*/
*/

```

```

use tpcc
go

```

```

if exists ( select name from sysindexes where name = 'customer_nc1' )
        drop index customer.customer_nc1
go

```

```

select getdate()
go
create unique nonclustered index customer_nc1 on customer(c_w_id, c_d_id,
c_last, c_first, c_id)
        on cs_seg
go
select getdate()
go

```

### IDXDISCL.SQL

```

/* TPC-C Benchmark Kit
*/
/*
*/
/* IDXDISCL.SQL
*/
/*
*/
/* Creates clustered index on district (seg)
*/
*/

```

```

use tpcc
go

```

```

use tpcc
go

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

select getdate()
go
create unique clustered index district_c1 on district(d_w_id, d_id)
    with fillfactor=1 on misc_seg
go
select getdate()
go

```

### IDXITMCL.SQL

```

/* TPC-C Benchmark Kit
*/
/*
*/
/* IDXITMCL.SQL
*/
/*
*/
/* Creates clustered index on item (seg)
*/

```

```

use tpcc
go

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

select getdate()
go
create unique clustered index item_c1 on item(i_id)
    with sorted_data on misc_seg
go
select getdate()
go

```

### IDXNODCL.SQL

```

/* TPC-C Benchmark Kit
*/
/*
*/
/* IDXNODCL.SQL
*/
/*
*/

```

```

/* Creates clustered index on new-order (seg)
*/
use tpcc
go

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

select getdate()
go
create unique clustered index new_order_c1 on new_order(no_w_id, no_d_id,
no_o_id)
    with sorted_data on misc_seg
go
select getdate()
go

```

### IDXODLCL.SQL

```

/* TPC-C Benchmark Kit
*/
/*
*/
/* IDXODLCL.SQL
*/
/*
*/
/* Creates clustered index on order-line (seg)
*/

```

```

use tpcc
go

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

select getdate()
go
create unique clustered index order_line_c1 on order_line(ol_w_id,
ol_d_id, ol_o_id, ol_number)
    with sorted_data on ol_seg
go
select getdate()
go

```

### IDXORDCL.SQL

```

/* TPC-C Benchmark Kit
*/

```

```

/*
*/
/*  IDXORDCL.SQL
*/
/*
*/
/*  Creates clustered index on orders (seg)
*/

use tpcc
go

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

select getdate()
go
create unique clustered index orders_c1 on orders(o_w_id, o_d_id, o_id)
    with sorted_data on misc_seg
go
select getdate()
go

```

### IDXSTKCL.SQL

```

/*  TPC-C Benchmark Kit
*/
/*
*/
/*  IDXSTKCL.SQL
*/
/*
*/
/*  Creates clustered index on stock (seg)
*/

use tpcc
go

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

select getdate()
go
create unique clustered index stock_c1 on stock(s_i_id, s_w_id)
    with sorted_data on cs_seg
go
select getdate()
go

```

### IDXWARCL.SQL

```

/*  TPC-C Benchmark Kit
*/
/*
*/
/*  IDXWARCL.SQL
*/
/*
*/
/*  Creates clustered index on warehouse (seg)
*/

use tpcc
go

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

select getdate()
go
create unique clustered index warehouse_c1 on warehouse(w_id)
    with fillfactor=1 on misc_seg
go
select getdate()
go

```

### PINTABLE.SQL

```

/*  TPC-C Benchmark Kit
*/
/*
*/
/*  PINTABLE.SQL
*/
/*
*/
/*  This script file is used to 'pin' certain tables in the data cache
*/

use tpcc
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

```

### SEGMENT.SQL

```

/*  TPC-C Benchmark Kit
*/
*/

```

```

/* SEGMENT.SQL */
/* This script is used create segments */

use tpcc
go

exec sp_dropsegment misc_seg
go
exec sp_dropsegment cs_seg
go
exec sp_dropsegment ol_seg
go

/* create segment for miscellaneous tables (warehouse, */
/* district, item, orders, new_order, and history) */

sp_addsegment misc_seg, tpc_misc1
go
sp_extendsegment misc_seg, tpc_misc2
go
sp_extendsegment misc_seg, tpc_misc3
go
sp_extendsegment misc_seg, tpc_misc4
go
sp_extendsegment misc_seg, tpc_misc5
go

/* create segment for customer and stock tables */

sp_addsegment cs_seg, tpc_cs1
go
sp_extendsegment cs_seg, tpc_cs2
go
sp_extendsegment cs_seg, tpc_cs3
go
sp_extendsegment cs_seg, tpc_cs4
go
sp_extendsegment cs_seg, tpc_cs5
go
sp_extendsegment cs_seg, tpc_cs6
go

/* create segment for order-line table */

sp_addsegment ol_seg, tpc_ol1
go
sp_extendsegment ol_seg, tpc_ol2
go
sp_extendsegment ol_seg, tpc_ol3
go
sp_extendsegment ol_seg, tpc_ol4
go
sp_extendsegment ol_seg, tpc_ol5
go

```

## TABLES .SQL

```

/* TPC-C Benchmark Kit
*/
/*
*/
/* TABLES.SQL
*/
/*
*/
/* Creates TPC-C tables (seg)
*/

use tpcc
go

checkpoint
go

if exists ( select name from sysobjects where name = 'warehouse' )
drop table warehouse
go

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 misc_seg
go

if exists ( select name from sysobjects where name = 'district' )
drop table district
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 misc_seg

```



```

go

if exists ( select name from sysobjects where name = 'customer' )
    drop table customer
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_1           char(250),
    c_data_2           char(250)
) on cs_seg
go

if exists ( select name from sysobjects where name = 'history' )
    drop table history
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 misc_seg
go

if exists ( select name from sysobjects where name = 'new_order' )
    drop table new_order
go

create table new_order
(
    no_o_id             int,

```

```

    no_d_id             tinyint,
    no_w_id             smallint
) on misc_seg
go

if exists ( select name from sysobjects where name = 'orders' )
    drop table orders
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 misc_seg
go

if exists ( select name from sysobjects where name = 'order_line' )
    drop table order_line
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 ol_seg
go

if exists ( select name from sysobjects where name = 'item' )
    drop table item
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 misc_seg
go

if exists ( select name from sysobjects where name = 'stock' )

```

```

drop table stock
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 cs_seg
go

```

### TPCCBCP.SQL

```

/* TPC-C Benchmark Kit
*/
/*
*/
/* TPCBCP.SQL
*/
/*
*/
/* This script file sets the table lock option for bulk load
*/

use tpcc
go

exec sp_tableoption "warehouse","table lock on bulk load",true
exec sp_tableoption "district","table lock on bulk load",true
exec sp_tableoption "stock","table lock on bulk load",true
exec sp_tableoption "item","table lock on bulk load",true
exec sp_tableoption "customer","table lock on bulk load",true
exec sp_tableoption "history","table lock on bulk load",true
exec sp_tableoption "orders","table lock on bulk load",true
exec sp_tableoption "order_line","table lock on bulk load",true
exec sp_tableoption "new_order","table lock on bulk load",true
go

```

### TPCCIRL.SQL

```

/* TPC-C Benchmark Kit
*/

```

```

/*
*/
/* TPCCIRL.SQL
*/
/*
*/
/* This script file sets the insert row lock option on selected tables
*/

use tpcc
go

exec sp_tableoption "history","insert row lock",true
exec sp_tableoption "new_order","insert row lock",true
exec sp_tableoption "orders","insert row lock",true
exec sp_tableoption "order_line","insert row lock",true
go

```

### WARMUP.SQL

```

/* Warm-up TPC-C database */

use tpcc
go

update sysobjects set cache= 2 from sysobjects where name='stock'
go

update sysobjects set cache= 5 from sysobjects where name='customer'
go

select name, id, cache from sysobjects where id > 100
go

dbcc gaminit
go

select "tpcc database GAMINIT finished!"
go

```

### Stored Procedures

### NEWORD.SQL

```

/* File:          NEWORD.SQL
*/
/*
*/
/* Microsoft TPC-C Kit Ver. 3.00.000
*/
/*
*/
/* Audited 08/23/96, By Francois Raab
*/
/*
*/
/*
*/
/* Copyright Microsoft, 1996
*/
/*
*/
*/

```

```

/* Purpose:      New-Order transaction for Microsoft TPC-C Benchmark Kit
*/
/* Author:       Damien Lindauer
*/
/*              damienl@Microsoft.com
*/

use tpcc
go

/* new-order transaction stored procedure */

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

/* Modified by rick vicik, 2/4/97 */
/* Combined initialization of local variables into district update
statement */
/* Combined 3 huge case select statements into a single one */

create proc tpcc_neworder

smallint,                @w_id
tinyint,                 @d_id
                           @c_id          int,
                           @o_ol_cnt
tinyint,                 @o_all_local
                           @i_id1  int = 0,
                           @i_id2  int = 0,
                           @i_id3  int = 0,
                           @i_id4  int = 0,
                           @i_id5  int = 0,
                           @i_id6  int = 0,
                           @i_id7  int = 0,
                           @i_id8  int = 0,
                           @i_id9  int = 0,
                           @i_id10 int = 0,
                           @i_id11 int = 0,
                           @i_id12 int = 0,
                           @i_id13 int = 0,
                           @i_id14 int = 0,
@s_w_id1 smallint = 0, @ol_qty1 smallint = 0,
@s_w_id2 smallint = 0, @ol_qty2 smallint = 0,
@s_w_id3 smallint = 0, @ol_qty3 smallint = 0,
@s_w_id4 smallint = 0, @ol_qty4 smallint = 0,
@s_w_id5 smallint = 0, @ol_qty5 smallint = 0,
@s_w_id6 smallint = 0, @ol_qty6 smallint = 0,
@s_w_id7 smallint = 0, @ol_qty7 smallint = 0,
@s_w_id8 smallint = 0, @ol_qty8 smallint = 0,
@s_w_id9 smallint = 0, @ol_qty9 smallint = 0,
@s_w_id10 smallint = 0, @ol_qty10 smallint = 0,
@s_w_id11 smallint = 0, @ol_qty11 smallint = 0,
@s_w_id12 smallint = 0, @ol_qty12 smallint = 0,
@s_w_id13 smallint = 0, @ol_qty13 smallint = 0,
@s_w_id14 smallint = 0, @ol_qty14 smallint = 0,

```

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```

@s_w_id15 smallint = 0, @ol_qty15 smallint = 0
@i_id15 int = 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    int,
        @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 available 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 holdlock)
where i_id = @li_id

/* if there actually is an item with this id, go to work */
if (@@rowcount > 0)
begin
update stock set s_ytd = s_ytd + @li_qty,
               @s_quantity = s_quantity,
               s_quantity = s_quantity - @li_qty +

```

```

then 91 else 0 end,

case when (s_quantity - @li_qty < 10)
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

/* insert order_line data (using data from item and
stock) */
insert into order_line values(@o_id, /* from
district update */
                             @d_id, /* input
param */
                             @w_id, /* input
param */
                             @li_no, /* orderline
number */
                             @li_id, /* lineitem
id */
                             @li_s_w_id, /* lineitem
warehouse */
                             "dec 31, 1889", /* constant
*/
                             @li_qty, /* lineitem
qty */
                             @i_price * @li_qty, /* ol_amount
*/
                             @s_dist) /* from
stock */

/* 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 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 holdlock
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 holdlock
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

```

## PAYMENT.SQL

```

/* File:      PAYMENT.SQL
*/
/*          Microsoft TPC-C Kit Ver. 3.00.000
*/
/*          Audited 08/23/96, By Francois Raab
*/
/*          Copyright Microsoft, 1996
*/
/* Purpose:   Payment transaction for Microsoft TPC-C Benchmark Kit
*/
/* Author:    Damien Lindauer
*/
/*           damienl@Microsoft.com
*/

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),
@data1        char(250),
@data2        char(250),
@c_data_1     char(250),
@c_data_2     char(250),
@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 holdlock
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 holdlock
where c_last = @c_last and
      c_w_id = @c_w_id and
      c_d_id = @c_d_id
order by c_w_id, c_d_id, 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,
@data1        = c_data_1,
@data2        = c_data_2,
@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_2 = substring(@data1,209,42) +
              substring(@data2, 1, 208)
select @c_data_1 = 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(@data1, 1, 208)

/* update customer info */

update customer set
      c_data_1 = @c_data_1,
      c_data_2 = @c_data_2
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_1,1,200)

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_d_id,
@c_w_id,
@d_id_local,
@w_id_local,
@datetime,
@h_amount,
@w_name + "

```

```

@c_discount,
@c_balance,
@screen_data

go

```

## DELIVERY.SQL

```

/* File: DELIVERY.SQL
*/
/* Microsoft TPC-C Kit Ver. 3.00.000
*/
/* Audited 08/23/96, By Francois Raab
*/
/* Copyright Microsoft, 1996
*/
/* Purpose: Delivery transaction for Microsoft TPC-C Benchmark Kit
*/
/* Author: Damien Lindauer
*/
/* damienl@Microsoft.com
*/

use tpcc
go

/* delivery transaction */

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 @o_id = min(no_o_id)
        from new_order holdlock
        where no_w_id = @w_id and
              no_d_id = @d_id

        if (@@rowcount <> 0)
        begin
            /* claim the order for this district */

            delete new_order
            where no_w_id = @w_id and
                  no_d_id = @d_id and
                  no_o_id = @o_id

            /* set carrier_id on this order (and get customer id) */

            update orders
            set o_carrier_id = @o_carrier_id,
                @c_id = o_c_id
            where o_w_id = @w_id and
                  o_d_id = @d_id and
                  o_id = @o_id

            /* set date in all lineitems for this order (and sum amounts)
*/
            update order_line
            set ol_delivery_d = getdate(),
                @total = @total + ol_amount
            where ol_w_id = @w_id and
                  ol_d_id = @d_id and
                  ol_o_id = @o_id

            /* accumulate lineitem amounts for this order into customer
*/

            update customer
            set c_balance = c_balance + @total,
                c_delivery_cnt = c_delivery_cnt + 1

            where c_w_id = @w_id and
                  c_d_id = @d_id and
                  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
```

```

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

```

```
go
```

## ORDSTAT.SQL

```

/* File:          ORDSTAT.SQL
*/
/*              Microsoft TPC-C Kit Ver. 3.00.000
*/
/*              Audited 08/23/96, By Francois Raab
*/
/*
*/
/*              Copyright Microsoft, 1996
*/
/*
*/
/* Purpose:      Order-Status transaction for Microsoft TPC-C Benchmark Kit
*/
/* Author:       Damien Lindauer
*/
/*              damienl@Microsoft.com
*/

use tpcc
go

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

/* Modified by rick vicik, 2/4/97 */
/* Eliminated @val local variable */

create proc tpcc_orderstatus @w_id          smallint,

```



```

tinyint,
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 holdlock
            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 holdlock
            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 holdlock
            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 holdlock
where o_w_id = @w_id and
       o_d_id = @d_id and
       o_c_id = @c_id
/* 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 holdlock
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

```

**STOCKLEV.SQL**

```

/* File:          STOCKLEV.SQL
*/
/*              Microsoft TPC-C Kit Ver. 3.00.000
*/
/*              Audited 08/23/96, By Francois Raab
*/
/*
*/

```

```

/*          Copyright Microsoft, 1996
*/
/*
*/
/* Purpose:   Stock-Level transaction for Microsoft TPC-C Benchmark Kit
*/
/* Author:    Damien Lindauer
*/
/*          damienl@Microsoft.com
*/

use tpcc
go

/* stock-level transaction stored procedure */

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

/* Modified by rick vicik, 2/4/97 */
/* Eliminate 1 local variable, use derived table to eliminate duplicate
item#'s */

create proc tpcc_stocklevel    @w_id            smallint,
                               @d_id            tinyint,
                               @threshold       smallint
as
declare @o_id int

select @o_id = d_next_o_id
from district
where d_w_id = @w_id and
      d_id    = @d_id

select count(*) from stock,
      (select distinct(ol_i_id) from order_line
       where ol_w_id    = @w_id and
             ol_d_id    = @d_id and
             ol_o_id between (@o_id-20) and (@o_id-1)) OL

where s_w_id    = @w_id and
      s_i_id    = OL.ol_i_id and
      s_quantity < @threshold
go

```

## Loader Source

### TPCCCLR.C

```

/*      FILE:          TPCCCLR.C
*      Microsoft TPC-C Kit Ver. 3.00.000
*      Audited 08/23/96, By Francois Raab
*
*      Copyright Microsoft, 1996
*
*      PURPOSE:       Database loader for Microsoft TPC-C Benchmark Kit
*      Author:        Damien Lindauer

```

```

*          damienl@Microsoft.com
*/

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

// Defines
#define MAXITEMS                100000
#define CUSTOMERS_PER_DISTRICT  3000
#define DISTRICT_PER_WAREHOUSE  10
#define ORDERS_PER_DISTRICT     3000
#define MAX_CUSTOMER_THREADS    2
#define MAX_ORDER_THREADS       3
#define MAX_MAIN_THREADS        4

// Functions declarations
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 CurrentDate();

// 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];
    // Added to insure ol_delivery_d set properly during load
    char            ol_delivery_d[30];
} 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;
    double       c_balance;
    double       c_ytd_payment;
    short        c_payment_cnt;
    short        c_delivery_cnt;
    char         c_data_1[C_DATA_LEN+1];
    char         c_data_2[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           errfile[20];
DBPROCESS     *i_dbproc1;
DBPROCESS     *w_dbproc1, *w_dbproc2;
DBPROCESS     *c_dbproc1, *c_dbproc2;
DBPROCESS     *o_dbproc1, *o_dbproc2, *o_dbproc3;
ORDERS_STRUCT orders_buf[ORDERS_PER_DISTRICT];
CUSTOMER_STRUCT customer_buf[CUSTOMERS_PER_DISTRICT];
long          main_threads_completed;
long          customer_threads_completed;

```

```

long          order_threads_completed;
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;
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         main_threads_started;
    RETCODE     retcode;
    LOGINREC   *login;

    printf("\n*****");
    printf("\n*                               *");
    printf("\n* Microsoft SQL Server 6.5      *");
    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);

    if (aptr->build_index = 0)
        printf("data load only\n");
    if (aptr->build_index = 1)
        printf("data load and index creation\n");

    // install dblib error handlers

    dbmsghandle((DBMSGHANDLE_PROC)SQLMsgHandler);
    dberrhandle((DBERRHANDLE_PROC)SQLErrHandler);

    // open connections to SQL Server

```

```

    OpenConnections();

    // open file for loader results
    fLoader = fopen(aptr->loader_res_file, "a");

    if (fLoader == NULL)
    {
        printf("Error, loader result file open failed.");
        exit(-1);
    }

    // start loading data

    sprintf(buffer, "TPC-C load started for %ld warehouses: ", aptr-
>num_warehouses);
    if(aptr->build_index = 0)
        strcat(buffer, "data load only\n");
    if (aptr->build_index = 1)
        strcat(buffer, "data load and index creation\n");

    printf("%s",buffer);
    fprintf(fLoader, "%s",buffer);

    main_time_start = (TimeNow() / MILLI);

    // start parallel load threads

    main_threads_completed = 0;
    main_threads_started = 0;

    if ((aptr->table == NULL) || !(strcmp(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);
        }
        main_threads_started++;
    }

    if ((aptr->table == NULL) || !(strcmp(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);
        }
        main_threads_started++;
    }

    if ((aptr->table == NULL) || !(strcmp(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);
        }
        main_threads_started++;
    }

    if ((aptr->table == NULL) || !(strcmp(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);
        }
    }

```

```

    main_threads_started++;
}

while (main_threads_completed != main_threads_started)
    Sleep(1000L);

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);

dbexit();

exit(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;

    printf("\nLoading item table...\n");

    // Seed with unique number
    seed(1);

    InitString(i_name, I_NAME_LEN+1);
    InitString(i_data, I_DATA_LEN+1);

    sprintf(name, "%s..%s", aptr->database, "item");
    bcp_init(i_dbproc1, name, NULL, "logs\\item.err", DB_IN);

    bcp_bind(i_dbproc1, (BYTE *) &i_id, 0, -1, NULL, 0,
0, 1);
    bcp_bind(i_dbproc1, (BYTE *) &i_im_id, 0, -1, NULL, 0,
0, 2);
    bcp_bind(i_dbproc1, (BYTE *) i_name, 0, I_NAME_LEN, NULL, 0,
0, 3);
    bcp_bind(i_dbproc1, (BYTE *) &i_price, 0, -1, NULL, 0,
SQLFLT8, 4);

```

```

    bcp_bind(i_dbproc1, (BYTE *) i_data, 0, I_DATA_LEN, NULL, 0,
0, 5);

    time_start = (TimeNow() / MILLI);

    item_rows_loaded = 0;

    for (i_id = 1; i_id <= MAXITEMS; 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);

        if (!bcp_sendrow(i_dbproc1))
            printf("Error, LoadItem() failed calling
bcp_sendrow(). Check error file.\n");
        item_rows_loaded++;
        CheckForCommit(i_dbproc1, item_rows_loaded, "item",
&time_start);
    }

    bcp_done(i_dbproc1);
    dbclose(i_dbproc1);

    printf("Finished loading item table.\n");

    if (aptr->build_index == 1)
        BuildIndex("idxitmcl");

    InterlockedIncrement(&main_threads_completed);
}

//=====
//
// 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;

```

```

printf("\nLoading warehouse table...\n");

// Seed with unique number
seed(2);

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");
bcp_init(w_dbproc1, name, NULL, "logs\\whouse.err", DB_IN);

bcp_bind(w_dbproc1, (BYTE *) &w_id,          0, -1,          NULL,
0, 0, 1);
bcp_bind(w_dbproc1, (BYTE *) w_name,         0, W_NAME_LEN,  NULL,
0, 0, 2);
bcp_bind(w_dbproc1, (BYTE *) w_street_1,     0, ADDRESS_LEN, NULL,
0, 0, 3);
bcp_bind(w_dbproc1, (BYTE *) w_street_2,     0, ADDRESS_LEN, NULL,
0, 0, 4);
bcp_bind(w_dbproc1, (BYTE *) w_city,         0, ADDRESS_LEN, NULL,
0, 0, 5);
bcp_bind(w_dbproc1, (BYTE *) w_state,        0, STATE_LEN,  NULL,
0, 0, 6);
bcp_bind(w_dbproc1, (BYTE *) w_zip,          0, ZIP_LEN,     NULL,
0, 0, 7);
bcp_bind(w_dbproc1, (BYTE *) &w_tax,        0, -1,          NULL,
0, SQLFLT8, 8);
bcp_bind(w_dbproc1, (BYTE *) &w_ytd,        0, -1,          NULL,
0, SQLFLT8, 9);

time_start = (TimeNow() / MILLI);
warehouse_rows_loaded = 0;

for (w_id = aptr->starting_warehouse; w_id < aptr-
>num_warehouses+1; 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;

    if (!bcp_sendrow(w_dbproc1))
        printf("Error, LoadWarehouse() failed calling
bcp_sendrow(). Check error file.\n");
    warehouse_rows_loaded++;
    CheckForCommit(i_dbproc1, warehouse_rows_loaded,
"warehouse", &time_start);
}

bcp_done(w_dbproc1);
dbclose(w_dbproc1);

printf("Finished loading warehouse table.\n");

```

```

if (aptr->build_index == 1)
    BuildIndex("idxwarcl");

stock_rows_loaded = 0;
district_rows_loaded = 0;

District(w_id);
Stock(w_id);

InterlockedIncrement(&main_threads_completed);
}

//=====
//
// 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;
    int rc;

    long time_start;
    int w_id;

    for (w_id = aptr->starting_warehouse; w_id < aptr-
>num_warehouses+1; w_id++)
    {
        printf("...Loading district table: w_id = %ld\n", w_id);

        // Seed with unique number
        seed(4);

        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_dbproc2, name, NULL, "logs\\district.err",
DB_IN);

        bcp_bind(w_dbproc2, (BYTE *) &d_id,          0, -1,
NULL, 0, 0, 1);
        bcp_bind(w_dbproc2, (BYTE *) &d_w_id,        0, -1,
NULL, 0, 0, 2);
        bcp_bind(w_dbproc2, (BYTE *) d_name,         0, D_NAME_LEN,
NULL, 0, 0, 3);

```

```

ADDRESS_LEN, bcp_bind(w_dbproc2, (BYTE *) d_street_1, 0,
NULL, 0, 0, 4);
ADDRESS_LEN, bcp_bind(w_dbproc2, (BYTE *) d_street_2, 0,
NULL, 0, 0, 5);
ADDRESS_LEN, bcp_bind(w_dbproc2, (BYTE *) d_city, 0,
NULL, 0, 0, 6);
NULL, 0, 0, 7);
NULL, 0, 0, 8);
NULL, 0, SQLFLT8, 9);
NULL, 0, SQLFLT8, 10);
NULL, 0, 0, 11);

d_w_id = w_id;
d_ytd = 30000.0;
d_next_o_id = 3001L;
time_start = (TimeNow() / MILLI);
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;
    if (!bcp_sendrow(w_dbproc2))
        printf("Error, District() failed calling
bcp_sendrow(). Check error file.\n");
    district_rows_loaded++;
    CheckForCommit(w_dbproc2, district_rows_loaded,
"district", &time_start);
}
rc = bcp_done(w_dbproc2);
}
printf("Finished loading district table.\n");
if (aptr->build_index == 1)
    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 i;
    short len;
    int rc;
    char name[20];
    long time_start;

    // Seed with unique number
    seed(3);

    sprintf(name, "%s..%s", aptr->database, "stock");
    rc = bcp_init(w_dbproc2, name, NULL, "logs\\stock.err", DB_IN);

    bcp_bind(w_dbproc2, (BYTE *) &s_i_id, 0, -1, NULL,
0, 0, 1);
    bcp_bind(w_dbproc2, (BYTE *) &s_w_id, 0, -1, NULL,
0, 0, 2);
    bcp_bind(w_dbproc2, (BYTE *) &s_quantity, 0, -1, NULL,
0, 0, 3);
    bcp_bind(w_dbproc2, (BYTE *) s_dist_01, 0, S_DIST_LEN, NULL,
0, 0, 4);
    bcp_bind(w_dbproc2, (BYTE *) s_dist_02, 0, S_DIST_LEN, NULL,
0, 0, 5);
    bcp_bind(w_dbproc2, (BYTE *) s_dist_03, 0, S_DIST_LEN, NULL,
0, 0, 6);
    bcp_bind(w_dbproc2, (BYTE *) s_dist_04, 0, S_DIST_LEN, NULL,
0, 0, 7);
    bcp_bind(w_dbproc2, (BYTE *) s_dist_05, 0, S_DIST_LEN, NULL,
0, 0, 8);
    bcp_bind(w_dbproc2, (BYTE *) s_dist_06, 0, S_DIST_LEN, NULL,
0, 0, 9);
    bcp_bind(w_dbproc2, (BYTE *) s_dist_07, 0, S_DIST_LEN, NULL,
0, 0, 10);
    bcp_bind(w_dbproc2, (BYTE *) s_dist_08, 0, S_DIST_LEN, NULL,
0, 0, 11);
    bcp_bind(w_dbproc2, (BYTE *) s_dist_09, 0, S_DIST_LEN, NULL,
0, 0, 12);
    bcp_bind(w_dbproc2, (BYTE *) s_dist_10, 0, S_DIST_LEN, NULL,
0, 0, 13);
    bcp_bind(w_dbproc2, (BYTE *) &s_ytd, 0, -1, NULL,
0, 0, 14);
}

```

```

        bcp_bind(w_dbproc2, (BYTE *) &s_order_cnt, 0, -1, NULL,
0, 0, 15);
        bcp_bind(w_dbproc2, (BYTE *) &s_remote_cnt, 0, -1, NULL,
0, 0, 16);
        bcp_bind(w_dbproc2, (BYTE *) s_data, 0, S_DATA_LEN, NULL,
0, 0, 17);

        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 <= MAXITEMS; s_i_id++)
        {
                for (s_w_id = aptr->starting_warehouse; s_w_id < aptr-
>num_warehouses+1; s_w_id++)
                {
                        s_quantity = 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);

                        if (!bcp_sendrow(w_dbproc2))
                                printf("Error, Stock() failed calling
                                bcp_sendrow(). Check error file.\n");
                                stock_rows_loaded++;
                                CheckForCommit(w_dbproc2, stock_rows_loaded,
"stock", &time_start);
                }
        }

        bcp_done(w_dbproc2);
        dbcClose(w_dbproc2);

        printf("Finished loading stock table.\n");

        if (aptr->build_index == 1)
                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];
        char                       buf[250];

        printf("\nLoading customer and history tables...\n");

        // Seed with unique number
        seed(5);

        // Initialize bulk copy
        sprintf(name, "%s..%s", aptr->database, "customer");
        bcp_init(c_dbproc1, name, NULL, "logs\\customer.err", DB_IN);

        sprintf(name, "%s..%s", aptr->database, "history");
        bcp_init(c_dbproc2, name, NULL, "logs\\history.err", DB_IN);

        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 = aptr->starting_warehouse; w_id <= aptr-
>num_warehouses; w_id++)
        {
                for (d_id = 1L; d_id <= DISTRICT_PER_WAREHOUSE; d_id++)
                {
                        CustomerBufLoad(d_id, w_id);

                        // Start parallel loading threads here...

                        customer_threads_completed=0;

                        // 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");
        }
        // 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,
(LPPTHREAD_START_ROUTINE) LoadHistoryTable,
&history_time_start,
                                0,
&dwThreadID[1]);
        if (hThread[1] == NULL)
        {
            printf("Error, failed in creating creating
thread = 1.\n");
        }
        while (customer_threads_completed != 2)
            Sleep(1000L);
    }
    // flush the bulk connection
    bcp_done(c_dbproc1);
    bcp_done(c_dbproc2);
    sprintf(buf, "update customer set c_first = 'C_LOAD = %d' where c_id =
1 and c_w_id = 1 and c_d_id = 1", LOADER_NURAND_C);
    dbcmd(c_dbproc1, buf);
    dbsqlxec(c_dbproc1);
    while (dbresults(c_dbproc1) != NO_MORE_RESULTS);
    dbclose(c_dbproc1);
    dbclose(c_dbproc2);
    printf("Finished loading customer table.\n");
    if (aptr->build_index == 1)
        BuildIndex("idxcuscl");
    if (aptr->build_index == 1)
        BuildIndex("idxcusnc");
    InterlockedIncrement(&main_threads_completed);
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;
        customer_buf[i].c_balance = 0;
        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_1, "");
        strcpy(customer_buf[i].c_data_2, "");
        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_LEN, c[i].c_first);

    c[i].c_id = i+1;
}

printf("...Loading customer buffer for: d_id = %d, w_id = %d\n",
    d_id, w_id);

for (i=0;i<CUSTOMERS_PER_DISTRICT;i++)
{
    customer_buf[i].c_d_id = d_id;
    customer_buf[i].c_w_id = w_id;
    customer_buf[i].h_amount = 10.0;
    customer_buf[i].c_ytd_payment = 10.0;
    customer_buf[i].c_payment_cnt = 1;
    customer_buf[i].c_delivery_cnt = 0;

    // 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_street_1,
                customer_buf[i].c_street_2,
                customer_buf[i].c_city,
                customer_buf[i].c_state,
                customer_buf[i].c_zip);

    MakeNumberString(16, 16, PHONE_LEN,
customer_buf[i].c_phone);

    if (RandomNumber(1L, 100L) > 10)
        customer_buf[i].c_credit[0] = 'G';
    else
        customer_buf[i].c_credit[0] = 'B';
    customer_buf[i].c_credit[1] = 'C';

    customer_buf[i].c_credit_lim = 50000.0;
    customer_buf[i].c_discount = ((float) RandomNumber(0L,
5000L)) / 10000.0;
    customer_buf[i].c_balance = -10.0;

    MakeAlphaString(250, 250, C_DATA_LEN,
customer_buf[i].c_data_1);

```

```

        MakeAlphaString(50, 250, C_DATA_LEN,
customer_buf[i].c_data_2);

        // 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;
    double       c_balance;
    double       c_ytd_payment;
    short        c_payment_cnt;
    short        c_delivery_cnt;
    char         c_data_1[C_DATA_LEN+1];
    char         c_data_2[C_DATA_LEN+1];
    char         name[20];
    char         c_since[50];

    bcp_bind(c_dbproc1, (BYTE *) &c_id,          0, -1,
NULL,0,0, 1);
    bcp_bind(c_dbproc1, (BYTE *) &c_d_id,        0, -1,
NULL,0,0, 2);
    bcp_bind(c_dbproc1, (BYTE *) &c_w_id,        0, -1,
NULL,0,0, 3);
    bcp_bind(c_dbproc1, (BYTE *) c_first,        0, FIRST_NAME_LEN,
NULL,0,0, 4);
    bcp_bind(c_dbproc1, (BYTE *) c_middle,        0,
MIDDLE_NAME_LEN,NULL,0,0, 5);
    bcp_bind(c_dbproc1, (BYTE *) c_last,         0, LAST_NAME_LEN,
NULL,0,0, 6);
    bcp_bind(c_dbproc1, (BYTE *) c_street_1,     0, ADDRESS_LEN,
NULL,0,0, 7);
    bcp_bind(c_dbproc1, (BYTE *) c_street_2,     0, ADDRESS_LEN,
NULL,0,0, 8);
    bcp_bind(c_dbproc1, (BYTE *) c_city,         0, ADDRESS_LEN,
NULL,0,0, 9);

```

```

    bcp_bind(c_dbproc1, (BYTE *) c_state,      0, STATE_LEN,
NULL,0,0,10);
    bcp_bind(c_dbproc1, (BYTE *) c_zip,        0, ZIP_LEN,
NULL,0,0,11);
    bcp_bind(c_dbproc1, (BYTE *) c_phone,      0, PHONE_LEN,
NULL,0,0,12);
    bcp_bind(c_dbproc1, (BYTE *) c_since,      0, 50,
NULL,0,SQLCHAR,13);
    bcp_bind(c_dbproc1, (BYTE *) c_credit,     0, CREDIT_LEN,
NULL,0,0,14);
    bcp_bind(c_dbproc1, (BYTE *) &c_credit_lim, 0, -1,
NULL,0,SQLFLT8,15);
    bcp_bind(c_dbproc1, (BYTE *) &c_discount,  0, -1,
NULL,0,SQLFLT8,16);
    bcp_bind(c_dbproc1, (BYTE *) &c_balance,   0, -1,
NULL,0,SQLFLT8,17);
    bcp_bind(c_dbproc1, (BYTE *) &c_ytd_payment, 0, -1,
NULL,0,SQLFLT8,18);
    bcp_bind(c_dbproc1, (BYTE *) &c_payment_cnt, 0, -1,
NULL,0,0,19);
    bcp_bind(c_dbproc1, (BYTE *) &c_delivery_cnt,0, -1,
NULL,0,0,20);
    bcp_bind(c_dbproc1, (BYTE *) c_data_1,     0, C_DATA_LEN,
NULL,0,0,21);
    bcp_bind(c_dbproc1, (BYTE *) c_data_2,     0, C_DATA_LEN,
NULL,0,0,22);

```

```

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);

    CurrentDate(&c_since);

    c_credit_lim = customer_buf[i].c_credit_lim;
    c_discount = customer_buf[i].c_discount;
    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_1, customer_buf[i].c_data_1);
    strcpy(c_data_2, customer_buf[i].c_data_2);

    // Send data to server
    if (!bcp_sendrow(c_dbproc1))
        printf("Error, LoadCustomerTable() failed calling
bcp_sendrow(). Check error file.\n");

```

```

        customer_rows_loaded++;
        CheckForCommit(c_dbproc1, customer_rows_loaded, "customer",
&customer_time_start->time_start);
    }

    InterlockedIncrement(&customer_threads_completed);
}

//=====
//
// 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[50];

    bcp_bind(c_dbproc2, (BYTE *) &c_id,        0, -1,      NULL, 0,
0, 1);
    bcp_bind(c_dbproc2, (BYTE *) &c_d_id,      0, -1,      NULL, 0,
0, 2);
    bcp_bind(c_dbproc2, (BYTE *) &c_w_id,      0, -1,      NULL, 0,
0, 3);
    bcp_bind(c_dbproc2, (BYTE *) &c_d_id,      0, -1,      NULL, 0,
0, 4);
    bcp_bind(c_dbproc2, (BYTE *) &c_w_id,      0, -1,      NULL, 0,
0, 5);
    bcp_bind(c_dbproc2, (BYTE *) h_date,       0, 50,      NULL, 0,
SQLCHAR, 6);
    bcp_bind(c_dbproc2, (BYTE *) &h_amount,    0, -1,      NULL, 0,
SQLFLT8, 7);
    bcp_bind(c_dbproc2, (BYTE *) h_data,      0, H_DATA_LEN, NULL, 0,
0, 8);

    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);
        CurrentDate(&h_date);

        // send to server
        if (!bcp_sendrow(c_dbproc2))
            printf("Error, LoadHistoryTable() failed calling
bcp_sendrow(). Check error file.\n");
        history_rows_loaded++;
        CheckForCommit(c_dbproc2, history_rows_loaded, "history",
&history_time_start->time_start);
    }

```

```

        InterlockedIncrement(&customer_threads_completed);
    }

//=====
//
// 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];

    printf("\nLoading orders...\n");

    // seed with unique number
    seed(6);

    // initialize bulk copy
    sprintf(name, "%s.%s", aptr->database, "orders");
    bcp_init(o_dbproc1, name, NULL, "logs\\orders.err", DB_IN);

    sprintf(name, "%s.%s", aptr->database, "new_order");
    bcp_init(o_dbproc2, name, NULL, "logs\\neword.err", DB_IN);

    sprintf(name, "%s.%s", aptr->database, "order_line");
    bcp_init(o_dbproc3, name, NULL, "logs\\ordline.err", DB_IN);

    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 = aptr->starting_warehouse; w_id <= aptr->num_warehouses; w_id++)
    {
        for (d_id = 1L; d_id <= DISTRICT_PER_WAREHOUSE; d_id++)
        {
            OrdersBufLoad(d_id, w_id);

            // start parallel loading threads here...

```

```

        order_threads_completed=0;
        // 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);
        }

        while (order_threads_completed != 3)
            Sleep(1000L);
    }

    printf("Finished loading orders.\n");

    InterlockedIncrement(&main_threads_completed);

    return;
}

//=====
//
// Function   : OrdersBufInit
//
// Clears shared buffer for ORDERS, NEWORDER, and ORDERLINE
//
//=====
void OrdersBufInit()
{
    int    i;
    int    j;

    for (i=0;i<ORDERS_PER_DISTRICT;i++)
    {
        orders_buf[i].o_id = 0;
        orders_buf[i].o_d_id = 0;
        orders_buf[i].o_w_id = 0;
        orders_buf[i].o_c_id = 0;
        orders_buf[i].o_carrier_id = 0;
        orders_buf[i].o_ol_cnt = 0;
        orders_buf[i].o_all_local = 0;

        for (j=0;j<=14;j++)
        {
            orders_buf[i].o_ol[j].ol = 0;
            orders_buf[i].o_ol[j].ol_i_id = 0;
            orders_buf[i].o_ol[j].ol_supply_w_id = 0;
            orders_buf[i].o_ol[j].ol_quantity = 0;
            orders_buf[i].o_ol[j].ol_amount = 0;
            strcpy(orders_buf[i].o_ol[j].ol_dist_info, "");
        }
    }
}

//=====

```

```

//
// Function   : OrdersBufLoad
//
// Fills shared buffer for ORDERS, NEWORDER, and ORDERLINE
//
//=====
void OrdersBufLoad(int d_id, int w_id)
{
    int    cust[ORDERS_PER_DIST+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_DIST);

    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 = RandomNumber(5L, 15L);

        if (o_id < 2100)
        {
            orders_buf[o_id].o_carrier_id = 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, MAXITEMS);
            orders_buf[o_id].o_ol[ol].ol_supply_w_id = w_id;
            orders_buf[o_id].o_ol[ol].ol_quantity = 5;
            MakeAlphaString(24, 24, OL_DIST_INFO_LEN,
&orders_buf[o_id].o_ol[ol].ol_dist_info);

            // Generate ORDER-LINE data
            if (o_id < 2100)
            {
                orders_buf[o_id].o_ol[ol].ol_amount = 0;
                // Added to insure ol_delivery_d set
properly during load

```

```

        CurrentDate(&orders_buf[o_id].o_ol[ol].ol_delivery_d);
        }
        else
        {
            orders_buf[o_id].o_ol[ol].ol_amount =
RandomNumber(1,999999)/100.0;
            // Added to insure ol_delivery_d set
properly during load
            strcpy(orders_buf[o_id].o_ol[ol].ol_delivery_d,"Dec 31, 1889");
        }
    }
}

//=====
//
// 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[50];

    // bind ORDER data
    bcp_bind(o_dbproc1, (BYTE *) &o_id,          0, -1, NULL, 0,
0, 1);
    bcp_bind(o_dbproc1, (BYTE *) &o_d_id,        0, -1, NULL, 0,
0, 2);
    bcp_bind(o_dbproc1, (BYTE *) &o_w_id,        0, -1, NULL, 0,
0, 3);
    bcp_bind(o_dbproc1, (BYTE *) &o_c_id,        0, -1, NULL, 0,
0, 4);
    bcp_bind(o_dbproc1, (BYTE *) o_entry_d,      0, 50, NULL, 0,
SQLCHAR, 5);
    bcp_bind(o_dbproc1, (BYTE *) &o_carrier_id,  0, -1, NULL, 0,
0, 6);
    bcp_bind(o_dbproc1, (BYTE *) &o_ol_cnt,      0, -1, NULL, 0,
0, 7);
    bcp_bind(o_dbproc1, (BYTE *) &o_all_local,   0, -1, NULL, 0,
0, 8);

    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;
        CurrentDate(&o_entry_d);

        // send data to server
        if (!bcp_sendrow(o_dbproc1))
            printf("Error, LoadOrdersTable() failed calling
bcp_sendrow(). Check error file.\n");
        orders_rows_loaded++;
        // CheckForCommit(o_dbproc1, orders_rows_loaded, "ORDERS",
&orders_time_start->time_start);
    }

    bcp_batch(o_dbproc1);

    if ((o_w_id == aptr->num_warehouses) && (o_d_id == 10))
    {
        bcp_done(o_dbproc1);
        dbcclose(o_dbproc1);

        if (aptr->build_index == 1)
            BuildIndex("idxordcl");
    }

    InterlockedIncrement(&order_threads_completed);
}

//=====
//
// Function   : LoadNewOrderTable
//
//=====

void LoadNewOrderTable(LOADER_TIME_STRUCT *new_order_time_start)
{
    int         i;
    long        o_id;
    short       o_d_id;
    short       o_w_id;

    // Bind NEW-ORDER data
    bcp_bind(o_dbproc2, (BYTE *) &o_id,          0, -1, NULL, 0, 0, 1);
    bcp_bind(o_dbproc2, (BYTE *) &o_d_id,        0, -1, NULL, 0, 0, 2);
    bcp_bind(o_dbproc2, (BYTE *) &o_w_id,        0, -1, NULL, 0, 0, 3);

    for (i = 2100; i < 3000; 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;

        if (!bcp_sendrow(o_dbproc2))
            printf("Error, LoadNewOrderTable() failed calling
bcp_sendrow(). Check error file.\n");
        new_order_rows_loaded++;
        // CheckForCommit(o_dbproc2, new_order_rows_loaded,
"NEW_ORDER", &new_order_time_start->time_start);
    }

    bcp_batch(o_dbproc2);

```

```

if ((o_w_id == aptr->num_warehouses) && (o_d_id == 10))
{
    bcp_done(o_dbproc2);
    dbclose(o_dbproc2);

    if (aptr->build_index == 1)
        BuildIndex("idxnodcl");
}

InterlockedIncrement(&order_threads_completed);
}

//=====
//
// 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;
    short o_all_local;
    char ol_dist_info[DIST_INFO_LEN+1];
    char ol_delivery_d[50];

    // bind ORDER-LINE data
    bcp_bind(o_dbproc3, (BYTE *) &o_id, 0, -1, NULL, 0, 0,
1);
    bcp_bind(o_dbproc3, (BYTE *) &o_d_id, 0, -1, NULL, 0, 0,
2);
    bcp_bind(o_dbproc3, (BYTE *) &o_w_id, 0, -1, NULL, 0, 0,
3);
    bcp_bind(o_dbproc3, (BYTE *) &ol, 0, -1, NULL, 0, 0,
4);
    bcp_bind(o_dbproc3, (BYTE *) &ol_i_id, 0, -1, NULL, 0, 0,
5);
    bcp_bind(o_dbproc3, (BYTE *) &ol_supply_w_id, 0, -1, NULL, 0, 0,
6);
    bcp_bind(o_dbproc3, (BYTE *) ol_delivery_d, 0, 50,
NULL, 0, SQLCHAR, 7);
    bcp_bind(o_dbproc3, (BYTE *) &ol_quantity, 0, -1, NULL, 0, 0,
8);
    bcp_bind(o_dbproc3, (BYTE *) &ol_amount, 0, -1, NULL, 0,
SQLFLT8, 9);
    bcp_bind(o_dbproc3, (BYTE *) ol_dist_info, 0, DIST_INFO_LEN,
NULL, 0, 0, 10);

    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;
    // Changed to insure ol_delivery_d set properly
(now set in OrdersBufLoad)
    // CurrentDate(&ol_delivery_d);

    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);

    if (!bcp_sendrow(o_dbproc3))
        printf("Error, LoadOrderLineTable() failed
calling bcp_sendrow(). Check error file.\n");
    order_line_rows_loaded++;
    // CheckForCommit(o_dbproc3,
order_line_rows_loaded, "ORDER_LINE", &order_line_time_start->time_start);
}

}

bcp_batch(o_dbproc3);

if ((o_w_id == aptr->num_warehouses) && (o_d_id == 10))
{
    bcp_done(o_dbproc3);
    dbclose(o_dbproc3);

    if (aptr->build_index == 1)
        BuildIndex("idxodlcl");
}

InterlockedIncrement(&order_threads_completed);
}

//=====
//
// 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(DBPROCESS *dbproc,
                   int rows_loaded,
                   char *table_name,
                   long *time_start)
{
    long      time_end, time_diff;

    // commit every "batch" rows

    if ( !(rows_loaded % aptr->batch) )
    {
        bcp_batch(dbproc);

        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 retcode;

    LOGINREC *login;

```

```

login = dblogin();

retcode = DBSETLUSER(login, aptr->user);
if (retcode == FAIL)
{
    printf("DBSETLUSER failed.\n");
}
retcode = DBSETLPWD(login, aptr->password);
if (retcode == FAIL)
{
    printf("DBSETLPWD failed.\n");
}

retcode = DBSETLPACKET(login, (USHORT) aptr->pack_size);
if (retcode == FAIL)
{
    printf("DBSETLPACKET failed.\n");
}

printf("DB-Library packet size: %ld\n",aptr->pack_size);

// turn connection into a BCP connection
retcode = BCP_SETL(login, TRUE);
if (retcode == FAIL)
{
    printf("BCP_SETL failed.\n");
}

// open connections to SQL Server */

if ((i_dbproc1 = dbopen(login, aptr->server)) == NULL)
{
    printf("Error on login 1 to server %s.\n", aptr->server);
    exit(-1);
}

if ((w_dbproc1 = dbopen(login, aptr->server)) == NULL)
{
    printf("Error on login 2 to server %s.\n", aptr->server);
    exit(-1);
}

if ((w_dbproc2 = dbopen(login, aptr->server)) == NULL)
{
    printf("Error on login 3 to server %s.\n", aptr->server);
    exit(-1);
}

if ((c_dbproc1 = dbopen(login, aptr->server)) == NULL)
{
    printf("Error on login 4 to server %s.\n", aptr->server);
    exit(-1);
}

if ((c_dbproc2 = dbopen(login, aptr->server)) == NULL)
{
    printf("Error on login 5 to server %s.\n", aptr->server);
    exit(-1);
}

```



```

if ((o_dbproc1 = dbopen(login, aptr->server)) == NULL)
{
    printf("Error on login 6 to server %s.\n", aptr->server);
    exit(-1);
}

if ((o_dbproc2 = dbopen(login, aptr->server)) == NULL)
{
    printf("Error on login 7 to server %s.\n", aptr->server);
    exit(-1);
}

if ((o_dbproc3 = dbopen(login, aptr->server)) == NULL)
{
    printf("Error on login 8 to server %s.\n", aptr->server);
    exit(-1);
}
}

```

```

//=====
//
// Function name: SQLErrHandler
//
//=====

```

```

int SQLErrHandler(SQLCONN *dbproc,
                 int      severity,
                 int      err,
                 int      oserr,
                 char     *dberrstr,
                 char     *oserrstr)
{
    char msg[256];
    FILE *fp1;
    char timebuf[128];
    char datebuf[128];

    _strtime(timebuf);
    _strdate(datebuf);

    sprintf(msg, "%s %s : DBLibrary (%ld) %s\n", datebuf, timebuf,
err, dberrstr);
    printf("%s",msg);

    fp1 = fopen("logs\tpccldr.err","a");
    if (fp1 == NULL)
    {
        printf("Error in opening errorlog file.\n");
    }
    else
    {
        fprintf(fp1, msg);
        fclose(fp1);
    }

    if (oserr != DBNOERR)

```

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```

{
    sprintf(msg, "%s %s : OSError (%ld) %s\n", datebuf,
timebuf, oserr, oserrstr);
    printf("%s",msg);

    fp1 = fopen("logs\tpccldr.err","a");
    if (fp1 == NULL)
    {
        printf("Error in opening errorlog file.\n");
    }
    else
    {
        fprintf(fp1, msg);
        fclose(fp1);
    }
}

if ((dbproc == NULL) || (DBDEAD(dbproc)))
{
    exit(-1);
}

return (INT_CANCEL);
}

```

```

//=====
//
// Function name: SQLMsgHandler
//
//=====

```

```

int SQLMsgHandler(SQLCONN *dbproc,
                  DBINT    msgno,
                  int      msgstate,
                  int      severity,
                  char     *msgtext)
{
    char msg[256];
    FILE *fp1;
    char timebuf[128];
    char datebuf[128];

    if ( (msgno == 5701) || (msgno == 2528) || (msgno == 5703) || (msgno
== 6006) )
    {
        return(INT_CONTINUE);
    }

    if (msgno == 0)
    {
        return(INT_CONTINUE);
    }
    else
    {
        _strtime(timebuf);
        _strdate(datebuf);

```

```

        sprintf(msg, "%s %s : SQLServer (%ld) %s\n", datebuf,
timebuf, msgno, msgtext);

        printf("%s",msg);

        fp1 = fopen("logs\\tpccldr.err", "a");
        if (fp1 == NULL)
        {
            printf("Error in opening errorlog file.\n");
        }
        else
        {
            fprintf(fp1, msg);
            fclose(fp1);
        }

        exit(-1);
    }

    return (INT_CANCEL);
}

```

```

//=====
//
// Function name: CurrentDate
//
//=====

```

```

void CurrentDate(char *datetime)
{
    char timebuf[128];
    char datebuf[128];

    _strtime(timebuf);
    _strdate(datebuf);

    sprintf(datetime, "%s %s", datebuf, timebuf);
}

```

```

//=====
//
// Function name: BuildIndex
//
//=====

```

```

void BuildIndex(char *index_script)
{
    char cmd[256];

    printf("Starting index creation: %s\n",index_script);

    sprintf(cmd, "isql -S%s -U%s -P%s -e -i%s\\%s.sql >>
logs\\%s.out",
                aptr->server,
                aptr->user,

```

```

        aptr->password,
        aptr->index_script_path,
        index_script,
        index_script);

    system(cmd);

    printf("Finished index creation: %s\n",index_script);
}

```

## GETARGS.C

```

// TPC-C Benchmark Kit
//
// Module: GETARGS.C
// Author: DamienL

```

```

// 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->table = NULL;
    pargs->loader_res_file = LOADER_RES_FILE;
    pargs->pack_size = DEF_LD_PACK_SIZE;
    pargs->starting_warehouse = DEF_STARTING_WAREHOUSE;
    pargs->build_index = BUILD_INDEX;
    pargs->index_script_path = INDEX_SCRIPT_PATH;

```

```

/* 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 'h':      /* Fall throught */
case 'H':
    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->table = ptr+2;
    break;

case 'f':
    pargs->loader_res_file = ptr+2;
    break;

case 'p':
    pargs->pack_size = atol(ptr+2);
    break;

case 'i':
    pargs->build_index = atol(ptr+2);

```

```

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
%d\n", (long) BATCH);
    printf("-p TDS packet size
%d\n", (long) DEFLDPACKSIZE);
    printf("-f Loader Results Output Filename
%s\n", LOADER_RES_FILE);
    printf("-s Starting Warehouse
%d\n", (long) DEF_STARTING_WAREHOUSE);

```

```

    printf("-i Build Option (data = 0, data and index = 1)
%ld\n", (long) BUILD_INDEX);
    printf("-d Index Script Path
%s\n", INDEX_SCRIPT_PATH);
    printf("-t Table to Load
tables \n");
    printf("    [item|warehouse|customer|orders]\n");
    printf("\nNote: Command line switches are case sensitive.\n");
    exit(0);
}

//=====
//
// Function name: GetArgsMaster
//
//=====

void GetArgsMaster(int argc, char **argv, MASTER_DATA *pargs)
{
    int        i;
    char       *ptr;

#ifdef DEBUG
    printf("[%ld]DBG: Entering GetArgsMaster()\n", (int)
GetCurrentThreadId());
#endif

    pargs->server          = SERVER;
    pargs->database        = DATABASE;
    pargs->admin_database  = ADMIN_DATABASE;
    pargs->user            = USER;
    pargs->password       = PASSWORD;
    pargs->ramp_up         = RAMP_UP;
    pargs->steady_state   = STEADY_STATE;
    pargs->ramp_down      = RAMP_DOWN;
    pargs->num_users      = NUM_USERS;
    pargs->num_warehouses = NUM_WAREHOUSES;
    pargs->think_times    = THINK_TIMES;
    pargs->display_data   = DISPLAY_DATA;
    pargs->deadlock_retry = DEADLOCK_RETRY;
    pargs->tran           = TRANSACTION;
    pargs->client_mode    = CLIENT_MODE;
    pargs->comment        = NULL;
    pargs->load_multiplier = DEF_LOAD_MULTIPLIER;
    pargs->checkpoint_interval = DEF_CHECKPOINT_INTERVAL;
    pargs->first_checkpoint = DEF_FIRST_CHECKPOINT;
    pargs->delivery_backoff = DELIVERY_BACKOFF;
    pargs->num_deliveries  = NUM_DELIVERIES;
    pargs->disable_90th   = DISABLE_90TH;
    pargs->enable_sqlstat = ENABLE_SQLSTAT;
    pargs->resfilename    = RESFILENAME;
    pargs->sqlstat_filename = SQLSTAT_FILENAME;
    pargs->sqlstat_period = SQLSTAT_PERIOD;
    pargs->shutdown_server = SHUTDOWN_SERVER;
    pargs->auto_run       = AUTO_RUN;
    pargs->disable_sqlperf = DISABLE_SQLPERF;

    /* check for zero command line args */

```

```

if ( argc == 1 )
    GetArgsMasterUsage();

for ( i = 1; i < argc; ++i)
{
    if (argv[i][0] != '-' && argv[i][0] != '/')
    {
        printf("\nUnrecognized command");
        GetArgsMasterUsage();
        exit(1);
    }

    ptr = argv[i];

    switch (ptr[1])
    {
        case 'h': /* Fall throught */
            GetArgsMasterUsage();
            break;

        case 'S':
            pargs->server = ptr+2;
            break;

        case 'D':
            pargs->database = ptr+2;
            break;

        case 'A':
            pargs->admin_database = ptr+2;
            break;

        case 'U':
            pargs->user = ptr+2;
            break;

        case 'P':
            pargs->password = ptr+2;
            break;

        case 'u':
            pargs->ramp_up = atol(ptr+2);
            break;

        case 's':
            pargs->steady_state = atol(ptr+2);
            break;

        case 'd':
            pargs->ramp_down = atol(ptr+2);
            break;

        case 'c':
            pargs->num_users = atol(ptr+2);
            break;

        case 'w':
            pargs->num_warehouses = atol(ptr+2);
            break;

        case 'T':

```

```

                pargs->think_times = atol(ptr+2);
                break;
case 'o':
                pargs->display_data = atol(ptr+2);
                break;
                case 'm':
                pargs->load_multiplier = atof(ptr+2);
                break;
case 'f':
                pargs->first_checkpoint = atol(ptr+2);
                break;
case 'i':
                pargs->checkpoint_interval = atol(ptr+2);
                break;
case 'C':
                pargs->comment = ptr+2;
                break;
case 'B':
                pargs->client_mode = atol(ptr+2);
                break;
case 'n':
                pargs->num_deliveries = atol(ptr+2);
                break;
case 'b':
                pargs->delivery_backoff = atol(ptr+2);
                break;
                case 'r':
                pargs->deadlock_retry = (short) atol(ptr+2);
                break;
                case 't':
                pargs->tran = atol(ptr+2);
                break;
                case 'E':
                pargs->enable_sqlstat = atol(ptr+2);
                break;
case 'e':
                pargs->sqlstat_filename = ptr+2;
                break;
                case 'g':
                pargs->shutdown_server = atol(ptr+2);
                break;
case 'F':
                pargs->resfilename = ptr+2;
                break;
                case 'N':

```

```

                pargs->disable_90th = atol(ptr+2);
                break;
case 'a':
                pargs->auto_run = atol(ptr+2);
                break;
case 'q':
                pargs->disable_sqlperf = atol(ptr+2);
                break;
case 'W':
                pargs->sqlstat_period = atol(ptr+2);
                break;
                default:
                GetArgsMasterUsage();
                exit(-1);
                break;
                }
        }
    }
    return;
}

//=====
//
// Function name: GetArgsMasterUsage
//
//=====

void GetArgsMasterUsage()
{
#ifdef DEBUG
    printf("[%ld]DBG: Entering GetArgsMasterUsage()\n", (int)
GetCurrentThreadId());
#endif

    printf("MASTER:\n\n");
    printf("Parameter
Default\n");
    printf("-----\n");
    printf("-S Server
%s\n", SERVER);
    printf("-D Database
%s\n", DATABASE);
    printf("-A Admin Database
%s\n", ADMIN_DATABASE);
    printf("-U Username
%s\n", USER);
    printf("-P Password
%s\n", PASSWORD);
    printf("-u Ramp Up Time (seconds)
%ld\n", (long) RAMP_UP);
    printf("-s Steady State Time (seconds)
%ld\n", (long) STEADY_STATE);

```

```

    printf("-d Ramp Down Time (seconds)
%ld\n", (long) RAMP_DOWN);
    printf("-c Number of Users
%ld\n", (long) NUM_USERS);
    printf("-w Number of Warehouses
%ld\n", (long) NUM_WAREHOUSES);
    printf("-f First Checkpoint (seconds)
%ld\n", (long) DEF_FIRST_CHECKPOINT);
    printf("-i Checkpoint Interval (seconds)
%ld\n", (long) DEF_CHECKPOINT_INTERVAL);
    printf("-B Client mode (TPC-C Scaled = 0, TPC-C Batch = 1)
%ld\n", (long) CLIENT_MODE);
    printf("-n Number of Delivery Threads per Client Driver
%ld\n", (long) NUM_DELIVERIES);
    printf("-b Delivery Queue Backoff Delay (seconds)
%ld\n", (long) DELIVERY_BACKOFF);

    printf("-r Deadlock Retries
%ld\n", (long) DEADLOCK_RETRY);
    printf("-T Use Think Times (no = 0, yes = 1)
%ld\n", (long) THINK_TIMES);
    printf("-m Think Time Load Multiplier
%0.4f\n", DEF_LOAD_MULTIPLIER);
    printf("-o Display Data to Console (no = 0, yes = 1)
%ld\n", (long) DISPLAY_DATA);
    printf("-t Transaction (0, 1, 2, 3, 4, 5)
%ld\n", (long) TRANSACTION);

    printf("-N Disable 90th Per. Calc. (no = 0, yes = 1)
%ld\n", (long) DISABLE_90TH);
    printf("-E Enable Steady State Sqlstats Collection (no = 0, yes =
1) %ld\n", (long) ENABLE_SQLSTAT);
    printf("-W Sqlstats Collection Period (seconds)
%ld\n", (long) SQLSTAT_PERIOD);
    printf("-e Sqlstats File Name
%s\n", SQLSTAT_FILENAME);
    printf("-g Shutdown SQL Server at End of Test (no = 0, yes = 1)
%ld\n", (long) SHUTDOWN_SERVER);
    printf("-F Result File Name
%s\n", RESFILENAME);
    printf("-a Automated Test Run (no = 0, yes = 1)
%ld\n", (long) AUTO_RUN);
    printf("-C Comment to Include in Result File
None\n");
    printf("\nNote: Command line switches are case sensitive.\n");

    exit(0);
}

//=====
//
// Function name: GetArgsClient
//
//=====

void GetArgsClient(int argc, char **argv, GLOBAL_CLIENT_DATA *pClient)
{
    int    i;
    char   *ptr;

```

```

#ifdef DEBUG
    printf("[%ld]DBG: Entering GetArgsClient()\n", (int)
GetCurrentThreadId());
#endif

    pClient->num_threads      = NUM_THREADS;
    pClient->server           = SERVER;
    pClient->database         = DATABASE;
    pClient->admin_database   = ADMIN_DATABASE;
    pClient->user             = USER;
    pClient->password         = PASSWORD;
    pClient->pack_size        = (long) DEFCLPACKSIZE;
    pClient->synch_servername = SYNCH_SERVERNAME;
    pClient->disable_delivery_resfiles = DISABLE_DELIVERY_RESFILES;
    pClient->enable_qj        = ENABLE_QJ;

/* check for 1 or more command line args */
if ( argc != 1 )
{
    for ( i = 1; i < argc; ++i)
    {
        if (argv[i][0] != '-' && argv[i][0] != '/')
        {
            printf("\nUnrecognized command");
            GetArgsClientUsage();
            exit(1);
        }

        ptr = argv[i];

        switch (ptr[1])
        {
            case 'S':
                pClient->server = ptr+2;
                break;

            case 'D':
                pClient->database = ptr+2;
                break;

            case 'A':
                pClient->admin_database = ptr+2;
                break;

            case 'U':
                pClient->user = ptr+2;
                break;

            case 'P':
                pClient->password = ptr+2;
                break;

            case 'c':
                pClient->num_threads = atol(ptr+2);
                break;

            case 'p':
                pClient->pack_size = atol(ptr+2);
                break;

            case 'd':

```

```

        pClient->disable_delivery_resfiles =
atol(ptr+2);
        break;
    case 's':
        pClient->synch_servername = ptr+2;
        break;
    case 'q':
        pClient->enable_qj = atol(ptr+2);
        break;
    default:
        GetArgsClientUsage();
        exit(-1);
        break;
    }
}
return;
}

//=====
//
// Function name: GetArgsClientUsage
//
//=====

void GetArgsClientUsage()
{
#ifdef DEBUG
    printf("[%ld]DBG: Entering GetArgsClientUsage()\n", (int)
GetCurrentThreadId());
#endif

    printf("CLIENT:\n\n");
    printf("Parameter
Default\n");
    printf("-----
-\n");
    printf("-S Server                %s\n",
SERVER);
    printf("-D Database                %s\n",
DATABASE);
    printf("-A Admin Database            %s\n",
ADMIN_DATABASE);
    printf("-U Username                %s\n",
USER);
    printf("-P Password                %s\n",
PASSWORD);
    printf("-c Number of User Connections
%ld\n", (long) NUM_THREADS);
    printf("-p TDS Packet Size
%ld\n", (long) DEFCLPACKSIZE);
    printf("-d Disable Delivery Result Files (no = 0, yes = 1)
%ld\n", (long) DISABLE_DELIVERY_RESFILES);

    printf("-s Master Driver Servername                %s\n",
SYNCH_SERVERNAME);

    printf("\nNote:  Command line switches are case sensitive.\n");
    exit(0);
}

//=====
//
// Function name: GetArgsDelivery
//
//=====
void GetArgsDelivery(int argc, char **argv, DELIVERY_ARGS *pDelivery)
{
    int        i;
    char       *ptr;

#ifdef DEBUG
    printf("[%ld]DBG: Entering GetArgsDelivery()\n", (int)
GetCurrentThreadId());
#endif

    pDelivery->pipe_num = 0;

    /* check for 1 or more command line args */
    if ( argc != 1 )
    {
        for ( i = 1; i < argc; ++i)
        {
            if (argv[i][0] != '-' && argv[i][0] != '/')
            {
                printf("\nUnrecognized command");
                GetArgsClientUsage();
                exit(1);
            }
        }

        ptr = argv[i];

        switch (ptr[1])
        {
            case 'p':
                pDelivery->pipe_num = (long)
atol(ptr+2);
                break;

            default:
                printf("ERROR:  No pipe number
specified.");
                exit(-1);
                break;
        }
    }

    return;
}

```

```

//=====
//
// Function name: GetArgsSQLStat
//
//=====

void GetArgsSQLStat(int argc, char **argv, SQLSTAT_ARGS *pargs)
{
    int        i;
    char        *ptr;

    /* init args struct with some useful values */
    pargs->server      = SERVER;
    pargs->user         = USER;
    pargs->password     = PASSWORD;
    pargs->admin_database = ADMIN_DATABASE;
    pargs->sqlstat_filename = SQLSTAT_FILENAME;
    pargs->run_id       = UNDEF;

    /* check for zero command line args */
    if ( argc == 1 )
        GetArgsSQLStatUsage();

    for ( i = 1; i < argc; ++i)
    {
        if (argv[i][0] != '-' && argv[i][0] != '/')
        {
            printf("\nUnrecognized command");
            GetArgsSQLStatUsage();
            exit(1);
        }

        ptr = argv[i];

        switch (ptr[1])
        {
            case 'S':
                pargs->server = ptr+2;
                break;

            case 'U':
                pargs->user = ptr+2;
                break;

            case 'P':
                pargs->password = ptr+2;
                break;

            case 'A':
                pargs->admin_database = ptr+2;
                break;

            case 'i':
                pargs->run_id = atoi(ptr+2);
                break;

            case 'f':
                pargs->sqlstat_filename = ptr+2;
                break;
        }
    }
}

```

```

        default:
            GetArgsSQLStatUsage();
            exit(-1);
            break;
    }
}

/* check for required args */
if (pargs->run_id == UNDEF )
{
    printf("Error, Run ID is required.\n");
    exit(-2);
}

return;
}

//=====
//
// Function name: GetArgsSQLStatUsage
//
//=====

void GetArgsSQLStatUsage()
{
    printf("SQLSTAT:\n\n");
    printf("Parameter
Default\n");
    printf("-----\n");
    printf("-S Server                %s\n",
SERVER);
    printf("-U Username                %s\n",
USER);
    printf("-P Password                %s\n",
PASSWORD);
    printf("-A Admin Database          %s\n",
ADMIN_DATABASE);
    printf("-i Run ID
(required)\n");
    printf("-f Statistics Result file
%s\n", SQLSTAT_FILENAME);

    printf("\nNote: Command line switches are case sensitive.\n");

    exit(0);
}

RANDOM.C

/* FILE: RANDOM.C
* Microsoft TPC-C Kit Ver. 3.00.000
* Audited 08/23/96, By Francois Raab
*
* Copyright Microsoft, 1996
*

```



```

*   PURPOSE:      Random number generation functions for Microsoft
TPC-C Benchmark Kit
*   Author:      Damien Lindauer
*                damienl@Microsoft.com
*/

// 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
//Original code pgd 08/13/96
long RandomNumber(long lower,
                    long upper)
{
    long rand_num;

#ifdef DEBUG
    printf("[%ld]DBG: Entering RandomNumber()...\n", (int)
GetCurrentThreadId());
#endif

    upper++;

    if ((upper <= lower))
        rand_num = upper;
    else
        rand_num = lower + irand() % ((upper > lower) ? upper -
lower : upper);

#ifdef DEBUG
    printf("[%ld]DBG: RandomNumber between %ld & %ld ==> %ld\n",
(int) GetCurrentThreadId(), lower, upper,
rand_num);
#endif

    return rand_num;
}
#endif

//=====
// Function : NURand
//
// Description:
//=====
long NURand(int iConst,
            long x,
            long y,
            long C)
{
    long rand_num;

#ifdef DEBUG
    printf("[%ld]DBG: Entering NURand()...\n", (int)
GetCurrentThreadId());
#endif

    rand_num = (((RandomNumber(0,iConst) | RandomNumber(x,y)) + C) % (y-
x+1))+x;

#ifdef DEBUG

```

```

    printf("[%ld]DBG: NURand: num = %d\n", (int) GetCurrentThreadId(),
rand_num);
#endif

    return rand_num;
}

```

## UTIL.C

```

// TPC-C Benchmark Kit
//
// Module: UTIL.C
// Author: DamienL

```

```

// Includes
#include "tpcc.h"

```

```

//=====
//
// Function name: UtilSleep
//
//=====

```

```

void UtilSleep(long delay)
{

```

```

#ifdef DEBUG
    printf("[%ld]DBG: Entering UtilSleep()\n", (int)
GetCurrentThreadId());
#endif

```

```

#ifdef DEBUG
    printf("[%ld]DBG: Sleeping for %ld seconds...\n", (int)
GetCurrentThreadId(), delay);
#endif

```

```

    Sleep(delay * 1000);
}

```

```

//=====
//
// Function name: UtilSleep
//
//=====

```

```

void UtilSleepMs(long delay)
{

```

```

#ifdef DEBUG
    printf("[%ld]DBG: Entering UtilSleepMs()\n", (int)
GetCurrentThreadId());
#endif

```

```

#ifdef DEBUG
    printf("[%ld]DBG: Sleeping for %ld milliseconds...\n", (int)
GetCurrentThreadId(), delay);
#endif

```

```

    Sleep(delay);
}

```

```

//=====
//
// Function name: UtilPrintNewOrder
//
//=====

```

```

void UtilPrintNewOrder(NEW_ORDER_DATA *pNewOrder)
{
    int i;

```

```

#ifdef DEBUG
    printf("[%ld]DBG: Entering UtilPrintNewOrder()\n", (int)
GetCurrentThreadId());
#endif

```

```

    EnterCriticalSection(&ConsoleCritSec);

```

```

    printf("\n[%04ld]\tNewOrder Transaction\n\n", (int)
GetCurrentThreadId());

```

```

    printf("Warehouse: %ld\n"
           "District: %ld\n"
           "Date: %02ld/%02ld/%04ld %02ld:%02ld:%02ld\n\n"
           "Customer Number: %ld\n"
           "Customer Name: %s\n"
           "Customer Credit: %s\n"
           "Cusotmer Discount: %02.2f%\n\n"
           "Order Number: %ld\n"
           "Warehouse Tax: %02.2f%\n"
           "District Tax: %02.2f%\n\n"
           "Number of Order Lines: %ld\n\n",
           (int) pNewOrder->w_id,
           (int) pNewOrder->d_id,
           (char *) pNewOrder->o_entry_d.month,
           (char *) pNewOrder->o_entry_d.day,
           (char *) pNewOrder->o_entry_d.year,
           (char *) pNewOrder->o_entry_d.hour,
           (char *) pNewOrder->o_entry_d.minute,
           (char *) pNewOrder->o_entry_d.second,
           (int) pNewOrder->c_id,
           (char *) pNewOrder->c_last,
           (char *) pNewOrder->c_credit,
           (float) pNewOrder->c_discount,
           (int) pNewOrder->o_id,
           (float) pNewOrder->w_tax,
           (float) pNewOrder->d_tax,
           (int) pNewOrder->o_ol_cnt);

```

```

    printf("Supp_W Item_Id Item Name                Qty Stock B/G
Price    Amount    \n");
    printf("-----\n");
    printf("-----\n");

```

```

    for (i=0; i < pNewOrder->o_ol_cnt; i++)
    {
        printf("%04ld %06ld %24s %02ld %03ld %1s %8.2f\n",
            (int) pNewOrder->Ol[i].ol_supply_w_id,
            (int) pNewOrder->Ol[i].ol_i_id,
            (char *) pNewOrder->Ol[i].ol_i_name,
            (int) pNewOrder->Ol[i].ol_quantity,
            (int) pNewOrder->Ol[i].ol_stock,
            (char *) pNewOrder->Ol[i].ol_brand_generic,
            (float) pNewOrder->Ol[i].ol_i_price,
            (float) pNewOrder->Ol[i].ol_amount);
    }

    printf("\nTotal: $%05.2f\n\n",
        (float) pNewOrder->total_amount);

    printf("Execution Status: %s\n\n",
        (char *) pNewOrder->execution_status);

    LeaveCriticalSection(&ConsoleCritSec);
}

//=====
//
// Function name: UtilPrintPayment
//
//=====

void UtilPrintPayment(PAYMENT_DATA *pPayment)
{
    char tmp_data[201];
    char data_line_1[51];
    char data_line_2[51];
    char data_line_3[51];
    char data_line_4[51];

#ifdef DEBUG
    printf("[%ld]DBG: Entering UtilPrintPayment()\n", (int)
        GetCurrentThreadId());
#endif

    EnterCriticalSection(&ConsoleCritSec);

    printf("\n[%04ld]\tPayment Transaction\n\n", (int)
        GetCurrentThreadId());

    printf("Date: %02ld/%02ld/%04ld %02ld:%02ld:%02ld\n\n",
        (int) pPayment->h_date.month,
        (int) pPayment->h_date.day,
        (int) pPayment->h_date.year,
        (int) pPayment->h_date.hour,
        (int) pPayment->h_date.minute,
        (int) pPayment->h_date.second);

    printf("Warehouse: %ld\n"
        "District: %ld\n",

```

```

        (int) pPayment->w_id,
        (int) pPayment->d_id);

    printf("Warehouse Address Street 1: %s\n"
        "Warehouse Address Street 2: %s\n",
        (char *) pPayment->w_street_1,
        (char *) pPayment->w_street_2);

    printf("Warehouse Address City: %s\n"
        "Warehouse Address State: %s\n"
        "Warehouse Address Zip: %s\n\n",
        (char *) pPayment->w_city,
        (char *) pPayment->w_state,
        (char *) pPayment->w_zip);

    printf("District Address Street 1: %s\n"
        "District Address Street 2: %s\n",
        (char *) pPayment->d_street_1,
        (char *) pPayment->d_street_2);

    printf("District Address City: %s\n"
        "District Address State: %s\n"
        "District Address Zip: %s\n\n",
        (char *) pPayment->d_city,
        (char *) pPayment->d_state,
        (char *) pPayment->d_zip);

    printf("Customer Number: %ld\n"
        "Customer Warehouse: %ld\n"
        "Customer District: %ld\n",
        (int) pPayment->c_id,
        (int) pPayment->c_w_id,
        (int) pPayment->c_d_id);

    printf("Customer Name: %s %s %s\n"
        "Customer Since: %02ld-%02ld-%04ld\n",
        (char *) pPayment->c_first,
        (char *) pPayment->c_middle,
        (char *) pPayment->c_last,
        (int) pPayment->c_since.month,
        (int) pPayment->c_since.day,
        (int) pPayment->c_since.year);

    printf("Customer Address Street 1: %s\n"
        "Customer Address Street 2: %s\n"
        "Customer Address City: %s\n"
        "Customer Address State: %s\n"
        "Customer Address Zip: %s\n"
        "Customer Phone Number: %s\n\n"
        "Customer Credit: %s\n"
        "Customer Discount: %02.2f%%\n",
        (char *) pPayment->c_street_1,
        (char *) pPayment->c_street_2,
        (char *) pPayment->c_city,
        (char *) pPayment->c_state,
        (char *) pPayment->c_zip,
        (char *) pPayment->c_phone,
        (char *) pPayment->c_credit,
        (double) pPayment->c_discount);

    printf("Amount Paid: $%04.2f\n"

```

```

        "New Customer Balance: $%10.2f\n",
        (float) pPayment->h_amount,
        (double) pPayment->c_balance);

printf("Credit Limit: $%10.2f\n\n",
        (double) pPayment->c_credit_lim);

if (strcmp(pPayment->c_data, " ") != 0)
{
    strcpy(tmp_data, pPayment->c_data);
    strncpy(data_line_1, tmp_data, 50); data_line_1[50] =
'\0';
    strncpy(data_line_2, &tmp_data[50], 50); data_line_2[50] =
'\0';
    strncpy(data_line_3, &tmp_data[100], 50); data_line_3[50] =
'\0';
    strncpy(data_line_4, &tmp_data[150], 50); data_line_4[50] =
'\0';
}
else
{
    strcpy(data_line_1, " "); strcpy(data_line_2, " ");
    strcpy(data_line_3, " "); strcpy(data_line_4, " ");
}

printf("
-----\n");
printf("Customer Data: |%50s|\n", data_line_1);
printf("                |%50s|\n", data_line_2);
printf("                |%50s|\n", data_line_3);
printf("                |%50s|\n", data_line_4);
printf("
-----\n\n");

printf("Execution Status: %s\n\n",
        (char *) pPayment->execution_status);

LeaveCriticalSection(&ConsoleCritSec);
}

//=====
//
// Function name: UtilPrintOrderStatus
//=====

void UtilPrintOrderStatus(ORDER_STATUS_DATA *pOrderStatus)
{
    int i;

#ifdef DEBUG
    printf("[%d]DBG: Entering UtilPrintOrderStatus()\n", (int)
GetCurrentThreadId());
#endif

    EnterCriticalSection(&ConsoleCritSec);

```

```

printf("\n[%04ld]\tOrder-Status Transaction\n\n", (int)
GetCurrentThreadId());

printf("Warehouse: %ld\n"
        "District: %ld\n\n",
        (int) pOrderStatus->w_id,
        (int) pOrderStatus->d_id);

printf("Customer Number: %ld\n"
        "Customer Name: %s %s %s\n\n",
        (int) pOrderStatus->c_id,
        (char *) pOrderStatus->c_first,
        (char *) pOrderStatus->c_middle,
        (char *) pOrderStatus->c_last);

printf("Customer Balance: $%5.2f\n\n",
        (double) pOrderStatus->c_balance);

printf("Order Number: %ld\n"
        "Entry Date: %02ld/%02ld/%04ld %02ld:%02ld:%02ld\n"
        "Carrier Number: %ld\n\n"
        "Number of order lines: %ld\n\n",
        (int) pOrderStatus->o_id,
        (int) pOrderStatus->o_entry_d.month,
        (int) pOrderStatus->o_entry_d.day,
        (int) pOrderStatus->o_entry_d.year,
        (int) pOrderStatus->o_entry_d.hour,
        (int) pOrderStatus->o_entry_d.minute,
        (int) pOrderStatus->o_entry_d.second,
        (int) pOrderStatus->o_carrier_id,
        (int) pOrderStatus->o_ol_cnt);

printf ("Supply-W      Item-Id      Delivery-Date      Qty      Amount      \n");
printf ("-----      -      -      -      -      -      -");

for (i=0;i < pOrderStatus->o_ol_cnt; i++)
{
    printf("%04ld          %06ld          %02ld/%02ld/%04ld
%02ld          %9.2f\n",
        (int) pOrderStatus-
>OlOrderStatusData[i].ol_supply_w_id,
        (int) pOrderStatus-
>OlOrderStatusData[i].ol_i_id,
        (int) pOrderStatus-
>OlOrderStatusData[i].ol_delivery_d.month,
        (int) pOrderStatus-
>OlOrderStatusData[i].ol_delivery_d.day,
        (int) pOrderStatus-
>OlOrderStatusData[i].ol_delivery_d.year,
        (int) pOrderStatus-
>OlOrderStatusData[i].ol_quantity,
        (double) pOrderStatus-
>OlOrderStatusData[i].ol_amount);
}

if (pOrderStatus->o_ol_cnt == 0)
    printf("\nNo Order-Status items.\n\n");

printf("\nExecution Status: %s\n\n",

```

```

        (char *) pOrderStatus->execution_status);
    LeaveCriticalSection(&ConsoleCritSec);
}

//=====
//
// Function name: UtilPrintDelivery
//
//=====

void UtilPrintDelivery(DELIVERY_DATA *pQueuedDelivery)
{
#ifdef DEBUG
    printf("[%d]DBG: Entering UtilPrintDelivery()\n", (int)
GetCurrentThreadId());
#endif

    EnterCriticalSection(&ConsoleCritSec);

    printf("\n[%04d]\tDelivery Transaction\n\n", (int)
GetCurrentThreadId());

    printf("Warehouse: %ld\n", (int) pQueuedDelivery->w_id);

    printf("Carrier Number: %ld\n\n", (int) pQueuedDelivery-
>o_carrier_id);

    printf("Execution Status: %s\n\n", (char *) pQueuedDelivery-
>execution_status);

    LeaveCriticalSection(&ConsoleCritSec);
}

//=====
//
// Function name: UtilPrintStockLevel
//
//=====

void UtilPrintStockLevel(STOCK_LEVEL_DATA *pStockLevel)
{
#ifdef DEBUG
    printf("[%d]DBG: Entering UtilPrintStockLevel()\n", (int)
GetCurrentThreadId());
#endif

    EnterCriticalSection(&ConsoleCritSec);

    printf("\n[%04d]\tStock-Level Transaction\n\n", (int)
GetCurrentThreadId());

    printf("Warehouse: %ld\nDistrict: %ld\n",
(int) pStockLevel->w_id,
(int) pStockLevel->d_id);

```

```

        printf("Stock Level Threshold: %ld\n\n", (int) pStockLevel-
>thresh_hold);

        printf("Low Stock Count: %ld\n\n", (int) pStockLevel->low_stock);

        printf("Execution Status: %s\n\n", (char *) pStockLevel-
>execution_status);

    LeaveCriticalSection(&ConsoleCritSec);
}

//=====
//
// Function name: UtilError
//
//=====
void UtilError(long threadid, char * header, char *msg)
{
#ifdef DEBUG
    printf("[%d]DBG: Entering UtilError()\n", (int)
GetCurrentThreadId());
#endif

    printf("[%d] %s: %s\n", (int) threadid, header, msg);
}

//=====
//
// Function name: UtilFatalError
//
//=====
void UtilFatalError(long threadid, char * header, char *msg)
{
#ifdef DEBUG
    printf("[%d]DBG: Entering UtilFatalError()\n", (int)
GetCurrentThreadId());
#endif

    printf("[Thread: %ld]... %s: %s\n", (int) threadid, header, msg);
    exit(-1);
}

//=====
//
// Function name: UtilStrCpy
//
//=====
void UtilStrCpy(char * pDest, char * pSrc, int n)
{
#ifdef DEBUG
    printf("[%d]DBG: Entering UtilStrCpy()\n", (int)
GetCurrentThreadId());
#endif

```

```

    strncpy(pDest, pSrc, n);
    pDest[n] = '\0';
}

#ifdef USE_CONMON
//=====
//
// Function name: WriteConsoleString
//
//=====
void WriteConsoleString(HANDLE hConMon, char *str, short x, short y, short
color, BOOL pad)
{
    COORD    dwWriteCoord = {0, 0};
    DWORD    cCharsWritten;
    LPOVOID  dummy;
    int      len, i;

#ifdef DEBUG
    printf("[%ld]DBG: Entering WriteConsoleString()\n", (int)
GetCurrentThreadId());
#endif

    dwWriteCoord.X = x;
    dwWriteCoord.Y = y;

    if (pad)
    {
        len = strlen(str);
        if (len < CON_LINE_SIZE)
        {
            for(i=1;i<CON_LINE_SIZE-len;i++)
            {
                strcat(str, " ");
            }
        }

        EnterCriticalSection(&ConsoleCritSec);

        switch (color)
        {
            case YELLOW:
                SetConsoleTextAttribute(hConMon,
                    FOREGROUND_INTENSITY | FOREGROUND_GREEN |
FOREGROUND_RED | BACKGROUND_BLUE);
                break;

            case RED:
                SetConsoleTextAttribute(hConMon,
                    FOREGROUND_INTENSITY | FOREGROUND_RED |
BACKGROUND_BLUE);
                break;

            case GREEN:
                SetConsoleTextAttribute(hConMon,
                    FOREGROUND_INTENSITY | FOREGROUND_GREEN |
BACKGROUND_BLUE);
                break;
        }
    }
}

```

65970120-B

```

    }

    SetConsoleCursorPosition(hConMon, dwWriteCoord);
    WriteConsole(hConMon, str, strlen(str), &cCharsWritten, dummy);

    LeaveCriticalSection(&ConsoleCritSec);
}
#endif

//=====
//
// Function name: AddDeliveryQueueNode
//
//=====
BOOL AddDeliveryQueueNode(DELIVERY_PTR node_to_add)
{
    DELIVERY_PTR    local_node;

#ifdef DEBUG
    DELIVERY_PTR    ptrtmp;
    short            i;
#endif

    EnterCriticalSection(&QueuedDeliveryCritSec);

    if ((local_node = malloc(sizeof(struct delivery_node)) ) == NULL)
    {
        printf("ERROR:  problem allocating memory for delivery
queue.\n");
        exit(-1);
    }
    else
    {
        memcpy(local_node, node_to_add, sizeof (struct
delivery_node));

        if (queued_delivery_cnt == 0)
        {
            delivery_head = local_node;
            delivery_head->next_delivery = NULL;
            delivery_tail = delivery_head;
        }
        else
        {
            local_node->next_delivery = NULL;
            delivery_tail->next_delivery = local_node;
            delivery_tail = local_node;
        }

        queued_delivery_cnt++;
    }

#ifdef DEBUG
    i=0;
    printf("Add to delivery list: %ld\n",queued_delivery_cnt);
    ptrtmp=delivery_head;
    while (ptrtmp != NULL)

```

```

    {
        i++;
        printf("%ld - w_id %ld - o_carrier_id %ld - queue_time
%d/%d/%d %d:%d:%d:%d\n",
            i, ptrtmp->w_id, ptrtmp->o_carrier_id,
            ptrtmp->queue_time.wMonth,
            ptrtmp->queue_time.wDay,
            ptrtmp->queue_time.wYear,
            ptrtmp->queue_time.wHour,
            ptrtmp->queue_time.wMinute,
            ptrtmp->queue_time.wSecond,
            ptrtmp->queue_time.wMilliseconds);

        ptrtmp=ptrtmp->next_delivery;
    }
#endif

    LeaveCriticalSection(&QueuedDeliveryCritSec);

    return TRUE;
}

//=====
//
// Function name: GetDeliveryQueueNode
//
//=====

BOOL GetDeliveryQueueNode(DELIVERY_PTR node_to_get)
{
    DELIVERY_PTR    local_node;
    BOOL            rc;
#ifdef DEBUG
    DELIVERY_PTR    ptrtmp;
    short           i;
#endif

    EnterCriticalSection(&QueuedDeliveryCritSec);

    if (queued_delivery_cnt == 0)
    {
#ifdef DEBUG
        printf("No delivery nodes found.\n");
#endif
        rc = FALSE;
    }
    else
    {
        memcpy(node_to_get, delivery_head, sizeof(struct
delivery_node));

        if (queued_delivery_cnt == 1)
        {
            free(delivery_head);
            delivery_head = NULL;
            queued_delivery_cnt = 0;

```

```

        }
    }
    else
    {
        local_node = delivery_head;
        delivery_head = delivery_head->next_delivery;
        free(local_node);
        queued_delivery_cnt--;
    }

#ifdef DEBUG
    i=0;
    printf("Get from delivery list:
%ld\n", queued_delivery_cnt);
    ptrtmp=delivery_head;
    while (ptrtmp != NULL)
    {
        i++;
        printf("%ld - w_id %ld - o_carrier_id %ld -
queue_time %d/%d/%d %d:%d:%d:%d\n",
            i, ptrtmp->w_id, ptrtmp->
            o_carrier_id,
            ptrtmp->queue_time.wMonth,
            ptrtmp->queue_time.wDay,
            ptrtmp->queue_time.wYear,
            ptrtmp->queue_time.wHour,
            ptrtmp->queue_time.wMinute,
            ptrtmp->queue_time.wSecond,
            ptrtmp->queue_time.wMilliseconds);

        ptrtmp=ptrtmp->next_delivery;
    }
#endif

    rc = TRUE;
}

    LeaveCriticalSection(&QueuedDeliveryCritSec);

    return rc;
}

//=====
//
// Function name: WriteDeliveryString
//
//=====

void WriteDeliveryString(char buf[255])
{
    DWORD    bytesWritten;
    DWORD    retCode;

#ifdef DEBUG
    printf("[%ld]DBG: Entering UtilDeliveryMsg()\n", (int)
GetCurrentThreadId());
#endif

```



```
    EnterCriticalSection(&WriteDeliveryCritSec);  
retCode = WriteFile (hDeliveryMonPipe, buf, PLEASE_WRITE,  
                    &bytesWritten, NULL);  
    LeaveCriticalSection(&WriteDeliveryCritSec);  
}
```



## **Appendix C - Tunable Parameters**

### **Microsoft Windows NT 4.0 Configuration Parameters**

There were no Windows NT Registry parameters that were changed from their default settings. The following services were disabled in the Windows NT Control Panel/ Services on the Server:

- License Logging Service
- NT LM Security Support Provider
- Plug and Play
- Spooler

### **Microsoft SQL Server Startup Parameters**

```
c:\mssql\binn\sqlservr -c -x -t1081 -T812 -T3502 -T1140 -Cd1450000 -Cp4500
```

Where:

- -c Start SQL Server independently of the Service Control Manager
- -x Disables the keeping of CPU time and cache hit ratio statistics
- -t1081 Allows the index pages a “second” trip through the cache
- -T812 Disables checkpoint buffer sorting
- -T3502 Writes a message to the SQL Server Errorlog showing the beginning and ending time of each checkpoint
- -T1140 Optimizes free space allocation
- -Cd1450000 Defines the number of 2KB database cache buffers
- -Cp4500 Defines the number of buffers for the procedure cache

### **SQL Server Stack Size**

The default stack size for Microsoft SQL Server 6.5. (6.50.258) was changed using the EDITBIN utility. The EDITBIN utility ships with Microsoft Visual C++ V4.0. The command used to change the stack size is:

```
editbin /S: 65536 sqlservr.exe
```

This command is fully documented as an article in the Microsoft Knowledge Base on the Microsoft Web Site at [www.microsoft.com/support](http://www.microsoft.com/support).

### **DBCC GAMINIT**

Prior to the execution of the benchmark, the following script was run to proactively populate the Global Allocation Map (GAM) rather than allowing it to be populated on an as needed basis.

```
Use tpcc  
go  
dbcc gaminit  
go
```

This command is fully documented as an article in the Microsoft Knowledge Base on the Microsoft Web Site at [www.microsoft.com/support](http://www.microsoft.com/support).

### **‘Cache’ Column of Sysobjects Table**

Prior to the execution of the benchmark, the following script was run and SQL Server was restarted to improve cache performance of tables which are accessed non-uniformly. Use of this feature is fully documented as an article in the Microsoft Knowledge Base on the Microsoft Web Site at [www.microsoft.com/support](http://www.microsoft.com/support).

```

Use tpcc
go
update sysobjects set cache=2 from sysobjects where name='stock'
go
update sysobjects set cache=5 from sysobjects where name='customer'
go

```

## BOOT.INI

The /3gb switch was added to the boot.ini file to cause NT Server to allow 3GB of user and 1GB of kernel virtual address space, rather than the usual 2GB of virtual address space for each.

## Microsoft SQL Server Startup Parameters

```

Key Name:          SOFTWARE\Microsoft\MSSQLServer\MSSQLServer\Parameters
Class Name:        <NO CLASS>
Last Write Time:   6/25/97 - 9:42 PM
Value 0
  Name:            SQLArg0
  Type:            REG_SZ
  Data:            -dC:\MSSQL\DATA\MASTER.DAT
Value 1
  Name:            SQLArg1
  Type:            REG_SZ
  Data:            -eC:\MSSQL\LOG\ERRORLOG

```

## Microsoft SQL Server Configuration Parameters

```

1> 2> 3> 4> 5> 6> 7> 8> 9> 10> 11> 12> 13> 14>
/*      File:      VERSION.SQL
*/
/*      Microsoft TPC-C Kit Ver. 3.00.000
*/
/*      Audited 08/23/96, By Francois Raab
*/
/*
*/
/*      Copyright Microsoft, 1996
*/
/*
*/
/*      Author:    Damien Lindauer
*/
/*      damienl@Microsoft.com
*/

```

```

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

```

```

-----
Oct  7 1997  9:29:02:043AM

```

(1 row affected)

```

1> 2> 3>
select @@version

```

```

-----
-----
Microsoft SQL Server 6.50 - 6.50.258 (Intel X86)
Jun 16 1997 11:46:49
Cop
yright (c) 1988-1997 Microsoft Corporation

```

(1 row affected)

```

1> 2>
1> 2> 3> 4> 5> 6> 7> 8> 9> 10> 11> 12> 13> 14>
/*      File:      CONFIG.SQL
*/
/*      Microsoft TPC-C Kit Ver. 3.00.000
*/
/*      Audited 08/23/96, By Francois Raab
*/
/*
*/
/*      Copyright Microsoft, 1996
*/
/*
*/
/*      Author:    Damien Lindauer
*/
/*      damienl@Microsoft.com
*/

```

```

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

```

```

-----
Oct  7 1997  9:29:02:826AM

```

(1 row affected)

```

1> 2> 3> Configuration option changed. Run the RECONFIGURE command to
install.

```

```

sp_configure "show advanced",1
1> 2> reconfigure with override
1> 2> sp_configure

```

name	run_value	minimum	maximum	config_value					
					priority boost	450	0	1	0
						0			
					procedure cache		1	99	1
						1			
affinity mask	63	0	2147483647	63	Protection cache size		1	8192	15
						15			
allow updates	1	0	1	1	RA cache hit limit		1	255	4
						4			
backup buffer size	2	1	32	2	RA cache miss limit		1	255	3
						3			
backup threads	4	0	32	4	RA delay		0	500	15
						15			
cursor threshold	-1	-1	2147483647	-1	RA pre-fetches		1	1000	2
						2			
database size	2	2	10000	2	RA slots per thread		1	255	5
						5			
default language	0	0	9999	0	RA worker threads		0	255	0
						0			
default sortorder id	50	0	255	50	recovery flags		0	1	0
						0			
fill factor	0	0	100	0	recovery interval		1	32767	32767
						32767			
free buffers	3000	20	524288	3000	remote access		0	1	0
						0			
hash buckets	749011	4999	1000003	749011	remote conn timeout		-1	32767	10
						10			
language in cache	3	3	100	3	remote login timeout		0	2147483647	5
						5			
LE threshold maximum	301	2	500000	301	remote proc trans		0	1	0
						0			
LE threshold minimum	20	2	500000	20	remote query timeout		0	2147483647	0
						0			
LE threshold percent	0	1	100	0	remote sites		0	256	0
						0			
locks	6000	5000	2147483647	6000	resource timeout		5	2147483647	10
						10			
LogLRU buffers	2100	0	2147483647	2100	set working set size		0	1	1
						1			
logwrite sleep (ms)	-1	-1	500	-1	show advanced options		0	1	1
						1			
max async IO	20	1	1024	20	SMP concurrency		-1	64	-1
						-1			
max lazywrite IO	100	1	1024	100	sort pages		64	511	64
						64			
max text repl size	65536	0	2147483647	65536	spin counter		1	2147483647	10000
						10000			
max worker threads	230	10	1024	230	tempdb in ram (MB)		0	2044	4
						4			
media retention	0	0	365	0	time slice		50	1000	100
						100			
memory	950000	2800	1048576	950000	user connections		5	32767	230
						230			
nested triggers	1	0	1	1	user options		0	4095	0
						0			
network packet size	4096	512	32767	4096					
open databases	10	5	32767	10	(1 row affected)				
					1>				
open objects		100	2147483647	450					

## RAID Disk Controller Configuration

MegaRAID Ultra PCI Adapter (434 Rev. B)  
BIOS Version 2.42 June 19, 1997

-----  
Host Adapter 1 Firmware Version Xm75 DRAM Size = 16MB

Number Of Logical Drives: 1.

Logical Drive 1

State : Optimal  
RAID TYPE : 0  
Write Policy : Write Thru  
Read Policy : No Read Ahead  
Cache Policy : Direct I/O  
Stripe Size : 32K Byte  
No. of Stripes : 7  
No. of Spans : 3  
Size : 87129MB

Component Physical Drives :

RANK 0  
CHANNEL : 1, TARGET : 0 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
CHANNEL : 2, TARGET : 0 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
CHANNEL : 1, TARGET : 1 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
CHANNEL : 2, TARGET : 1 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
CHANNEL : 1, TARGET : 2 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
CHANNEL : 2, TARGET : 2 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
CHANNEL : 1, TARGET : 3 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
RANK 1  
CHANNEL : 2, TARGET : 3 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
CHANNEL : 1, TARGET : 4 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
CHANNEL : 2, TARGET : 4 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
CHANNEL : 1, TARGET : 8 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
CHANNEL : 2, TARGET : 8 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
CHANNEL : 1, TARGET : 9 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
CHANNEL : 2, TARGET : 9 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
RANK 2  
CHANNEL : 1, TARGET : 10 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
CHANNEL : 2, TARGET : 10 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB

CHANNEL : 1, TARGET : 11 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
CHANNEL : 2, TARGET : 11 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
CHANNEL : 1, TARGET : 12 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
CHANNEL : 2, TARGET : 12 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
CHANNEL : 1, TARGET : 13 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB

-----  
Host Adapter 2 Firmware Version Xm75 DRAM Size = 16MB

Number Of Logical Drives: 1.

Logical Drive 1

State : Optimal  
RAID TYPE : 0  
Write Policy : Write Thru  
Read Policy : No Read Ahead  
Cache Policy : Direct I/O  
Stripe Size : 32K Byte  
No. of Stripes : 5  
No. of Spans : 4  
Size : 82980MB

Component Physical Drives :

RANK 0  
CHANNEL : 1, TARGET : 0 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
CHANNEL : 2, TARGET : 0 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
CHANNEL : 1, TARGET : 1 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
CHANNEL : 2, TARGET : 1 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
CHANNEL : 1, TARGET : 2 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
RANK 1  
CHANNEL : 2, TARGET : 2 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
CHANNEL : 1, TARGET : 3 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
CHANNEL : 2, TARGET : 3 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
CHANNEL : 1, TARGET : 4 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
CHANNEL : 2, TARGET : 4 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
RANK 2  
CHANNEL : 1, TARGET : 8 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
CHANNEL : 2, TARGET : 8 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB  
CHANNEL : 1, TARGET : 9 UNISYS - 003557M2954E-512,  
Capacity - 4149 MB

```

CHANNEL : 2, TARGET : 9          UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 1, TARGET : 10        UNISYS - 003557M2954E-512,
Capacity - 4149 MB
RANK 2
CHANNEL : 2, TARGET : 10        UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 1, TARGET : 11        UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 2, TARGET : 11        UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 1, TARGET : 12        UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 2, TARGET : 12        UNISYS - 003557M2954E-512,
Capacity - 4149 MB

```

-----

Host Adapter 3 Firmware Version Xm75 DRAM Size = 16MB

Number Of Logical Drives: 1.

```

Logical Drive 1
State           : Optimal
RAID TYPE       : 0
Write Policy    : Write Thru
Read Policy     : No Read Ahead
Cache Policy    : Direct I/O
Stripe Size    : 32K Byte
No. of Stripes : 5
No. of Spans   : 4
Size           : 128310MB
Component Physical Drives :

```

```

RANK 0
CHANNEL : 1, TARGET : 0          UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 2, TARGET : 0          UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 1, TARGET : 1          UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 2, TARGET : 1          UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 1, TARGET : 2          UNISYS - 007434M2949E-512,
Capacity - 8682 MB
RANK 1
CHANNEL : 2, TARGET : 2          UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 1, TARGET : 3          UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 2, TARGET : 3          UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 1, TARGET : 4          UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 2, TARGET : 4          UNISYS - 007434M2949E-512,
Capacity - 8682 MB
RANK 2

```

```

CHANNEL : 1, TARGET : 8          UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 2, TARGET : 8          UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 1, TARGET : 9          UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 2, TARGET : 9          UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 1, TARGET : 10         UNISYS - 003557M2954E-512,
Capacity - 4149 MB
RANK 2
CHANNEL : 2, TARGET : 10         UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 1, TARGET : 11         UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 2, TARGET : 11         UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 1, TARGET : 12         UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 2, TARGET : 12         UNISYS - 003557M2954E-512,
Capacity - 4149 MB

```

-----

Host Adapter 4 Firmware Version Xm75 DRAM Size = 16MB

Number Of Logical Drives: 1.

```

Logical Drive 1
State           : Optimal
RAID TYPE       : 0
Write Policy    : Write Thru
Read Policy     : No Read Ahead
Cache Policy    : Direct I/O
Stripe Size    : 32K Byte
No. of Stripes : 5
No. of Spans   : 4
Size           : 128310MB
Component Physical Drives :

```

```

RANK 0
CHANNEL : 1, TARGET : 0          UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 2, TARGET : 0          UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 1, TARGET : 1          UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 2, TARGET : 1          UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 1, TARGET : 2          UNISYS - 007434M2949E-512,
Capacity - 8682 MB
RANK 1
CHANNEL : 2, TARGET : 2          UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 1, TARGET : 3          UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 2, TARGET : 3          UNISYS - 007434M2949E-512,
Capacity - 8682 MB

```

```

CHANNEL : 1, TARGET : 4    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 2, TARGET : 4    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
RANK 2
CHANNEL : 1, TARGET : 8    UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 2, TARGET : 8    UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 1, TARGET : 9    UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 2, TARGET : 9    UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 1, TARGET : 10   UNISYS - 003557M2954E-512,
Capacity - 4149 MB
RANK 2
CHANNEL : 2, TARGET : 10   UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 1, TARGET : 11   UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 2, TARGET : 11   UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 1, TARGET : 12   UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 2, TARGET : 12   UNISYS - 003557M2954E-512,
Capacity - 4149 MB

```

-----  
Host Adapter 5 Firmware Version Xm75 DRAM Size = 16MB

Number Of Logical Drives: 1.

```

Logical Drive 1
State           : Optimal
RAID TYPE       : 0
Write Policy    : Write Thru
Read Policy     : No Read Ahead
Cache Policy    : Direct I/O
Stripe Size    : 32K Byte
No. of Stripes : 5
No. of Spans   : 4
Size           : 128310MB
Component Physical Drives :
RANK 0
CHANNEL : 1, TARGET : 0    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 2, TARGET : 0    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 1, TARGET : 1    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 2, TARGET : 1    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 1, TARGET : 2    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
RANK 1

```

```

CHANNEL : 2, TARGET : 2    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 1, TARGET : 3    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 2, TARGET : 3    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 1, TARGET : 4    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 2, TARGET : 4    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
RANK 2
CHANNEL : 1, TARGET : 8    UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 2, TARGET : 8    UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 1, TARGET : 9    UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 2, TARGET : 9    UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 1, TARGET : 10   UNISYS - 003557M2954E-512,
Capacity - 4149 MB
RANK 2
CHANNEL : 2, TARGET : 10   UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 1, TARGET : 11   UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 2, TARGET : 11   UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 1, TARGET : 12   UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 2, TARGET : 12   UNISYS - 003557M2954E-512,
Capacity - 4149 MB

```

-----  
Host Adapter 6 Firmware Version Xm75 DRAM Size = 16MB

Number Of Logical Drives: 1.

```

Logical Drive 1
State           : Optimal
RAID TYPE       : 0
Write Policy    : Write Thru
Read Policy     : No Read Ahead
Cache Policy    : Direct I/O
Stripe Size    : 32K Byte
No. of Stripes : 5
No. of Spans   : 4
Size           : 128310MB
Component Physical Drives :
RANK 0
CHANNEL : 1, TARGET : 0    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 2, TARGET : 0    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 1, TARGET : 1    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 2, TARGET : 1    UNISYS - 007434M2949E-512,
Capacity - 8682 MB

```



```

CHANNEL : 1, TARGET : 2    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
RANK 1
CHANNEL : 2, TARGET : 2    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 1, TARGET : 3    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 2, TARGET : 3    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 1, TARGET : 4    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 2, TARGET : 4    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
RANK 2
CHANNEL : 1, TARGET : 8    UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 2, TARGET : 8    UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 1, TARGET : 9    UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 2, TARGET : 9    UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 1, TARGET : 10   UNISYS - 003557M2954E-512,
Capacity - 4149 MB
RANK 2
CHANNEL : 2, TARGET : 10   UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 1, TARGET : 11   UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 2, TARGET : 11   UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 1, TARGET : 12   UNISYS - 003557M2954E-512,
Capacity - 4149 MB
CHANNEL : 2, TARGET : 12   UNISYS - 003557M2954E-512,
Capacity - 4149 MB

```

-----  
Host Adapter 7 Firmware Version Xm75 DRAM Size = 16MB

Number Of Logical Drives: 2.

Logical Drive 1

```

State           : Optimal
RAID TYPE       : 1
Write Policy    : Write Thru
Read Policy     : No Read Ahead
Cache Policy    : Direct I/O
Stripe Size    : 128K Byte
No. of Stripes : 2
No. of Spans   : 4
Size           : 34728MB
Component Physical Drives :
RANK 0

```

```

CHANNEL : 1, TARGET : 0    UNISYS - 006405ST19101W-512,
Capacity - 8683 MB

```

```

CHANNEL : 2, TARGET : 0    UNISYS - 006405ST19101W-512,
Capacity - 8683 MB
RANK 1
CHANNEL : 1, TARGET : 1    UNISYS - 006405ST19101W-512,
Capacity - 8683 MB
CHANNEL : 2, TARGET : 1    UNISYS - 006405ST19101W-512,
Capacity - 8683 MB
RANK 2
CHANNEL : 1, TARGET : 8    UNISYS - 006405ST19101W-512,
Capacity - 8683 MB
CHANNEL : 2, TARGET : 8    UNISYS - 006405ST19101W-512,
Capacity - 8683 MB
RANK 3
CHANNEL : 1, TARGET : 9    UNISYS - 006405ST19101W-512,
Capacity - 8683 MB
CHANNEL : 2, TARGET : 9    UNISYS - 006405ST19101W-512,
Capacity - 8683 MB

```

Logical Drive 2

```

State           : Optimal
RAID TYPE       : 5
Write Policy    : Write Thru
Read Policy     : Adaptive Read Ahead
Cache Policy    : Cached I/O
Stripe Size    : 128K Byte
No. of Stripes : 6
No. of Spans   : 2
Size           : 86820MB
Component Physical Drives :
RANK 0

```

```

CHANNEL : 3, TARGET : 0    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 3, TARGET : 1    UNISYS - 006405ST19101W-512,
Capacity - 8683 MB
CHANNEL : 3, TARGET : 2    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 3, TARGET : 3    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 3, TARGET : 4    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 3, TARGET : 6    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
RANK 1
CHANNEL : 3, TARGET : 8    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 3, TARGET : 9    UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 3, TARGET : 10   UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 3, TARGET : 11   UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 3, TARGET : 12   UNISYS - 007434M2949E-512,
Capacity - 8682 MB
CHANNEL : 3, TARGET : 13   UNISYS - 007434M2949E-512,
Capacity - 8682 MB

```

## Configuration of Log Drives

There were four mirrored pairs of log drives, with four log drives housed in one independently powered disk cage and their four mirrors housed in a second independently powered disk cage. Each disk cage contained redundant power supplies. The two disk cages were attached to two channels of the seventh RAID controller. The controller was configured to stripe log IO across the four pairs of log drives and to use Write Thru, No Read Ahead and DirectIO (no read or write caching in the RAID controller).

The log disk drives themselves have large data buffers and support both Read Cache Enable (RCE, Factory enabled) and Write Cache Enable (WCE, Factory disabled). All disk writes first load data into the disk buffer. If WCE is enabled, IO completion is signaled immediately, and data is transferred to the media as soon as possible. If WCE is disabled, IO completion is not signaled until after the data is transferred to the media.

The four pairs of (hot-pluggable) log drives were moved from their RAID disk cages to the internal drive cage in the system (accessible from the front door). The latter is connected to an in-built Adaptec SCSI controller. Adaptec's EZ-SCSI software (provided with the base system) SCSI Explorer was used to rescan the SCSI bus and change the setting of WCE for each log drive to enabled. The log drives were then moved back into their RAID disk cages.

For the priced configuration, a UPS was attached to one of the redundant power supplies of both log disk cages. Since even with WCE enabled, the log drives will transfer the data from the buffer to the media as soon as possible (i.e., during the next disk revolution for sequential writes), the existence of the UPS guarantees that a loss of system power will not stop the writes from occurring to the disk media after IO completion is signaled to the RAID controller and system. Since there is no single point of failure in this configuration, it meets the TPC-C requirements of guaranteeing the durability of all committed transactions.

## NT Server Configuration Information

Microsoft Diagnostics Report For \\HS6SUT

OS Version Report

Microsoft (R) Windows NT (TM) Server

65970120-B

Version 4.0 (Build 1381: Service Pack 3) x86 Multiprocessor Free  
Registered Owner: SAM&M, Unisys Corporation  
Product Number: 50382-123-1234567-69937

### System Report

System: AT/AT COMPATIBLE  
Hardware Abstraction Layer: MPS 1.4 - APIC platform  
BIOS Date: 09/30/97  
BIOS Version: PhoenixBIOS 4.0 Release 5.16.9B1

### Processor list:

0: x86 Family 6 Model 1 Stepping 9 GenuineIntel ~200 Mhz  
1: x86 Family 6 Model 1 Stepping 9 GenuineIntel ~200 Mhz  
2: x86 Family 6 Model 1 Stepping 9 GenuineIntel ~200 Mhz  
3: x86 Family 6 Model 1 Stepping 9 GenuineIntel ~200 Mhz  
4: x86 Family 6 Model 1 Stepping 9 GenuineIntel ~200 Mhz  
5: x86 Family 6 Model 1 Stepping 9 GenuineIntel ~200 Mhz

### Video Display Report

BIOS Date: 09/02/94  
BIOS Version: CL-GD5429 VGA BIOS Version 1.00a

### Adapter:

Setting: 1024 x 768 x 256  
72 Hz  
Type: cirrus compatible display adapter  
String: Cirrus Logic Compatible  
Memory: 1 MB  
Chip Type: CL 5429  
DAC Type: Integrated RAMDAC

### Driver:

Vendor: Microsoft Corporation  
File(s): cirrus.sys, vga.dll, cirrus.dll, vga256.dll, vga64K.dll  
Version: 4.00, 4.0.0

### Drives Report

C:\ (Local - NTFS) SYSTEM Total: 0KB, Free: 0KB  
Serial Number: E006 - C69  
Bytes per cluster: 512  
Sectors per cluster: 1  
Filename length: 255  
D:\ (Local - NTFS) DUMP10 Total: 4,241,128KB, Free: 3,458,380KB  
Serial Number: C4B4 - 84B6  
Bytes per cluster: 512  
Sectors per cluster: 8  
Filename length: 255  
W:\ (Local - NTFS) DUMP110 Total: 88,895,644KB, Free: 5,948,264KB  
Serial Number: 8B1 - 8407  
Bytes per cluster: 512  
Sectors per cluster: 8  
Filename length: 255  
X:\ (Local - NTFS) FILES Total: 2,152,708KB, Free: 738,076KB  
Serial Number: D0BB - 55B8

Bytes per cluster: 512  
Sectors per cluster: 8  
Filename length: 255

#### Memory Report

-----  
Handles: 1,220  
Threads: 120  
Processes: 15

Physical Memory (K)  
Total: 3,931,568  
Available: 1,058,428  
File Cache: 14,676

Kernel Memory (K)  
Total: 865,744  
Paged: 5,540  
Nonpaged: 860,204

Commit Charge (K)  
Total: 3,085,648  
Limit: 4,039,980  
Peak: 3,089,896

Pagefile Space (K)  
Total: 262,144  
Total in use: 3,004  
Peak: 3,200

X:\pagefile.sys  
Total: 262,144  
Total in use: 3,004  
Peak: 3,200

#### Services Report

-----  
Alerter Running (Automatic)  
X:\WINNTG\System32\services.exe  
Service Account Name: LocalSystem  
Error Severity: Normal  
Service Flags: Shared Process  
Service Dependencies:  
LanmanWorkstation  
Computer Browser Running (Automatic)  
X:\WINNTG\System32\services.exe  
Service Account Name: LocalSystem  
Error Severity: Normal  
Service Flags: Shared Process  
Service Dependencies:  
LanmanWorkstation  
LanmanServer  
LmHosts  
ClipBook Server Stopped (Manual)  
X:\WINNTG\system32\clipsrv.exe  
Service Account Name: LocalSystem  
Error Severity: Normal

Service Flags: Own Process  
Service Dependencies:  
NetDDE  
DHCP Client (TDI) Stopped (Disabled)  
X:\WINNTG\System32\services.exe  
Service Account Name: LocalSystem  
Error Severity: Normal  
Service Flags: Shared Process  
Service Dependencies:  
Tcpip  
Afd  
NetBT  
EventLog (Event log) Running (Automatic)  
X:\WINNTG\system32\services.exe  
Service Account Name: LocalSystem  
Error Severity: Normal  
Service Flags: Shared Process  
Server Running (Automatic)  
X:\WINNTG\System32\services.exe  
Service Account Name: LocalSystem  
Error Severity: Normal  
Service Flags: Shared Process  
Group Dependencies:  
TDI  
Workstation (NetworkProvider) Running (Automatic)  
X:\WINNTG\System32\services.exe  
Service Account Name: LocalSystem  
Error Severity: Normal  
Service Flags: Shared Process  
Group Dependencies:  
TDI  
License Logging Service Stopped (Manual)  
X:\WINNTG\System32\llssrv.exe  
Service Account Name: LocalSystem  
Error Severity: Normal  
Service Flags: Own Process  
TCP/IP NetBIOS Helper Running (Automatic)  
X:\WINNTG\System32\services.exe  
Service Account Name: LocalSystem  
Error Severity: Normal  
Service Flags: Shared Process  
Group Dependencies:  
NetworkProvider  
Messenger Stopped (Manual)  
X:\WINNTG\System32\services.exe  
Service Account Name: LocalSystem  
Error Severity: Normal  
Service Flags: Shared Process  
Service Dependencies:  
LanmanWorkstation  
NetBios  
MSDTC (MS Transactions) Stopped (Manual)  
C:\MSSQL\BINN\msdtc.exe  
Service Account Name: LocalSystem  
Error Severity: Normal  
Service Flags: Own Process  
Service Dependencies:  
RPCSS  
MSSQLServer Stopped (Manual)

C:\MSSQL\BINN\SQLSERVR.EXE  
Service Account Name: LocalSystem  
Error Severity: Normal  
Service Flags: Own Process, Interactive  
Network DDE (NetDDEGroup) Stopped (Manual)  
X:\WINNTG\system32\netdde.exe  
Service Account Name: LocalSystem  
Error Severity: Normal  
Service Flags: Shared Process  
Service Dependencies:  
NetDDESDM  
Network DDE DSDM Stopped (Manual)  
X:\WINNTG\system32\netdde.exe  
Service Account Name: LocalSystem  
Error Severity: Normal  
Service Flags: Shared Process  
Net Logon (RemoteValidation) Stopped (Manual)  
X:\WINNTG\System32\lsass.exe  
Service Account Name: LocalSystem  
Error Severity: Normal  
Service Flags: Shared Process  
Service Dependencies:  
LanmanWorkstation  
LmHosts  
NT LM Security Support Provider Stopped (Manual)  
X:\WINNTG\System32\SERVICES.EXE  
Service Account Name: LocalSystem  
Error Severity: Normal  
Service Flags: Shared Process  
Plug and Play (PlugPlay) Stopped (Manual)  
X:\WINNTG\system32\services.exe  
Service Account Name: LocalSystem  
Error Severity: Normal  
Service Flags: Shared Process  
Directory Replicator Stopped (Manual)  
X:\WINNTG\System32\lmrepl.exe  
Service Account Name: LocalSystem  
Error Severity: Normal  
Service Flags: Own Process  
Service Dependencies:  
LanmanWorkstation  
LanmanServer  
Remote Procedure Call (RPC) Locator Stopped (Manual)  
X:\WINNTG\System32\LOCATOR.EXE  
Service Account Name: LocalSystem  
Error Severity: Normal  
Service Flags: Own Process  
Service Dependencies:  
LanmanWorkstation  
Rdr  
Remote Procedure Call (RPC) Service Running (Automatic)  
X:\WINNTG\system32\RpcSs.exe  
Service Account Name: LocalSystem  
Error Severity: Normal  
Service Flags: Own Process  
Schedule Stopped (Manual)  
X:\WINNTG\System32\AtSvc.Exe  
Service Account Name: LocalSystem  
Error Severity: Normal

Service Flags: Own Process  
Simple TCP/IP Services Running (Automatic)  
X:\WINNTG\system32\tcpsvcs.exe  
Service Account Name: LocalSystem  
Error Severity: Normal  
Service Flags: Shared Process  
Service Dependencies:  
Afd  
Group Dependencies:  
TDI  
SNMP Running (Automatic)  
X:\WINNTG\System32\snmp.exe  
Service Account Name: LocalSystem  
Error Severity: Normal  
Service Flags: Own Process  
Service Dependencies:  
Tcpip  
EventLog  
SNMP Trap Service Stopped (Manual)  
X:\WINNTG\System32\snmptrap.exe  
Service Account Name: LocalSystem  
Error Severity: Normal  
Service Flags: Own Process  
Service Dependencies:  
Tcpip  
EventLog  
Spooler (SpoolerGroup) Stopped (Manual)  
X:\WINNTG\system32\spoolss.exe  
Service Account Name: LocalSystem  
Error Severity: Normal  
Service Flags: Own Process, Interactive  
SQLExecutive Stopped (Manual)  
C:\MSSQL\BINN\SQLEXEC.EXE  
Service Account Name: .\sa  
Error Severity: Normal  
Service Flags: Own Process  
Telephony Service Stopped (Manual)  
X:\WINNTG\system32\tapisrv.exe  
Service Account Name: LocalSystem  
Error Severity: Normal  
Service Flags: Own Process  
UPS Stopped (Manual)  
X:\WINNTG\System32\ups.exe  
Service Account Name: LocalSystem  
Error Severity: Normal  
Service Flags: Own Process  
Drivers Report  
-----  
Abiosdsk (Primary disk) Stopped (Disabled)  
Error Severity: Ignore  
Service Flags: Kernel Driver, Shared Process  
AFD Networking Support Environment (TDI) Running (Automatic)  
X:\WINNTG\System32\drivers\afd.sys  
Error Severity: Normal  
Service Flags: Kernel Driver, Shared Process  
Aha154x (SCSI miniport) Stopped (Disabled)

Error Severity: Normal  
Service Flags: Kernel Driver, Shared Process  
Aha174x (SCSI miniport) Stopped (Disabled)  
Error Severity: Normal  
Service Flags: Kernel Driver, Shared Process  
aic78xx (SCSI miniport) Running (Boot)  
X:\WINNTG\System32\DRIVERS\aic78xx.sys  
Error Severity: Normal  
Service Flags: Kernel Driver, Shared Process  
Always (SCSI miniport) Stopped (Disabled)  
Error Severity: Normal  
Service Flags: Kernel Driver, Shared Process  
ami0nt (SCSI miniport) Stopped (Disabled)  
Error Severity: Normal  
Service Flags: Kernel Driver, Shared Process  
amsint (SCSI miniport) Stopped (Disabled)  
Error Severity: Normal  
Service Flags: Kernel Driver, Shared Process  
Arrow (SCSI miniport) Stopped (Disabled)  
Error Severity: Normal  
Service Flags: Kernel Driver, Shared Process  
Asante PCI Adapter Driver (NDIS) Running (Automatic)  
X:\WINNTG\System32\drivers\asantpci.sys  
Error Severity: Normal  
Service Flags: Kernel Driver, Shared Process  
Aspi32 Running (Automatic)  
Error Severity: Normal  
Service Flags: Kernel Driver, Shared Process  
atapi (SCSI miniport) Stopped (Disabled)  
Error Severity: Normal  
Service Flags: Kernel Driver, Shared Process  
Atdisk (Primary disk) Stopped (Disabled)  
Error Severity: Ignore  
Service Flags: Kernel Driver, Shared Process  
ati (Video) Stopped (Disabled)  
Error Severity: Ignore  
Service Flags: Kernel Driver, Shared Process  
Beep (Base) Running (System)  
Error Severity: Normal  
Service Flags: Kernel Driver, Shared Process  
BusLogic (SCSI miniport) Stopped (Disabled)  
Error Severity: Normal  
Service Flags: Kernel Driver, Shared Process  
Busmouse (Pointer Port) Stopped (Disabled)  
Error Severity: Ignore  
Service Flags: Kernel Driver, Shared Process  
Cdaudio (Filter) Stopped (System)  
Error Severity: Ignore  
Service Flags: Kernel Driver, Shared Process  
CdFs (File system) Running (Disabled)  
Error Severity: Normal  
Service Flags: File System Driver, Shared Process  
Group Dependencies:  
SCSI CDROM Class  
Cdrom (SCSI CDROM Class) Running (System)  
Error Severity: Ignore  
Service Flags: Kernel Driver, Shared Process  
Group Dependencies:  
SCSI miniport

Changer (Filter) Stopped (System)  
Error Severity: Ignore  
Service Flags: Kernel Driver, Shared Process  
cirrus (Video) Running (System)  
Error Severity: Normal  
Service Flags: Kernel Driver, Shared Process  
Cpqarray (SCSI miniport) Stopped (Disabled)  
Error Severity: Normal  
Service Flags: Kernel Driver, Shared Process  
cpqfw2e (SCSI miniport) Stopped (Disabled)  
Error Severity: Normal  
Service Flags: Kernel Driver, Shared Process  
dac960nt (SCSI miniport) Stopped (Disabled)  
Error Severity: Normal  
Service Flags: Kernel Driver, Shared Process  
dce376nt (SCSI miniport) Stopped (Disabled)  
Error Severity: Normal  
Service Flags: Kernel Driver, Shared Process  
Delldsa (SCSI miniport) Stopped (Disabled)  
Error Severity: Normal  
Service Flags: Kernel Driver, Shared Process  
Dell\_DGX (Video) Stopped (Disabled)  
Error Severity: Ignore  
Service Flags: Kernel Driver, Shared Process  
Disk (SCSI Class) Running (Boot)  
Error Severity: Ignore  
Service Flags: Kernel Driver, Shared Process  
Group Dependencies:  
SCSI miniport  
diskint Running (System)  
Error Severity: Normal  
Service Flags: Kernel Driver, Shared Process  
Diskperf (Filter) Stopped (Disabled)  
Error Severity: Normal  
Service Flags: Kernel Driver, Shared Process  
DptScsi (SCSI miniport) Stopped (Disabled)  
Error Severity: Normal  
Service Flags: Kernel Driver, Shared Process  
dte329x (SCSI miniport) Stopped (Disabled)  
Error Severity: Normal  
Service Flags: Kernel Driver, Shared Process  
em (Base) Running (System)  
Error Severity: Normal  
Service Flags: Kernel Driver, Shared Process  
et4000 (Video) Stopped (Disabled)  
Error Severity: Ignore  
Service Flags: Kernel Driver, Shared Process  
Fastfat (Boot file system) Stopped (Disabled)  
Error Severity: Normal  
Service Flags: File System Driver, Shared Process  
Fd16\_700 (SCSI miniport) Stopped (Disabled)  
Error Severity: Normal  
Service Flags: Kernel Driver, Shared Process  
Fd7000ex (SCSI miniport) Stopped (Disabled)  
Error Severity: Normal  
Service Flags: Kernel Driver, Shared Process  
Fd8xx (SCSI miniport) Stopped (Disabled)  
Error Severity: Normal  
Service Flags: Kernel Driver, Shared Process

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flashpnt (SCSI miniport)                Stopped (Disabled)
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
Floppy (Primary disk)                   Running (System)
  Error Severity: Ignore
  Service Flags: Kernel Driver, Shared Process
Ftdisk (Filter)                         Stopped (Disabled)
  Error Severity: Ignore
  Service Flags: Kernel Driver, Shared Process
i8042 Keyboard and PS/2 Mouse Port Driver (Keyboard Port) Running (System)
  System32\DRIVERS\i8042prt.sys
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
Inport (Pointer Port)                   Stopped (Disabled)
  Error Severity: Ignore
  Service Flags: Kernel Driver, Shared Process
Jazzg300 (Video)                        Stopped (Disabled)
  Error Severity: Ignore
  Service Flags: Kernel Driver, Shared Process
Jazzg364 (Video)                        Stopped (Disabled)
  Error Severity: Ignore
  Service Flags: Kernel Driver, Shared Process
Jzvx1484 (Video)                        Stopped (Disabled)
  Error Severity: Ignore
  Service Flags: Kernel Driver, Shared Process
Keyboard Class Driver (Keyboard Class)  Running (System)
  System32\DRIVERS\kbdclass.sys
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
KSecDD (Base)                           Running (System)
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
mga (Video)                              Stopped (Disabled)
  Error Severity: Ignore
  Service Flags: Kernel Driver, Shared Process
mga_mil (Video)                         Stopped (Disabled)
  Error Severity: Ignore
  Service Flags: Kernel Driver, Shared Process
mitsumi (SCSI miniport)                 Stopped (Disabled)
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
mkecr5xx (SCSI miniport)                Stopped (Disabled)
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
Modem (Extended base)                   Stopped (Manual)
  Error Severity: Ignore
  Service Flags: Kernel Driver, Shared Process
Mouse Class Driver (Pointer Class)       Running (System)
  System32\DRIVERS\mouclass.sys
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
mraid (Primary disk)                    Running (Boot)
  Error Severity: Ignore
  Service Flags: Kernel Driver, Shared Process
mraid35x (SCSI miniport)                Stopped (Boot)
  X:\WINNTG\system32\drivers\mraid35x.sys
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process

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Msfs (File system)                      Running (System)
  Error Severity: Normal
  Service Flags: File System Driver, Shared Process
Mup (Network)                            Running (Manual)
  X:\WINNTG\System32\drivers\mup.sys
  Error Severity: Normal
  Service Flags: File System Driver, Shared Process
Ncr53c9x (SCSI miniport)                 Stopped (Disabled)
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
ncr77c22 (Video)                         Stopped (Disabled)
  Error Severity: Ignore
  Service Flags: Kernel Driver, Shared Process
Ncrc700 (SCSI miniport)                  Stopped (Disabled)
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
Ncrc710 (SCSI miniport)                  Stopped (Disabled)
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
Microsoft NDIS System Driver (NDIS)      Running (System)
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
NetBIOS Interface (NetBIOSGroup)         Stopped (Manual)
  X:\WINNTG\System32\drivers\netbios.sys
  Error Severity: Normal
  Service Flags: File System Driver, Shared Process
  Group Dependencies:
    TDI
WINS Client (TCP/IP) (PNP_TDI)           Stopped (Automatic)
  X:\WINNTG\System32\drivers\netbt.sys
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
  Service Dependencies:
    Tcpip
NetDetect                                 Stopped (Manual)
  X:\WINNTG\system32\drivers\netdtect.sys
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
Npfs (File system)                       Running (System)
  Error Severity: Normal
  Service Flags: File System Driver, Shared Process
Ntfs (File system)                       Running (Disabled)
  Error Severity: Normal
  Service Flags: File System Driver, Shared Process
Null (Base)                              Running (System)
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
NWLink IPX/SPX Compatible Transport Protocol (PNP_TDI) Running (Automatic)
  X:\WINNTG\System32\drivers\nwlnkipx.sys
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
NWLink NetBIOS (PNP_TDI)                 Running (Automatic)
  X:\WINNTG\System32\drivers\nwlnknb.sys
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
  Service Dependencies:
    NwlnkIpx
NWLink SPX/SPXII Protocol                 Running (Manual)

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X:\WINNTG\System32\drivers\nwlnksp.sys
Error Severity: Normal
Service Flags: Kernel Driver, Shared Process
Service Dependencies:
  NwlnkIpx
Olisci (SCSI miniport)           Stopped (Disabled)
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
Parallel (Extended base)         Running (Automatic)
  Error Severity: Ignore
  Service Flags: Kernel Driver, Shared Process
Service Dependencies:
  Parport
Group Dependencies:
  Parallel arbitrator
Parport (Parallel arbitrator)    Running (Automatic)
  Error Severity: Ignore
  Service Flags: Kernel Driver, Shared Process
ParVdm (Extended base)           Running (Automatic)
  Error Severity: Ignore
  Service Flags: Kernel Driver, Shared Process
Service Dependencies:
  Parport
Group Dependencies:
  Parallel arbitrator
PCIDump (PCI Configuration)      Stopped (System)
  Error Severity: Ignore
  Service Flags: Kernel Driver, Shared Process
Pcmcia (System Bus Extender)     Stopped (Disabled)
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
PnP ISA Enabler Driver (Base)    Stopped (System)
  Error Severity: Ignore
  Service Flags: Kernel Driver, Shared Process
PortFltr (port)                  Stopped (Manual)
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
Group Dependencies:
  SCSI miniport
psidisp (Video)                   Stopped (Disabled)
  Error Severity: Ignore
  Service Flags: Kernel Driver, Shared Process
Ql10wnt (SCSI miniport)          Stopped (Disabled)
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
qv (Video)                         Stopped (Disabled)
  Error Severity: Ignore
  Service Flags: Kernel Driver, Shared Process
Rdr (Network)                     Running (Manual)
  X:\WINNTG\System32\drivers\rdr.sys
  Error Severity: Normal
  Service Flags: File System Driver, Shared Process
s3 (Video)                         Stopped (Disabled)
  Error Severity: Ignore
  Service Flags: Kernel Driver, Shared Process
Scsiiprnt (Extended base)        Stopped (Automatic)
  Error Severity: Ignore
  Service Flags: Kernel Driver, Shared Process
Group Dependencies:

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  SCSI miniport
Scsiscan (SCSI Class)             Stopped (System)
  Error Severity: Ignore
  Service Flags: Kernel Driver, Shared Process
Group Dependencies:
  SCSI miniport
Serial (Extended base)            Running (Automatic)
  Error Severity: Ignore
  Service Flags: Kernel Driver, Shared Process
Sermouse (Pointer Port)          Stopped (Disabled)
  Error Severity: Ignore
  Service Flags: Kernel Driver, Shared Process
Sfloppy (Primary disk)           Stopped (System)
  Error Severity: Ignore
  Service Flags: Kernel Driver, Shared Process
Group Dependencies:
  SCSI miniport
Simbad (Filter)                   Stopped (Disabled)
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
slcd32 (SCSI miniport)           Stopped (Disabled)
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
Sparrow (SCSI miniport)          Stopped (Disabled)
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
Spock (SCSI miniport)            Stopped (Disabled)
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
Srv (Network)                     Running (Manual)
  X:\WINNTG\System32\drivers\srv.sys
  Error Severity: Normal
  Service Flags: File System Driver, Shared Process
symc810 (SCSI miniport)          Stopped (Disabled)
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
T128 (SCSI miniport)             Stopped (Disabled)
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
T13B (SCSI miniport)             Stopped (Disabled)
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
TCP/IP Service (PNP_TDI)         Running (Automatic)
  X:\WINNTG\System32\drivers\tcpip.sys
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
tga (Video)                       Stopped (Disabled)
  Error Severity: Ignore
  Service Flags: Kernel Driver, Shared Process
tmv1 (SCSI miniport)             Stopped (Disabled)
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
Ultra124 (SCSI miniport)         Stopped (Disabled)
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
Ultra14f (SCSI miniport)         Stopped (Disabled)
  Error Severity: Normal
  Service Flags: Kernel Driver, Shared Process
Ultra24f (SCSI miniport)         Stopped (Disabled)

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Error Severity: Normal
Service Flags: Kernel Driver, Shared Process
v7vram (Video)           Stopped (Disabled)
Error Severity: Ignore
Service Flags: Kernel Driver, Shared Process
VgaSave (Video Save)     Stopped (System)
X:\WINNTG\System32\drivers\vga.sys
Error Severity: Ignore
Service Flags: Kernel Driver, Shared Process
VgaStart (Video Init)    Stopped (System)
X:\WINNTG\System32\drivers\vga.sys
Error Severity: Ignore
Service Flags: Kernel Driver, Shared Process
Wd33c93 (SCSI miniport)  Stopped (Disabled)
Error Severity: Normal
Service Flags: Kernel Driver, Shared Process
wd90c24a (Video)         Stopped (Disabled)
Error Severity: Ignore
Service Flags: Kernel Driver, Shared Process
wdvga (Video)           Stopped (Disabled)
Error Severity: Ignore
Service Flags: Kernel Driver, Shared Process
weitek9 (Video)         Stopped (Disabled)
Error Severity: Ignore
Service Flags: Kernel Driver, Shared Process
Xga (Video)             Stopped (Disabled)
Error Severity: Ignore
Service Flags: Kernel Driver, Shared Process

```

IRQ and Port Report

Devices	Vector	Level	Affinity
MPS 1.4 - APIC platform	8	8	0x0000003f
MPS 1.4 - APIC platform	0	0	0x0000003f
MPS 1.4 - APIC platform	1	1	0x0000003f
MPS 1.4 - APIC platform	2	2	0x0000003f
MPS 1.4 - APIC platform	3	3	0x0000003f
MPS 1.4 - APIC platform	4	4	0x0000003f
MPS 1.4 - APIC platform	5	5	0x0000003f
MPS 1.4 - APIC platform	6	6	0x0000003f
MPS 1.4 - APIC platform	7	7	0x0000003f
MPS 1.4 - APIC platform	8	8	0x0000003f
MPS 1.4 - APIC platform	9	9	0x0000003f
MPS 1.4 - APIC platform	10	10	0x0000003f
MPS 1.4 - APIC platform	11	11	0x0000003f
MPS 1.4 - APIC platform	12	12	0x0000003f
MPS 1.4 - APIC platform	13	13	0x0000003f
MPS 1.4 - APIC platform	14	14	0x0000003f
MPS 1.4 - APIC platform	15	15	0x0000003f
MPS 1.4 - APIC platform	16	16	0x0000003f
MPS 1.4 - APIC platform	17	17	0x0000003f
MPS 1.4 - APIC platform	18	18	0x0000003f
MPS 1.4 - APIC platform	19	19	0x0000003f
MPS 1.4 - APIC platform	20	20	0x0000003f
MPS 1.4 - APIC platform	21	21	0x0000003f
MPS 1.4 - APIC platform	22	22	0x0000003f

MPS 1.4 - APIC platform	23	23	0x0000003f
MPS 1.4 - APIC platform	24	24	0x0000003f
MPS 1.4 - APIC platform	25	25	0x0000003f
MPS 1.4 - APIC platform	26	26	0x0000003f
MPS 1.4 - APIC platform	27	27	0x0000003f
MPS 1.4 - APIC platform	28	28	0x0000003f
MPS 1.4 - APIC platform	29	29	0x0000003f
MPS 1.4 - APIC platform	30	30	0x0000003f
MPS 1.4 - APIC platform	31	31	0x0000003f
MPS 1.4 - APIC platform	32	32	0x0000003f
MPS 1.4 - APIC platform	33	33	0x0000003f
MPS 1.4 - APIC platform	34	34	0x0000003f
MPS 1.4 - APIC platform	35	35	0x0000003f
MPS 1.4 - APIC platform	36	36	0x0000003f
MPS 1.4 - APIC platform	37	37	0x0000003f
MPS 1.4 - APIC platform	38	38	0x0000003f
MPS 1.4 - APIC platform	39	39	0x0000003f
MPS 1.4 - APIC platform	40	40	0x0000003f
MPS 1.4 - APIC platform	41	41	0x0000003f
MPS 1.4 - APIC platform	42	42	0x0000003f
MPS 1.4 - APIC platform	43	43	0x0000003f
MPS 1.4 - APIC platform	44	44	0x0000003f
MPS 1.4 - APIC platform	45	45	0x0000003f
MPS 1.4 - APIC platform	46	46	0x0000003f
MPS 1.4 - APIC platform	47	47	0x0000003f
MPS 1.4 - APIC platform	61	61	0x0000003f
MPS 1.4 - APIC platform	65	65	0x0000003f
MPS 1.4 - APIC platform	80	80	0x0000003f
MPS 1.4 - APIC platform	193	193	0x0000003f
MPS 1.4 - APIC platform	225	225	0x0000003f
MPS 1.4 - APIC platform	253	253	0x0000003f
MPS 1.4 - APIC platform	254	254	0x0000003f
MPS 1.4 - APIC platform	255	255	0x0000003f
i8042prt	1	1	0xffffffff
i8042prt	12	12	0xffffffff
Serial	4	4	0x00000000
Serial	3	3	0x00000000
AsantePCI	10	10	0x00000000
Floppy	6	6	0x00000000
aic78xx	10	10	0x00000000
mraid	14	14	0x00000000
mraid	11	11	0x00000000
mraid	15	15	0x00000000
mraid	10	10	0x00000000
mraid	14	14	0x00000000
mraid	11	11	0x00000000
mraid	15	15	0x00000000

Devices	Physical Address	Length
MPS 1.4 - APIC platform	0x00000000	0x0000000010
MPS 1.4 - APIC platform	0x00000020	0x0000000002
MPS 1.4 - APIC platform	0x00000040	0x0000000004
MPS 1.4 - APIC platform	0x00000048	0x0000000004
MPS 1.4 - APIC platform	0x00000061	0x0000000001
MPS 1.4 - APIC platform	0x00000070	0x0000000002
MPS 1.4 - APIC platform	0x00000080	0x0000000010
MPS 1.4 - APIC platform	0x00000092	0x0000000001
MPS 1.4 - APIC platform	0x000000a0	0x0000000002



```

MPS 1.4 - APIC platform 0x000000c0 0x0000000010
MPS 1.4 - APIC platform 0x000000d0 0x0000000010
MPS 1.4 - APIC platform 0x000000f0 0x0000000010
MPS 1.4 - APIC platform 0x00000400 0x0000000010
MPS 1.4 - APIC platform 0x00000461 0x0000000002
MPS 1.4 - APIC platform 0x00000464 0x0000000002
MPS 1.4 - APIC platform 0x00000480 0x0000000010
MPS 1.4 - APIC platform 0x000004c2 0x000000000e
MPS 1.4 - APIC platform 0x000004d0 0x0000000002
MPS 1.4 - APIC platform 0x000004d4 0x000000002c
MPS 1.4 - APIC platform 0x00000c84 0x0000000001
i8042prt 0x00000060 0x0000000001
i8042prt 0x00000064 0x0000000001
Parport 0x00000378 0x0000000003
Serial 0x000003f8 0x0000000007
Serial 0x000002f8 0x0000000007
AsantePCI 0x0000f880 0x0000000080
Floppy 0x000003f0 0x0000000006
Floppy 0x000003f7 0x0000000001
aic78xx 0x0000f000 0x0000000100
mraid 0x0000f480 0x0000000080
mraid 0x0000fc00 0x0000000080
mraid 0x0000f800 0x0000000080
mraid 0x0000ec00 0x0000000080
mraid 0x0000e880 0x0000000080
mraid 0x0000e800 0x0000000080
mraid 0x0000e480 0x0000000080
cirrus 0x000003b0 0x000000000c
cirrus 0x000003c0 0x0000000020

```

DMA and Memory Report

```

-----
Devices          Channel   Port
-----
Floppy           2       0
-----
Devices          Physical Address  Length
-----
MPS 1.4 - APIC platform 0xfec00000 0x00000400
MPS 1.4 - APIC platform 0xfec00000 0x00000400
aic78xx         0xfe9fe000 0x00001000
cirrus          0x000a0000 0x00020000

```

Environment Report

```

-----
System Environment Variables
ComSpec=X:\WINNTG\system32\cmd.exe
HOME=X:/
NUMBER_OF_PROCESSORS=6
OS=Windows_NT
Os2LibPath=X:\WINNTG\system32\os2\dll;

```

```

Path=X:\MKSDemo\mksnt;X:\WINNTG\system32;X:\WINNTG;;C:\MSSQL\BINN;x:\intel
\emon\emon\bin
PROCESSOR_ARCHITECTURE=x86
PROCESSOR_IDENTIFIER=x86 Family 6 Model 1 Stepping 9, GenuineIntel
PROCESSOR_LEVEL=6
PROCESSOR_REVISION=0109
ROOTDIR=X:\MKSDemo
SHELL=X:/MKSDemo/mksnt/sh.exe
TMPDIR=X:/TEMP
windir=X:\WINNTG

```

Environment Variables for Current User

```

TEMP=X:\TEMP
TMP=X:\TEMP

```

Network Report

```

-----
Your Access Level: Admin & Local
Workgroup or Domain: WORKGROUP
Network Version: 4.0
LanRoot: WORKGROUP
Logged On Users: 1
Current User (1): Administrator
Logon Domain: HS6SUT
Logon Server: HS6SUT

```

Transport: NwlnkNb, 00-00-94-79-6D-68, VC's: 2, Wan: Wan

```

Character Wait: 3,600
Collection Time: 250
Maximum Collection Count: 16
Keep Connection: 600
Maximum Commands: 5
Session Time Out: 45
Character Buffer Size: 512
Maximum Threads: 50
Lock Quota: 6,144
Lock Increment: 10
Maximum Locks: 500
Pipe Increment: 10
Maximum Pipes: 500
Cache Time Out: 40
Dormant File Limit: 45
Read Ahead Throughput: 4,294,967,295
Mailslot Buffers: 3
Server Announce Buffers: 20
Illegal Datagrams: 5
Datagram Reset Frequency: 60
Log Election Packets: False
Use Opportunistic Locking: True
Use Unlock Behind: True
Use Close Behind: True
Buffer Pipes: True
Use Lock, Read, Unlock: True

```

Use NT Caching: True  
Use Raw Read: True  
Use Raw Write: True  
Use Write Raw Data: True  
Use Encryption: True  
Buffer Deny Write Files: True  
Buffer Read Only Files: True  
Force Core Creation: True  
512 Byte Max Transfer: False  
Bytes Received: 24,569,653  
SMB's Received: 149,692  
Paged Read Bytes Requested: 0  
Non Paged Read Bytes Requested: 711,306,240  
Cache Read Bytes Requested: 0  
Network Read Bytes Requested: 355,653,120  
Bytes Transmitted: 10,748,616  
SMB's Transmitted: 149,692  
Paged Read Bytes Requested: 0  
Non Paged Read Bytes Requested: 1,169,003  
Cache Read Bytes Requested: 0  
Network Read Bytes Requested: 0  
Initially Failed Operations: 0  
Failed Completion Operations: 0  
Read Operations: 86,832  
Random Read Operations: 86,825  
Read SMB's: 86,832  
Large Read SMB's: 0  
Small Read SMB's: 3  
Write Operations: 37,247  
Random Write Operations: 0  
Write SMB's: 37,246  
Large Write SMB's: 0  
Small Write SMB's: 0  
Raw Reads Denied: 0  
Raw Writes Denied: 0  
Network Errors: 0  
Sessions: 80  
Failed Sessions: 0  
Reconnects: 0  
Core Connects: 0  
LM 2.0 Connects: 0  
LM 2.x Connects: 0  
Windows NT Connects: 79  
Server Disconnects: 1  
Hung Sessions: 0  
Use Count: 156  
Failed Use Count: 0  
Current Commands: 0  
Server File Opens: 3  
Server Device Opens: 0  
Server Jobs Queued: 0  
Server Session Opens: 1  
Server Sessions Timed Out: 0  
Server Sessions Errored Out: 0  
Server Password Errors: 0  
Server Permission Errors: 0  
Server System Errors: 0  
Server Bytes Sent: 24,523,912  
Server Bytes Received: 10,696,166

Server Average Response Time: 0  
Server Request Buffers Needed: 0  
Server Big Buffers Needed: 0

## Internet Information Server Registry Parameters

Key Name: SYSTEM\CurrentControlSet\Services\InetInfo  
Class Name: <NO CLASS>  
Last Write Time: 9/11/97 - 6:38 AM

Key Name: SYSTEM\CurrentControlSet\Services\InetInfo\Parameters  
Class Name: <NO CLASS>  
Last Write Time: 10/3/97 - 10:22 AM

Value 0  
Name: BandwidthLevel  
Type: REG\_DWORD  
Data: 0xffffffff

Value 1  
Name: ListenBackLog  
Type: REG\_DWORD  
Data: 0x19

Value 2  
Name: PoolThreadLimit  
Type: REG\_DWORD  
Data: 0x64

Key Name: SYSTEM\CurrentControlSet\Services\InetInfo\Parameters\Filter  
Class Name: <NO CLASS>  
Last Write Time: 9/11/97 - 6:38 AM

Value 0  
Name: FilterType  
Type: REG\_DWORD  
Data: 0

Value 1  
Name: NumDenySites  
Type: REG\_DWORD  
Data: 0

Value 2  
Name: NumGrantSites  
Type: REG\_DWORD  
Data: 0

Key Name: SYSTEM\CurrentControlSet\Services\InetInfo\Parameters\MimeMap  
Class Name: <NO CLASS>  
Last Write Time: 9/11/97 - 6:38 AM

Value 0  
Name: application/envoy, evy, , 5  
Type: REG\_SZ  
Data:

Value 1

Name: application/mac-binhex40, hqx, , 4  
Type: REG\_SZ  
Data:

Value 2  
Name: application/msword, doc, , 5  
Type: REG\_SZ  
Data:

Value 3  
Name: application/msword, dot, , 5  
Type: REG\_SZ  
Data:

Value 4  
Name: application/octet-stream, \*, , 5  
Type: REG\_SZ  
Data:

Value 5  
Name: application/octet-stream, bin, , 5  
Type: REG\_SZ  
Data:

Value 6  
Name: application/octet-stream, exe, , 5  
Type: REG\_SZ  
Data:

Value 7  
Name: application/oda, oda, , 5  
Type: REG\_SZ  
Data:

Value 8  
Name: application/pdf, pdf, , 5  
Type: REG\_SZ  
Data:

Value 9  
Name: application/postscript, ai, , 5  
Type: REG\_SZ  
Data:

Value 10  
Name: application/postscript, eps, , 5  
Type: REG\_SZ  
Data:

Value 11  
Name: application/postscript, ps, , 5  
Type: REG\_SZ  
Data:

Value 12  
Name: application/rtf, rtf, , 5  
Type: REG\_SZ  
Data:

Value 13  
 Name: application/winhelp,hlp,,5  
 Type: REG\_SZ  
 Data:

Value 14  
 Name: application/x-bcpio,bcpio,,5  
 Type: REG\_SZ  
 Data:

Value 15  
 Name: application/x-cpio,cpio,,5  
 Type: REG\_SZ  
 Data:

Value 16  
 Name: application/x-csh,csh,,5  
 Type: REG\_SZ  
 Data:

Value 17  
 Name: application/x-director,dcr,,5  
 Type: REG\_SZ  
 Data:

Value 18  
 Name: application/x-director,dir,,5  
 Type: REG\_SZ  
 Data:

Value 19  
 Name: application/x-director,dxr,,5  
 Type: REG\_SZ  
 Data:

Value 20  
 Name: application/x-dvi,dvi,,5  
 Type: REG\_SZ  
 Data:

Value 21  
 Name: application/x-gtar,gtar,,9  
 Type: REG\_SZ  
 Data:

Value 22  
 Name: application/x-hdf,hdf,,5  
 Type: REG\_SZ  
 Data:

Value 23  
 Name: application/x-latex,latex,,5  
 Type: REG\_SZ  
 Data:

Value 24  
 Name: application/x-msaccess,mdb,,5  
 Type: REG\_SZ  
 Data:

Value 25  
 Name: application/x-mscardfile,crd,,5  
 Type: REG\_SZ  
 Data:

Value 26  
 Name: application/x-msclip,clip,,5  
 Type: REG\_SZ  
 Data:

Value 27  
 Name: application/x-msexcel,xla,,5  
 Type: REG\_SZ  
 Data:

Value 28  
 Name: application/x-msexcel,xlc,,5  
 Type: REG\_SZ  
 Data:

Value 29  
 Name: application/x-msexcel,xlm,,5  
 Type: REG\_SZ  
 Data:

Value 30  
 Name: application/x-msexcel,xls,,5  
 Type: REG\_SZ  
 Data:

Value 31  
 Name: application/x-msexcel,xlt,,5  
 Type: REG\_SZ  
 Data:

Value 32  
 Name: application/x-msexcel,xlw,,5  
 Type: REG\_SZ  
 Data:

Value 33  
 Name: application/x-msmediaview,m13,,5  
 Type: REG\_SZ  
 Data:

Value 34  
 Name: application/x-msmediaview,m14,,5  
 Type: REG\_SZ  
 Data:

Value 35  
 Name: application/x-msmetafile,wmf,,5  
 Type: REG\_SZ  
 Data:

Value 36  
 Name: application/x-msmoney,mny,,5  
 Type: REG\_SZ  
 Data:

Data:

Value 37  
 Name: application/x-mspowerpoint,ppt,,5  
 Type: REG\_SZ  
 Data:

Value 38  
 Name: application/x-msproject,mpp,,5  
 Type: REG\_SZ  
 Data:

Value 39  
 Name: application/x-mspublisher,pub,,5  
 Type: REG\_SZ  
 Data:

Value 40  
 Name: application/x-msterminal,term,,5  
 Type: REG\_SZ  
 Data:

Value 41  
 Name: application/x-msworks,wks,,5  
 Type: REG\_SZ  
 Data:

Value 42  
 Name: application/x-mswrite,wri,,5  
 Type: REG\_SZ  
 Data:

Value 43  
 Name: application/x-netcdf,cdf,,5  
 Type: REG\_SZ  
 Data:

Value 44  
 Name: application/x-netcdf,nc,,5  
 Type: REG\_SZ  
 Data:

Value 45  
 Name: application/x-perfmon,pma,,5  
 Type: REG\_SZ  
 Data:

Value 46  
 Name: application/x-perfmon,pmc,,5  
 Type: REG\_SZ  
 Data:

Value 47  
 Name: application/x-perfmon,pml,,5  
 Type: REG\_SZ  
 Data:

Value 48  
 Name: application/x-perfmon,pmr,,5

Type: REG\_SZ  
 Data:

Value 49  
 Name: application/x-perfmon,pmw,,5  
 Type: REG\_SZ  
 Data:

Value 50  
 Name: application/x-sh,sh,,5  
 Type: REG\_SZ  
 Data:

Value 51  
 Name: application/x-shar,shar,,5  
 Type: REG\_SZ  
 Data:

Value 52  
 Name: application/x-sv4cpio,sv4cpio,,5  
 Type: REG\_SZ  
 Data:

Value 53  
 Name: application/x-sv4crc,sv4crc,,5  
 Type: REG\_SZ  
 Data:

Value 54  
 Name: application/x-tar,tar,,5  
 Type: REG\_SZ  
 Data:

Value 55  
 Name: application/x-tcl,tcl,,5  
 Type: REG\_SZ  
 Data:

Value 56  
 Name: application/x-tex,tex,,5  
 Type: REG\_SZ  
 Data:

Value 57  
 Name: application/x-texinfo,texi,,5  
 Type: REG\_SZ  
 Data:

Value 58  
 Name: application/x-texinfo,texinfo,,5  
 Type: REG\_SZ  
 Data:

Value 59  
 Name: application/x-troff,roff,,5  
 Type: REG\_SZ  
 Data:

Value 60

Name: application/x-troff,t,,5  
Type: REG\_SZ  
Data:

Value 61  
Name: application/x-troff,tr,,5  
Type: REG\_SZ  
Data:

Value 62  
Name: application/x-troff-man,man,,5  
Type: REG\_SZ  
Data:

Value 63  
Name: application/x-troff-me,me,,5  
Type: REG\_SZ  
Data:

Value 64  
Name: application/x-troff-ms,ms,,5  
Type: REG\_SZ  
Data:

Value 65  
Name: application/x-ustar,ustar,,5  
Type: REG\_SZ  
Data:

Value 66  
Name: application/x-wais-source,src,,7  
Type: REG\_SZ  
Data:

Value 67  
Name: application/zip,zip,,9  
Type: REG\_SZ  
Data:

Value 68  
Name: audio/basic,au,,<  
Type: REG\_SZ  
Data:

Value 69  
Name: audio/basic,snd,,<  
Type: REG\_SZ  
Data:

Value 70  
Name: audio/x-aiff,aif,,<  
Type: REG\_SZ  
Data:

Value 71  
Name: audio/x-aiff,aifc,,<  
Type: REG\_SZ  
Data:

Value 72  
Name: audio/x-aiff,aiff,,<  
Type: REG\_SZ  
Data:

Value 73  
Name: audio/x-pn-realaudio,ram,,<  
Type: REG\_SZ  
Data:

Value 74  
Name: audio/x-wav,wav,,<  
Type: REG\_SZ  
Data:

Value 75  
Name: image/bmp,bmp,,:  
Type: REG\_SZ  
Data:

Value 76  
Name: image/cis-cod,cod,,5  
Type: REG\_SZ  
Data:

Value 77  
Name: image/gif,gif,,g  
Type: REG\_SZ  
Data:

Value 78  
Name: image/ief,ief,,:  
Type: REG\_SZ  
Data:

Value 79  
Name: image/jpeg,jpe,,:  
Type: REG\_SZ  
Data:

Value 80  
Name: image/jpeg,jpeg,,:  
Type: REG\_SZ  
Data:

Value 81  
Name: image/jpeg,jpg,,:  
Type: REG\_SZ  
Data:

Value 82  
Name: image/tiff,tif,,:  
Type: REG\_SZ  
Data:

Value 83  
Name: image/tiff,tiff,,:  
Type: REG\_SZ  
Data:

Value 84	Name: image/x-cmu-raster,ras,,:	Data:	Value 96	Name: text/html,stm,,h
	Type: REG_SZ			Type: REG_SZ
	Data:			Data:
Value 85	Name: image/x-cmx,cmx,,5		Value 97	Name: text/plain,bas,,0
	Type: REG_SZ			Type: REG_SZ
	Data:			Data:
Value 86	Name: image/x-portable-anymap,pnm,,:		Value 98	Name: text/plain,c,,0
	Type: REG_SZ			Type: REG_SZ
	Data:			Data:
Value 87	Name: image/x-portable-bitmap,pbm,,:		Value 99	Name: text/plain,h,,0
	Type: REG_SZ			Type: REG_SZ
	Data:			Data:
Value 88	Name: image/x-portable-graymap,pgm,,:		Value 100	Name: text/plain,txt,,0
	Type: REG_SZ			Type: REG_SZ
	Data:			Data:
Value 89	Name: image/x-portable-pixmap,ppm,,:		Value 101	Name: text/richtext,rtx,,0
	Type: REG_SZ			Type: REG_SZ
	Data:			Data:
Value 90	Name: image/x-rgb,rgb,,:		Value 102	Name: text/tab-separated-values,tsv,,0
	Type: REG_SZ			Type: REG_SZ
	Data:			Data:
Value 91	Name: image/x-xbitmap,xbm,,:		Value 103	Name: text/x-setext,etx,,0
	Type: REG_SZ			Type: REG_SZ
	Data:			Data:
Value 92	Name: image/x-ppixmap,xpm,,:		Value 104	Name: video/mpeg,mpe,,;
	Type: REG_SZ			Type: REG_SZ
	Data:			Data:
Value 93	Name: image/x-xwindowdump,xwd,,:		Value 105	Name: video/mpeg,mpeg,,;
	Type: REG_SZ			Type: REG_SZ
	Data:			Data:
Value 94	Name: text/html,htm,,h		Value 106	Name: video/mpeg,mpg,,;
	Type: REG_SZ			Type: REG_SZ
	Data:			Data:
Value 95	Name: text/html,html,,h		Value 107	Name: video/quicktime,mov,,;
	Type: REG_SZ			

Type: REG\_SZ  
Data:

Value 108  
Name: video/quicktime,qt, , ,  
Type: REG\_SZ  
Data:

Value 109  
Name: video/x-msvideo,avi, , ,<  
Type: REG\_SZ  
Data:

Value 110  
Name: video/x-sgi-movie,movie, , ,<  
Type: REG\_SZ  
Data:

Value 111  
Name: x-world/x-vrml,flr, , ,5  
Type: REG\_SZ  
Data:

Value 112  
Name: x-world/x-vrml,wrl, , ,5  
Type: REG\_SZ  
Data:

Value 113  
Name: x-world/x-vrml,wrz, , ,5  
Type: REG\_SZ  
Data:

Value 114  
Name: x-world/x-vrml,xaf, , ,5  
Type: REG\_SZ  
Data:

Value 115  
Name: x-world/x-vrml,xof, , ,5  
Type: REG\_SZ  
Data:

Key Name: SYSTEM\CurrentControlSet\Services\InetInfo\Performance  
Class Name: <NO CLASS>  
Last Write Time: 9/11/97 - 6:38 AM

Value 0  
Name: Close  
Type: REG\_SZ  
Data: CloseINFOPerformanceData

Value 1  
Name: Collect  
Type: REG\_SZ  
Data: CollectINFOPerformanceData

Value 2  
Name: First Counter

Type: REG\_DWORD  
Data: 0x7e6

Value 3  
Name: First Help  
Type: REG\_DWORD  
Data: 0x7e7

Value 4  
Name: Last Counter  
Type: REG\_DWORD  
Data: 0x804

Value 5  
Name: Last Help  
Type: REG\_DWORD  
Data: 0x805

Value 6  
Name: Library  
Type: REG\_SZ  
Data: infoctrs.DLL

Value 7  
Name: Open  
Type: REG\_SZ  
Data: OpenINFOPerformanceData

Key Name: SOFTWARE\Microsoft\Inetsrv  
Class Name: GenericClass  
Last Write Time: 9/11/97 - 6:38 AM

Key Name: SOFTWARE\Microsoft\Inetsrv\CurrentVersion  
Class Name: GenericClass  
Last Write Time: 9/11/97 - 6:43 AM

Value 0  
Name: Description  
Type: REG\_SZ  
Data: Microsoft Internet Information Server 3.0

Value 1  
Name: InstallDate  
Type: REG\_DWORD  
Data: 0x3417f43e

Value 2  
Name: MajorVersion  
Type: REG\_DWORD  
Data: 0x4

Value 3  
Name: MinorVersion  
Type: REG\_DWORD  
Data: 0

Value 4  
Name: OperationsSupport  
Type: REG\_DWORD



Data: 0x86

Value 5  
 Name: ServiceName  
 Type: REG\_SZ  
 Data: Microsoft Internet Information Server 3.0

Value 6  
 Name: SoftwareType  
 Type: REG\_SZ  
 Data: service

Value 7  
 Name: Title  
 Type: REG\_SZ  
 Data: Microsoft Internet Information Server 3.0

Key Name: SOFTWARE\Microsoft\Inetsrv\CurrentVersion\NetRules  
 Class Name: GenericClass  
 Last Write Time: 9/11/97 - 6:38 AM

Value 0  
 Name: InfName  
 Type: REG\_SZ  
 Data: oemnsvin.inf

Value 1  
 Name: InfoOption  
 Type: REG\_SZ  
 Data: Inetsrv

## World Wide Web Server Registry Parameters

Key Name: SYSTEM\CurrentControlSet\Services\W3SVC  
 Class Name: <NO CLASS>  
 Last Write Time: 9/12/97 - 8:21 AM

Value 0  
 Name: DependOnGroup  
 Type: REG\_MULTI\_SZ  
 Data:

Value 1  
 Name: DependOnService  
 Type: REG\_MULTI\_SZ  
 Data: RPCSS  
 NTLMSSP

Value 2  
 Name: DisplayName  
 Type: REG\_SZ  
 Data: World Wide Web Publishing Service

Value 3  
 Name: ErrorControl  
 Type: REG\_DWORD

Data: 0

Value 4  
 Name: ImagePath  
 Type: REG\_EXPAND\_SZ  
 Data: C:\WINNT\System32\inetsrv\inetinfo.exe

Value 5  
 Name: ObjectName  
 Type: REG\_SZ  
 Data: LocalSystem

Value 6  
 Name: Start  
 Type: REG\_DWORD  
 Data: 0x3

Value 7  
 Name: Type  
 Type: REG\_DWORD  
 Data: 0x20

Key Name: SYSTEM\CurrentControlSet\Services\W3SVC\Enum  
 Class Name: <NO CLASS>  
 Last Write Time: 10/6/97 - 4:05 PM

Value 0  
 Name: 0  
 Type: REG\_SZ  
 Data: Root\LEGACY\_W3SVC\0000

Value 1  
 Name: Count  
 Type: REG\_DWORD  
 Data: 0x1

Value 2  
 Name: NextInstance  
 Type: REG\_DWORD  
 Data: 0x1

Key Name: SYSTEM\CurrentControlSet\Services\W3SVC\Parameters  
 Class Name: <NO CLASS>  
 Last Write Time: 9/11/97 - 7:07 AM

Value 0  
 Name: AccessDeniedMessage  
 Type: REG\_SZ  
 Data: Error: Access is Denied.

Value 1  
 Name: AdminEmail  
 Type: REG\_SZ  
 Data: Admin@corp.com

Value 2  
 Name: AdminName  
 Type: REG\_SZ  
 Data: Administrator

Value 3	Name: AnonymousUserName Type: REG_SZ Data: IUSR_XR6-CLIENT1	Data: %SystemRoot%\System32\LogFiles
Value 4	Name: Authorization Type: REG_DWORD Data: 0x5	Value 15 Name: LogFileFormat Type: REG_DWORD Data: 0
Value 5	Name: CacheExtensions Type: REG_DWORD Data: 0x1	Value 16 Name: LogFilePeriod Type: REG_DWORD Data: 0x1
Value 6	Name: CheckForWAISDB Type: REG_DWORD Data: 0	Value 17 Name: LogFileTruncateSize Type: REG_DWORD Data: 0x1388000
Value 7	Name: ConnectionTimeout Type: REG_DWORD Data: 0x1c20	Value 18 Name: LogSqlDataSource Type: REG_SZ Data: HTTPLOG
Value 8	Name: DebugFlags Type: REG_DWORD Data: 0x8	Value 19 Name: LogSqlPassword Type: REG_SZ Data: sqllog
Value 9	Name: Default Load File Type: REG_SZ Data: Default.htm	Value 20 Name: LogSqlTableName Type: REG_SZ Data: Internetlog
Value 10	Name: Dir Browse Control Type: REG_DWORD Data: 0x4000001e	Value 21 Name: LogSqlUserName Type: REG_SZ Data: InternetAdmin
Value 11	Name: Filter DLLs Type: REG_SZ Data: C:\WINNT\System32\inetsrv\sspifilt.dll	Value 22 Name: LogType Type: REG_DWORD Data: 0
Value 12	Name: GlobalExpire Type: REG_DWORD Data: 0xffffffff	Value 23 Name: MajorVersion Type: REG_DWORD Data: 0x2
Value 13	Name: InstallPath Type: REG_SZ Data: C:\WINNT\System32\inetsrv	Value 24 Name: MaxConnections Type: REG_DWORD Data: 0x2710
Value 14	Name: LogFileDirectory Type: REG_EXPAND_SZ	Value 25 Name: MinorVersion Type: REG_DWORD Data: 0
		Value 26 Name: NTAAuthenticationProviders

```

Type:          REG_SZ
Data:          NTLM

Value 27
Name:          ScriptTimeout
Type:          REG_DWORD
Data:          0x384

Value 28
Name:          SecurePort
Type:          REG_DWORD
Data:          0x1bb

Value 29
Name:          ServerComment
Type:          REG_SZ
Data:

Value 30
Name:          ServerSideIncludesEnabled
Type:          REG_DWORD
Data:          0x1

Value 31
Name:          ServerSideIncludesExtension
Type:          REG_SZ
Data:          .stm

Key Name:
SYSTEM\CurrentControlSet\Services\W3SVC\Parameters\Script Map
Class Name:    <NO CLASS>
Last Write Time: 9/11/97 - 6:38 AM
Value 0
Name:          .idc
Type:          REG_SZ
Data:          C:\WINNT\System32\inetsrv\httpodbc.dll

Key Name:
SYSTEM\CurrentControlSet\Services\W3SVC\Parameters\Virtual Roots
Class Name:    <NO CLASS>
Last Write Time: 9/11/97 - 7:07 AM
Value 0
Name:          /,
Type:          REG_SZ
Data:          C:\InetPub\wwwroot,,5

Value 1
Name:          /iisadmin,
Type:          REG_SZ
Data:          C:\WINNT\System32\inetsrv\iisadmin,,1

Value 2
Name:          /Scripts,
Type:          REG_SZ
Data:          C:\InetPub\scripts,,4

```

```

Key Name:      SYSTEM\CurrentControlSet\Services\W3SVC\Performance
Class Name:    <NO CLASS>
Last Write Time: 9/11/97 - 6:38 AM
Value 0
Name:          Close
Type:          REG_SZ
Data:          CloseW3PerformanceData

Value 1
Name:          Collect
Type:          REG_SZ
Data:          CollectW3PerformanceData

Value 2
Name:          First Counter
Type:          REG_DWORD
Data:          0x806

Value 3
Name:          First Help
Type:          REG_DWORD
Data:          0x807

Value 4
Name:          Last Counter
Type:          REG_DWORD
Data:          0x83e

Value 5
Name:          Last Help
Type:          REG_DWORD
Data:          0x83f

Value 6
Name:          Library
Type:          REG_SZ
Data:          w3ctrans.DLL

Value 7
Name:          Open
Type:          REG_SZ
Data:          OpenW3PerformanceData

Key Name:      SYSTEM\CurrentControlSet\Services\W3SVC\Security
Class Name:    <NO CLASS>
Last Write Time: 9/11/97 - 6:38 AM
Value 0
Name:          Security
Type:          REG_BINARY
Data:          00000000 01 00 14 80 c0 00 00 00 - cc 00 00 00 14 00 00 00
.....
00000010 34 00 00 00 02 00 20 00 - 01 00 00 00 02 80 18 00 4.....
.....
00000020 ff 01 0f 00 01 01 00 00 - 00 00 00 01 00 00 00 00
.....
00000030 20 02 00 00 02 00 8c 00 - 05 00 00 00 00 00 18 00
.....

```

```

00000040 8d 01 02 00 01 01 00 00 - 00 00 00 01 00 00 00 00
.....
00000050 ff ff ff ff 00 00 1c 00 - fd 01 02 00 01 02 00 00
.....
00000060 00 00 00 05 20 00 00 00 - 23 02 00 00 08 b8 14 00 ....
...#.....
00000070 00 00 1c 00 ff 01 0f 00 - 01 02 00 00 00 00 00 05
.....
00000080 20 00 00 00 20 02 00 00 - 08 b8 14 00 00 00 1c 00 ...
.....
00000090 ff 01 0f 00 01 02 00 00 - 00 00 00 05 20 00 00 00 .....
...
000000a0 25 02 00 00 08 b8 14 00 - 00 00 18 00 fd 01 02 00
%.....
000000b0 01 01 00 00 00 00 00 05 - 12 00 00 00 25 02 00 00
%.....
000000c0 01 01 00 00 00 00 00 05 - 12 00 00 00 01 01 00 00
%.....
000000d0 00 00 00 05 12 00 00 00 - .....

```

```

Key Name:          SYSTEM\CurrentControlSet\Services\W3SVC\W3SAMP
Class Name:        <NO CLASS>
Last Write Time:   9/11/97 - 6:39 AM

```

## Tuxedo Configuration

Note: this configuration file is repeated on each of the other 5 clients with the exception of the Hostname, "XR6-CLIENT1", which is replaced by "XR6-CLIENT2" thru "XR6-CLIENT6".

```

*RESOURCES
IPCKEY          133133

MAXACCESSERS   1900
MAXSERVERS     210
MAXSERVICES    1800
MODEL          SHM
MASTER        tpcctm
LDBAL         N

```

```

SCANUNIT      15
BLOCKTIME     60
BBLQUERY      60

*MACHINES
DEFAULT:
"XR6-CLIENT1" LMID=tpcctm
               TUXDIR="c:\tuxedo"
               APPDIR="c:\tuxedo\runtime"
               TUXCONFIG="c:\tuxedo\runtime\tuxconfig"
               ULOGPFX="c:\tuxedo\runtime\ulog\ULOG"
               TYPE="WinNT"
               UID=0
               GID=0

*GROUPS
GROUPNT
               LMID=tpcctm   GRPNO=1   OPENINFO=NONE

*SERVERS
DEFAULT:
               CLOPT="-A -- -sHS6SUT -dtpcc"

tpccsvr       SRVGRP=GROUPNT
               SRVID=100
               MIN=35 MAX=200
               RQADDR=tpccq REPLYQ=Y

tpccdelv      SRVGRP=GROUPNT
               SRVID=301
               MIN=1 MAX=1
               CLOPT="-A -- -sHS6SUT -dtpcc -n301"
               RQADDR=delivery REPLYQ=Y

tpccdelv      SRVGRP=GROUPNT
               SRVID=302
               MIN=1 MAX=1
               CLOPT="-A -- -sHS6SUT -dtpcc -n302"
               RQADDR=delivery REPLYQ=Y

*SERVICES

```

## Appendix D - RTE Code

### Admin Environment

```
set WEBADMINCFG=web1065-24x6.cfg
set WEBMAXDRIVERS=24
set WEBDIAGLEVEL=4
set WEBEVENTLOG=0
set WEBEVENTHOST=
set WEBCHECKLEVEL=2
```

webadmin.exe

### Profiles used for Performance Run

#### web1065-24x6.cfg

```
//
// Common Driver Configuration
//
INITBASEPORT 4300
INITSYNCMAX 4
INITPAUSE 1
INITSCALE 220
INITTSCALE 100
INITRWID 1, 1065
INITFIXEDWID 1
INITCCLAST 223
INITCCID 223
INITCITEMID 223
//
// Configuration Driver 1
//
1 INITIPADDR 192.59.13.228
1 INITIISADDR 192.168.83.1
1 INITIISPORT 80
1 INITBROWSERS 440
1 INITMYWID 1,44
//
// Configuration Driver 2
//
2 INITIPADDR 192.59.13.229
2 INITIISADDR 192.168.85.2
2 INITIISPORT 80
2 INITBROWSERS 440
```

```
2 INITMYWID 45,88
//
// Configuration Driver 3
//
3 INITIPADDR 192.59.13.230
3 INITIISADDR 192.168.87.3
3 INITIISPORT 80
3 INITBROWSERS 440
3 INITMYWID 89,132
//
// Configuration Driver 4
//
4 INITIPADDR 192.59.13.231
4 INITIISADDR 192.168.89.4
4 INITIISPORT 80
4 INITBROWSERS 440
4 INITMYWID 133,176
//
// Configuration Driver 5
//
5 INITIPADDR 192.59.13.223
5 INITIISADDR 192.59.32.5
5 INITIISPORT 80
5 INITBROWSERS 440
5 INITMYWID 177,220
//
// Configuration Driver 6
//
6 INITIPADDR 192.59.13.224
6 INITIISADDR 192.59.34.6
6 INITIISPORT 80
6 INITBROWSERS 440
6 INITMYWID 221,264
//
// Configuration Driver 7
//
7 INITIPADDR 192.59.13.224
7 INITIISADDR 192.59.35.6
7 INITIISPORT 80
7 INITBROWSERS 440
7 INITMYWID 265,308
//
// Configuration Driver 8
//
8 INITIPADDR 192.59.13.223
8 INITIISADDR 192.59.33.5
8 INITIISPORT 80
8 INITBROWSERS 440
8 INITMYWID 309,352
//
```

```

// Configuration Driver 9
//
9 INITIPADDR 192.59.13.231
9 INITIISADDR 192.168.90.4
9 INITIISPORT 80
9 INITBROWSERS 440
9 INITMYWID 353,396
//
// Configuration Driver 10
//
10 INITIPADDR 192.59.13.230
10 INITIISADDR 192.168.88.3
10 INITIISPORT 80
10 INITBROWSERS 440
10 INITMYWID 397,440
//
// Configuration Driver 11
//
11 INITIPADDR 192.59.13.229
11 INITIISADDR 192.168.86.2
11 INITIISPORT 80
11 INITBROWSERS 440
11 INITMYWID 441,484
//
// Configuration Driver 12
//
12 INITIPADDR 192.59.13.228
12 INITIISADDR 192.168.84.1
12 INITIISPORT 80
12 INITBROWSERS 440
12 INITMYWID 485,528
//
// Configuration Driver 13
//
13 INITIPADDR 192.59.13.228
13 INITIISADDR 192.168.83.1
13 INITIISPORT 80
13 INITBROWSERS 440
13 INITMYWID 529,572
//
// Configuration Driver 14
//
14 INITIPADDR 192.59.13.229
14 INITIISADDR 192.168.85.2
14 INITIISPORT 80
14 INITBROWSERS 440
14 INITMYWID 573,616
//
// Configuration Driver 15
//
15 INITIPADDR 192.59.13.230
15 INITIISADDR 192.168.87.3
15 INITIISPORT 80
15 INITBROWSERS 440
15 INITMYWID 617,660
//
// Configuration Driver 16
//
16 INITIPADDR 192.59.13.231

```

```

16 INITIISADDR 192.168.89.4
16 INITIISPORT 80
16 INITBROWSERS 450
16 INITMYWID 661,705
//
// Configuration Driver 17
//
17 INITIPADDR 192.59.13.223
17 INITIISADDR 192.59.32.5
17 INITIISPORT 80
17 INITBROWSERS 450
17 INITMYWID 706,750
//
// Configuration Driver 18
//
18 INITIPADDR 192.59.13.224
18 INITIISADDR 192.59.34.6
18 INITIISPORT 80
18 INITBROWSERS 450
18 INITMYWID 751,795
//
// Configuration Driver 19
//
19 INITIPADDR 192.59.13.224
19 INITIISADDR 192.59.35.6
19 INITIISPORT 80
19 INITBROWSERS 450
19 INITMYWID 796,840
//
// Configuration Driver 20
//
20 INITIPADDR 192.59.13.223
20 INITIISADDR 192.59.33.5
20 INITIISPORT 80
20 INITBROWSERS 450
20 INITMYWID 841,885
//
// Configuration Driver 21
//
21 INITIPADDR 192.59.13.231
21 INITIISADDR 192.168.90.4
21 INITIISPORT 80
21 INITBROWSERS 450
21 INITMYWID 886,930
//
// Configuration Driver 22
//
22 INITIPADDR 192.59.13.230
22 INITIISADDR 192.168.88.3
22 INITIISPORT 80
22 INITBROWSERS 450
22 INITMYWID 931,975
//
// Configuration Driver 23
//
23 INITIPADDR 192.59.13.229
23 INITIISADDR 192.168.86.2
23 INITIISPORT 80
23 INITBROWSERS 450

```

```
23 INITMYWID 976,1020
//
// Configuration Driver 24
//
24 INITIPADDR 192.59.13.228
24 INITIISADDR 192.168.84.1
24 INITIISPORT 80
24 INITBROWSERS 450
24 INITMYWID 1021,1065
//
```

## Driver Environment

Note: this configuration file is repeated on each of the other 23 drivers with the exception of WEBDRIVERNO, which is replaced by 2 thru 24.

```
set WEBDRIVERNO=1
set WEBADMBASEPORT=4300
set WEBDIAGLEVEL=2
set WEBEVENTLOG=1
set WEVENTHOST=
set WEBLOGLEVEL=1
set WEBSINGLETRAN=0
set WEBTPCCAUDIT=0
set WEBRTFUDGETM=110
set WEBNEWORDERPROB=4476
set WEBPAYMENTPROB=4309
set WEBORDERSTATUSPROB=405
set WEBDELIVERYPROB=405
set WEBSTOCKLEVELPROB=405
```

```
webdriver.exe
exit
```





# Appendix E - Disk Storage

# TPC-C 180- Day Disk Space Requirements

Warehouses

1110

tpmC

13089.30

Table	Initial Rows	Data KB	Index KB	Extra 5%KB	Total WrtH
Warehouse	1,110	2,220	12	112	
District	11,100	22,200	94	1,115	
Customer	33,300,000	22,204,440	1,723,374	1,196,391	25.1
History (D)	33,300,000	1,665,002	0		1.6
Order (D)	33,300,000	865,800	5,222		8
New-Order	9,990,000	111,000	674	5,584	1
Order-Line (D)	332,999,230	18,510,758	120,992		18.6
Item	100,000	9,100	46	457	
Stock	111,000,000	37,007,400	204,468	1,860,593	39.0
<b>Totals KB</b>		80,397,920	2,054,882	3,064,251	85.5
<b>Dbspaces</b>	<b>Count</b>	<b>Size MB</b>	<b>MB Allocated</b>	<b>MB Loaded + 5%</b>	<b>MB for 8</b>
master, model, tempdb & msdb	43	43	43	43	
tpc_misc	4	655	3,500	2,626	
	1	880			
tpc_cs	5	9,952	63,000	62,692	
	1	13,240			
tpc_ol	4	4,549	22,500	18,195	
	1	4,304			
<b>Total Allocated MB</b>			<b>89,043</b>	<b>83,556</b>	

Dynamic Space MB

20,548 Sum of data for orders, order\_line & history

Static Space

62,964 Sum of data+ index+5%- Dynamic Space

Free Space

5,530 Total allocated space - (Dynamic & Static Spaces)

Daily Growth

3,877 (Dynamic Space / (W \* 62.5)) \* tpmC

Daily Spread

0 Free space - 1.5 \* Daily growth (zero if negative)  
0 SQL Server can be configured to eliminate Daily Spread

180 Day Space MB

760,817 Static Space + 180 \* (Daily Growth + Daily Spread)

180 Day Space GB

**742.99**

8 hr log GB

**33.24** (need double for mirroring)

Disk Capacity MB

4149

**4.0518 GB** Capacity of 4GB disks

8682

**8.4785 GB** Capacity of 9GB disks

**Space Usage**  
180- day space DB

**GB Needed**  
742.99 GB

**Disks Priced**  
81

**GB Priced**  
328.19 GB  
4GB drives

extra disks

40

339.14 GB  
9GB drives

9

76.31 GB  
9GB drives

130

743.64 GB

8- hr log+ mirror

66.48 GB

8

67.84 GB  
9GB drives

OS, SQL Server

4.00 GB

1

4.05 GB  
4GB drives

E-2

TPC-C Full Disclosure Report

65970120-B

### TPC-C 180 - Day Dynamic Table Growth Rates

Table	Initial (KB)	Final (KB)	Change(KB)	KB per New-Order	8-Hr
History	1,665,002	1,886,456	221,454	0.0486	
Orders	871,022	1,003,960	132,938	0.0292	
misc_seg	2,536,024	2,890,416	354,392	0.0778	477.5099
Order_line	18,631,750	21,204,964	2,573,214		
ol_seg	18,631,750	21,204,964	2,573,214	0.5651	3467.1637
Syslogs	6	25,262,838	25,262,832		
logsegment	6	25,262,838	25,262,832	5.5478	33.2415
<b>SUM(d_next_o_id)</b>	33,311,100	37,864,746	4,553,646		
New_order	111,674	135,654	23,980	0.0053	



**Appendix F - Third-Party Price Quotations**



NETLUX  
14180 Live Oak Ave., Unit E  
Baldwin Park, Ca. 91760

1-800-789-1780  
Phone:#818-851-9737  
Fax #818-851-9837

October 14, 1997

Advanced Logic Research  
Cameron Spears  
Software Engineering Manager  
9401 Jeronimo  
Irvine, Ca. 91706  
714-380-5539

Quotation

Quantity	Part No.	Description	Unit Price	Total
736	NX-H16EZ	16-port Desktop Ethernet Hub	\$84.00	\$61,824.00
3	NX-H8TX	8-port 100Mbps FAST Ethernet Hub	\$299.00	\$ 897.00

Terms and Conditions:  
FOB Origin  
5 Year Warranty  
Prices good for 60 Days

Sincerely,  
Martin Parry  
NETLUX

October 29, 1997

Cameron Spears  
 Advanced Logic Research Inc  
 9401 Jeronimo  
 Irvine, CA 92718

Dear Mr. Spears:

Here is the pricing you requested for the Unisys Client Hardware listed below:

<b>Aquantia DM/6 II configured with 256MB party memory (ECC)</b>			
Qty	Description	Price	Total
6	SW/6	896	5376
6	CMT/60072-ZFA	727	4362
6	PROC/600-266	34	204
6	POK/04-SKB	0	
6	B25-LC	28	168
6	PWM/1-P/S2	234	1404
6	HD/1600-5	126	756
6	CDR/1200-AI	120	720
6	ETH/01007-PCI	133	1596
6	ETH/01-PCI	123	738
6	PCV/102-PCI	634	15216
24	MTP/6-64M	634	15216
6	EV/61/42-COL	245	1470
TOTAL:			31998

Five year, on-site, 4-hour response, Monday through Friday maintenance for the systems listed above would be \$918.00 per system for a total of \$4908.00

If you have any questions please don't hesitate to call me at 1-800-586-4797 ext 4448. These prices are valid until December 29, 1997.

Best Regards,

Harold Hendrix  
 Account Manager - Unisys Indirect Channels

cc: File



ENTERPRISE MIDDLEWARE SOLUTIONS

July 7, 1997

Mr. Cameron Spears  
ALR  
9401 Geronimo  
Irvine, CA 92618

Dear Cameron,

Per your request I am enclosing the pricing information regarding TUXEDO 6.x that you requested. This pricing applies to Tuxedo 6.1, 6.2 and 6.3. Please note that Tuxedo 6.3 is our most recent version of Tuxedo but that all 6.x releases are generally available. Core functionality services pricing is appropriate for your activities.

***Tuxedo Core Functionality Services (CFS) Program Product Pricing and Description***

TUX CFS is a limited function product from BEA that offers a subset of TUXEDO 6.3/6.2/6.1 capabilities. The following standard 6.x features ARE NOT AVAILABLE WITH TUX-Core AND CANNOT BE SUPPORTED BY TUX-Core:

1. AWS
2. /Q
3. /COBOL
4. /DCE
5. Transaction
6. Events
7. DOMAINS
8. Admin API
9. ACLs (Access Control List security option)
10. Link Level Encryption
11. Web Browser GUI Admin

TUX-CFS provides a basic level of middleware support for distributed computing, and is best used by organizations with substantial resources and knowledge for advanced distributed computing implementations.

TUX-CFS prices are server only and are based on the overall performance characteristics of the server and uses the same five tier computer classification as TUXEDO 6.3. Prices range from \$3,000 for Tier 1 to \$250,000 for Tier 5. Under this pricing option EVERY system running TUX-CFS at the user site must have a TUXEDO license installed and pay the appropriate per server license fees.



07/07/97

BEA SYSTEMS, INC.

**BEA Tux/CFS Unlimited User License Fees Per Server**

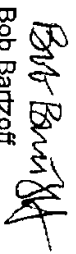
Unlimited User License fees per server	Number of Users	Dollar Amount	Maintenance (5 x 8) per Year	Maintenance (7 x 24) per Year
Tier 1 -- PC Servers with 1 or 2 CPUs, entry level RISC Uni-processor workstations and servers (Class 1 and Class 2)	Unlimited	\$3,000.00	\$450.00	\$660.00
Tier 2 - PC Servers with 3 or 4 CPUs, Midrange RISC Uni-processor servers and workstations (class 3)	Unlimited	\$12,000.00	\$1,800.00	\$2,640.00
Tier 3 - Midrange Multiprocessors, up to 8 CPUs per system capacity (Class 4 and 5)	Unlimited	\$30,000.00	\$4,500.00	\$6,600.00
Tier 4 - Large (more than 8, less than 32 CPUs) and Mainframe Systems (Class 6)	Unlimited	\$100,000.00	\$15,000.00	\$22,000.00
Tier 5 - Massively Parallel Systems, > 32 processors	Unlimited	\$250,000.00	\$37,500.00	\$55,000.00

**Intel based server tier classifications:**

Platform	Operating System	Tier 1 Class 1	Tier 1 Class 2	Tier 2 Class 3	Tier 3 Class 4	Tier 3 Class 5
Intel Pentium/ Pentium Pro PCs	Interactive R3.2 ESIX SVR 4.0 SCO UNIX 3.2.2 and 3.2.4 SCO ODT 2.x,3.x Solaris x86 2 X UnixWare, Windows NT 3.5/4.0	All 386/486 PCs are Class 1	ALL Pentium and Pentium Pro PCs with 1 or 2 CPUs are Class 2	ALL Pentium and Pentium Pro PCs with 3 or 4 CPUs are Class 3		ALL Pentium and Pentium Pro PCs with 5,6,7, or 8 CPUs are Class 5

Please feel free to call me if you require additional information.

Sincerely,



Bob Bartzoff  
BEA Systems, Inc.  
(408) 542-4363

10/28/97 TUE 20:36 FAX 9367329

MICROSOFT RECEP 10 OUT

005

Microsoft Corporation  
One Microsoft Way  
Redmond, WA 98052-6399

Tel 206 882 8080  
Telex 160520  
Fax 206 936 7329

**Microsoft**

October 28, 1997

Mr. Cameron Spears  
Software Engineering Manager  
Advanced Logic Research, Inc.  
9401 Jeronimo  
Irvine, CA 92618

via FAX # 714-581-7951

Dear Cameron,

Microsoft has received your request for permission to disclose the results of TPC-C benchmark tests conducted by ALR with Microsoft SQL Server, Enterprise Edition 6.5 on the following system:

ALR Revolution 6X6, 6 processors, Pentium Pro, 200 MHz, 1MB L2 cache  
Test results: 13089 ipmC @ \$35/ipmC approximately

Microsoft hereby grants ALR permission to disclose these results to third parties and acknowledges that ALR has formally requested permission to do so in accordance with the license agreement for Microsoft SQL Server Enterprise Edition software.

Best regards,



Sid Arora  
Product Manager, Microsoft SQL Server  
Personal and Business Systems Group

Microsoft Corporation is an equal opportunity employer.

10/28/97 TUE 20:36 FAX 9367329

MICROSOFT RECEP 10 OUT

004

Microsoft Corporation  
One Microsoft Way  
Redmond, WA 98052-6399

Tel 206 882 8080  
Telex 160520  
Fax 206 936 7329

**Microsoft**

October 28, 1997

Mr. Cameron Spears  
Software Engineering Manager  
Advanced Logic Research, Inc.  
9401 Jeronimo  
Irvine, CA 92618

via FAX # 714-581-7951

Dear Cameron,

Here is the information you requested regarding US pricing of certain Microsoft products:

Microsoft SQL Server, Enterprise Edition 6.5, unlimited user licence	\$28999
Microsoft Windows NT Server, Enterprise Edition 4.0, incl 25 CALs	\$3999
Windows NT Server 4.0 software, incl 5 CALs	\$809
Microsoft SQL Workstation (includes programmers toolkit)	\$499
Visual C++ 32-bit edition (subscription)	\$499
5-yr maintenance for above software @ \$2095/yr	\$10475

This quote is valid for the next 60 days. Please let me know if I can be of any further assistance.

Best regards,



Sid Arora  
Product Manager, Microsoft SQL Server  
Personal and Business Systems Group

Microsoft Corporation is an equal opportunity employer.