# TPC Benchmark C®
# Full Disclosure Report

# *Compaq AlphaServer ES40*
# *Model 6/833*
# *4 CPU*
# *Client/Server System*
# *Using Compaq Tru64 UNIX®*
# *and*
# *Compaq ProLiant ML350*
# *Using*
# *Microsoft 2000 Server ®*
# *and*
# *Sybase Adaptive Server Enterprise® 12.0.0.3*

| Company Name | System Name | Database Software | Operating System Software |
|---|---|---|---|
| | | | |
| **Compaq Computer Corporation** | **Compaq AlphaServer ES40 Model 6/833 4 CPU** | **Sybase Adaptive Server Enterprise 12.0.0.3** | **Compaq Tru64 UNIX V5.1** |

Availability Date: May 1, 2001

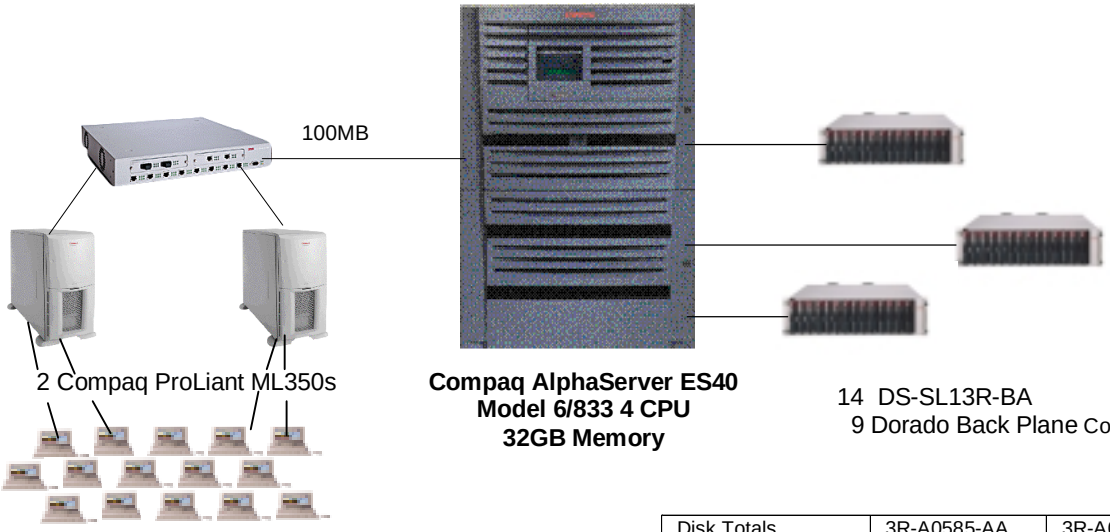
| Total System Cost | TPC-C Throughput | Price Performance |
|---|---|---|
| - Hardware<br>- Software<br>- 3-Years Maintenance | Sustained maximum throughput of system running TPC Benchmark C expressed in transactions per minute | Total system cost/ TPC-C® throughput **$627,144/37,274** |
| **$627,144** | **37,274** | **$16.83** |

**First Printing February, 2001**

| COMPAQ | **Compaq AlphaServer ES40<br>Model 6/833 4 CPU<br>Client Server System** | TPC-C Rev. 5<br>Upgrade from TPC-C Rev. 3.5<br><br>**Report Date: April 3, 2001**<br>Original Date: February 26, 2001 |
|---|---|---|

| Total System Cost | TPC-C Throughput | Price/Performance | Availability Date |
|---|---|---|---|
| **$627,144** | **37,274** | **$16.83** | **May 1, 2001** |

| Processors | Database | Operating System | Other Software | Number Users |
|---|---|---|---|---|
| 4 833MHz Alphachip 21264 | Sybase Adaptive Server Enterprise 12.0.0.3 | Compaq Tru64 UNIX V5.1 | Compaq DB Web Connector V1.1 | 30,000 |




| Disk Totals | 3R-A0585-AA | 3R-A0584-AA |
|---|---|---|
| DB + System Disks | 87 | 104 |
| 10% Spare Disks | 9 | 11 |
| Total | 96 | 115 |

| | System Components<br>Database Server, Compaq AlphaServer ES40 Model 6/833 | | Client Components (Each of 2)<br>Compaq ProLiant ML350 | |
|---|---|---|---|---|
| | **Qty** | **Type** | **Qty** | **Type** |
| Processors | 4 | 6/833 MHz Alphachip 21264 | 1 | GHz Intel Pentium III |
| Cache Memory | 8 | MB Cache | | 512KB Cache |
| Memory | 4 | 8 GB Memory | 1 | 128MB Memory |
| Total Memory | 32 | GB Memory | 2 | 256MB Memory |
| Disk Controllers | 9 | Back Plane Raid Controller | | 640 Total |
| Disks | 104 | 9.1GB Disks | 1 | 18.2GB Disk |
| | 87 | 18.2GB Disks | | |
| Total Disk Storage | 2529.8 | GB | | |

COMPAQ

**AlphaServer ES40**
**Model 6/833**
**4 CPU C/S System**

TPC-C Rev. 5 Upgrade from TPC-C Rev. 3.5

Report Date: April 3, 2001
Original Date: February 26, 2001

| Description | Part Number | Third Party Brand | Unit Price Pricing | Qty | Extended Price | 3 yr. Maint. Price |
|---|---|---|---|---|---|---|
| **Server Hardware** | | | | | | |
| Compaq AS ES40 833 Model 2 4MB | DA-64CAA-FA | 1 | 92,016 | 1 | 92,016 | 12,830 |
| ES40 Tower Enclosure | BA61M-MT | 1 | 500 | 1 | 500 | Inc. |
| ES40 SMP CPU, 833MHZ, Unix | KN610-CB | 1 | 16,500 | 3 | 49,500 | Inc. |
| ES40 4GB Memory Option | MS610-FA | 1 | 51,200 | 7 | 358,400 | Inc. |
| ES40 Power Supply | H7906-A9 | 1 | 1,250 | 2 | 2,500 | Inc. |
| 3 Channel LVD Raid Controller | DS-KZPCC-CE | 1 | 3,731 | 9 | 33,579 | Inc. |
| Ultra 68VHD 10M Cable Assembly | BN37A-03 | 1 | 140 | 34 | 4,760 | Inc. |
| Star Lite Storage Shelf | DS-SL13R-BA | 1 | 3,523 | 14 | 49,322 | Inc. |
| 12/24GB 4mm Dat 5.25" | TLZ10-LB | 1 | 1,000 | 1 | 1,000 | Inc. |
| Dual Port Ultra Wide SCSI PCI Adapt. 10/100 | ITI-4280UE | 1 | 822 | 1 | 822 | Inc. |
| VT510,White,North Amer, No Kedy | VT510-DA | 1 | 610 | 1 | 610 | |
| US/Canada Keyboard | PCXLA-NA | 1 | 25 | 1 | 25 | |
| 17-03212-05 8MP-8MP Patch Cable | BN25G-07 | 1 | 9 | 3 | 27 | |
| 18GB 10K RPM Drive | 3R-A0585-AA | 1 | 878 | 96 | 84,288 | Spared |
| 9.1GB 10K RPM Drive | 3R-A0584-AA | 1 | 575 | 115 | 66,125 | Spared |
| Etherfast 8 Port 100Base-TX Hub | DEH3552 | 2 | 108 | 3 | 324 | Spared |
| | | | **Subtotal** | | **743,798** | **12,830** |
| **Server Software** | | | | | | |
| *3YR AS ES40 UNIX BRZ+24X7* | *FM-62UNS-36* | *1* | *3,341* | *1* | | *3,341* |
| *3YR AS ES40 UNIX SMP* | *FM-62USM-36* | *1* | *837* | *3* | | *2,511* |
| cVISN MC MG Mul Sys 1 Lic | QM-MQDAA-BA | 1 | 995 | 1 | 995 | |
| cVISN Mul CDRM Kit | QA-5FVAB-H8 | 1 | 99 | 1 | 99 | |
| Tru64 UNIX AlphaCDROM | QA-MT4AA-H8 | 1 | 395 | 1 | 395 | |
| Sybase ASE Pricing | Sybase | 3 | 34,995 | 1 | 34,995 | 28,000 |
| | | | **Subtotal** | | **36,484** | **33,852** |
| **Client Hardware** | | | | | | |
| Compaq ProLiant ML350 1.0Ghz | 160247-001 | 1 | 3,142 | 2 | 6,284 | 1,500 |
| Pentium II P1000-256K Processor | 207068-B21 | 1 | 2,570 | 2 | 5,140 | Inc. |
| 512MB SDRAM DIMM Memory | 128279-B21 | 1 | 2,049 | 2 | 4,098 | Inc. |
| ProLiant ML350 Hot Plug Drive Cage | 161275-B21 | 1 | 656 | 2 | 1,312 | Inc. |
| 18.2gb Wide Ultra 3 Drive | 142673-B22 | 1 | 952 | 2 | 1,904 | Inc. |
| Ethernet Dual Channel | 338456-B21 | 1 | 427 | 8 | 3,416 | Inc. |
| NC3132 Dual 10/100 Module | 338456-B22 | 1 | 340 | 8 | 2,720 | Inc. |
| 256MB SDRAM DIMM Memory Option | 313616-B21 | 1 | 986 | 4 | 3,944 | Inc. |
| Presario MV740 Monitor | 153724-001 | 1 | 521 | 4 | 2,084 | Spared |
| | | | **Subtotal** | | **30,902** | **1,500** |
| **Client Software** | | | | | | |
| Compaq DB Web Connector V1.1 | QB-641AA-SA | 1 | 450 | 4 | 1,800 | 1,440 |
| | | | **Subtotal** | | **1,800** | **1,440** |
| **Notes:** ** 10% Spares** | | | | | | |
| **ICS Discount: 30% on Server Hardware/Software based on volume.** | | | | | **($233,300)** | |
| **ICS Discount: 20% on FM and FR numbers based on volume.** | | | | | | **($2,162)** |
| | | | **Subtotal** | | **$579,684** | **$47,460** |
| | | | **Three Year Cost of Ownership** | | | **$627,144** |
| **1=IC System Solutions, 2=MicroWarehouse, 3= Sybase, 4=NetCruiser** | | | | | **tpmC Rating:** | **37,274** |
| **Audited by InfoSizing** | | | | | **$ / tpmC:** | **$16.83** |

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

**Numeric Quantities Summary**
**Compaq AlphaServer ES40 Model 6/833 4 CPU C/S System**

**MQTH**

| | |
|---|---|
| MQTH, computed Maximum Qualified Throughput | 37274 |

**Response Times** in seconds

| Transaction | 90th percentile | Average | Maximum |
|---|---|---|---|
| New-Order | 0.548 | 0.368 | 97.848 |
| Payment | 1.200 | 0.646 | 98.003 |
| Order-Status | 0.603 | 0.402 | 8.277 |
| Delivery (interactive) | 0.635 | 0.357 | 10.215 |
| Delivery (deferred) | 0.704 | 0.486 | 3.329 |
| Stock-Level | 1.098 | 0.583 | 42.734 |
| Menu | 0.341 | 0.228 | 56.016 |

**Transaction Mix** in percent of total transactions

| Transaction | Total Occurrences | Percentage |
|---|---|---|
| New-Order | 4472909 | 44.961% |
| Payment | 4279518 | 43.017% |
| Order-Status | 398619 | 4.007% |
| Delivery (interactive) | 398647 | 4.007% |
| Stock-Level | 398810 | 4.009% |

**Keying/Think Times** in seconds

| Transaction | Minimum | Average | Maximum |
|---|---|---|---|
| New-Order | 18.000/0.000 | 18.001/12.000 | 18.041/119.913 |
| Payment | 3.000/0.000 | 3.002/12.004 | 3.041/119.890 |
| Order-Status | 2.000/0.000 | 2.001/10.001 | 2.034/ 99.139 |
| Delivery (interactive) | 2.000/0.000 | 2.001/ 5.004 | 2.033/ 49.771 |
| Stock-Level | 2.000/0.000 | 2.001/ 5.009 | 2.034/ 49.763 |

**Emulation Delay** in seconds

| Transaction | Response Time | Menu Response Time |
|---|---|---|
| New-Order | 0.10 | 0.10 |
| Payment | 0.10 | 0.10 |
| Order-Status | 0.10 | 0.10 |
| Delivery (interactive) | 0.10 | 0.10 |
| Stock-Level | 0.10 | 0.10 |

**Test Duration**

| | |
|---|---|
| Ramup up time | 30:00 minutes |
| Measurement interval | 120:00.00 minutes |
| Number of checkpoints | 4 |
| Number of New Order transactions | 4472909 |
| Number of transactions (all types) completed in measurement interval | 9948503 |

## Abstract

This report documents the compliance of Compaq Computer Corporation's and Sybase, Inc.'s TPC Benchmark C tests on the Compaq AlphaServer ES40 Model 6/833 4 CPU client/server system with Version 5.0 of the TPC Benchmark C Standard Specification. Two Compaq ProLiant 1600's were used as the front-end clients. One of these systems was also used as a development system.

Two standard metrics, transactions-per-minute-C (tpmC) and price per tpmC ($/tpmC) are reported, in accordance with the TPC Benchmark C Standard. The independent auditor's report by InfoSizing is appended at the end of this report.

**Table of Contents**

# Preface

This report documents the compliance of Compaq Computer Corporation and Sybase, Inc., and TPC Benchmark C (TPC-C) testing on the Compaq AlphaServer ES40 Model 6/833 4 CPU client/server system with Version 5.0 of the *TPC Benchmark C Standard Specification*[1]. The TPC-C Standard represents an effort by Compaq Computer Corporation and other members of the Transaction Processing Performance Council (TPC) to create industry-wide benchmarks for evaluating the performance and price/performance of transaction processing systems.

These tests were run using the Compaq DB Web Connector V1.1, Sybase Adaptive Server Enterprise 12.0.0.3 relational database under the Compaq Tru64 UNIX V5.1 operating system. Two Compaq ProLiant 1600 computers were used as the front-end clients.

**About the TPC-C Benchmark**
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.

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

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[1] *TPC Benchmark C Standard Specification*, Transaction Processing Performance Council, Version 5.0

**Document Structure**

This *TPC Benchmark C Non Disclosure Report* is organized as follows:

- The main body of the document lists each item in Clause 8 of the TPC-C Standard and explains how each requirement is satisfied.
- Appendix A contains the source code of the TPC-C application code used to implement the TPC-C transactions.
- Appendix B contains the database definition and population code used in the tests.
- Appendix C contains the Remote Terminal Emulator (RTE) code used to generate and record transactions.
- Appendix D contains the tunable parameters.
- Appendix E contains the independent auditor's report on the compliance of this disclosure with the benchmark specifications.
- Appendix F contains third-party price quotations.

**Additional Copies**

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Compaq Computer Corporation
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U.S.A.

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# TPC Benchmark C Full Disclosure

The *TPC Benchmark C Standard Specification* requires test sponsors to publish, and make available to the public, a full disclosure report for the results to be considered compliant with the Standard. The required contents of the full disclosure report are specified in Clause 8. This report is intended to satisfy the Standard's requirement for full disclosure. It documents the compliance of the benchmark tests with each item listed in Clause 8 of the *TPC Benchmark C Standard Specification*.

In the *Standard Specification*, the main headings in Clause 8 are keyed to the other clauses. The headings in this report use the same sequence, so that they correspond to the titles or subjects referred to in Clause 8.

Each section in this report begins with the text of the corresponding item from Clause 8 of the *Standard Specification*, printed in italic type. The plain type text that follows explains how the tests comply with the TPC Benchmark C requirement. In sections where Clause 8 requires extensive listings, the section refers to the appropriate appendix at the end of this report.

# 1. General Items

## 1.1 Order and Titles

*The order and titles of sections in the Test Sponsor's Full Disclosure Report must correspond with the order and titles for the TPC-C standard specification. 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 sections in this report correspond with that of the TPC-C standard specification.

## 1.2 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 at the beginning of this report.

## 1.3 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,*
- *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, and*
- *percentage of transaction mix for each transaction type.*

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

## 1.4 Application Program

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

Appendix A contains the Compaq C application code and the Sybase stored procedures.

## 1.5 Sponsor

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

This benchmark test was sponsored by Compaq Computer Corporation and Sybase, Inc., and attested to by Information Paradigm.

## 1.6 Parameters and Options

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

- *Database tuning options*
- *Recovery/locking options*
- *Operating system and application configuration parameters*

Appendix D contains the tunable parameters used in the TPC-C tests.

## 1.7 Configuration Diagrams

*Provide diagrams of both the measured and priced configurations, 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 or memory unique to the test.*
- *Number and type of disk drive 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.*
- *Type and the run-time execution location of software components (e.g., DBMS, client processes, transaction monitors, software drivers, etc.)*

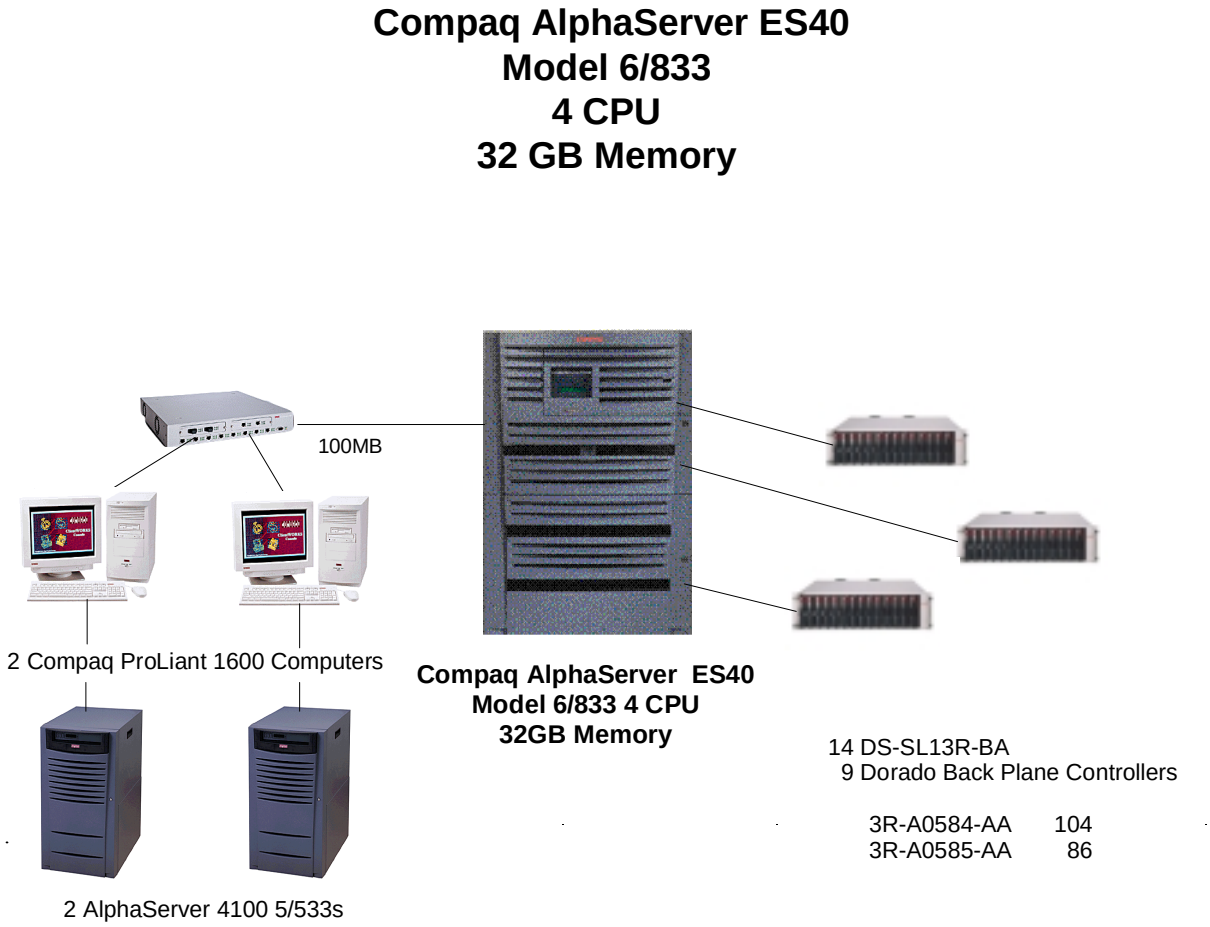
The TPC-C terminal users were emulated by Compaq's Portable Remote Terminal Emulator (PRTE) software, which ran on two AlphaServer 4100 5/533. The emulated terminal was connected using HTTP (HyperText Transport Protocol) to a client node.

The clients consisted of two Compaq ProLiant 1600 computers running the TPC-C web client screen and application software. Each emulated terminal ran the TPC-C client application and made a request to the Sybase Adaptive Server using SQL Server dblib calls.

The server was a Compaq AlphaServer Model ES40 6/833 4 CPU system running Compaq Tru64 UNIX V5.1. The measured server was configured with 104 3R-A0584-AA's (9.1GB) and 86 3R-A0585-AA's (18.2GB). The priced configuration consists of and 115 3R-A0584-AA's (9.1GB) and 96 3R-A0585-AA's (18.2GB), which includes an additional 10% spareable disks.

**Measured Configuration**

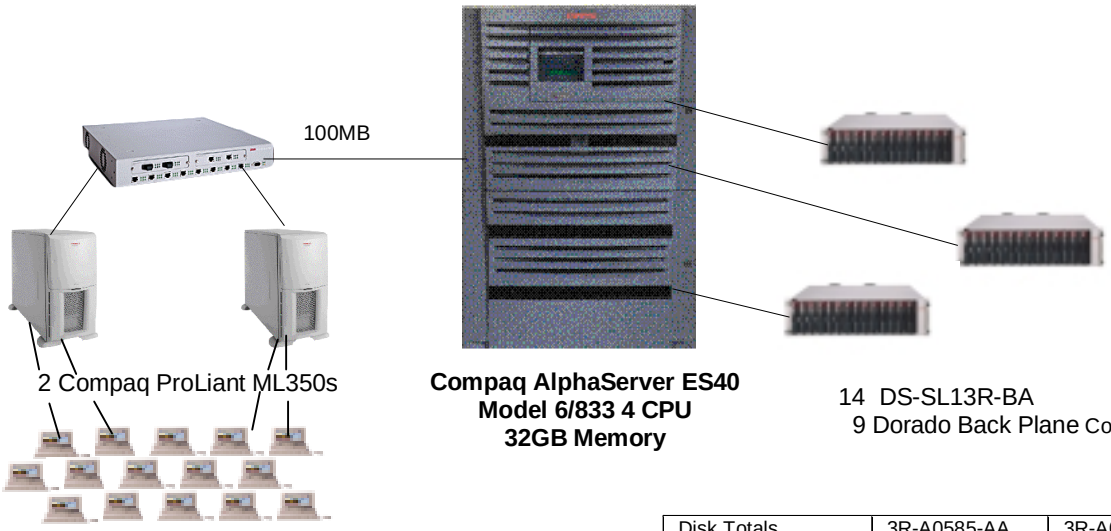
The following figure represents the measured configuration. The benchmark system used a remote terminal emulator (RTE) to initiate transactions and measure response times of transactions, as well as record various data for each transaction.



**Priced System Configuration**

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

**Compaq AlphaServer ES40**
**Model 6/833**
**4 CPU**
**32 GB Memory**




| Disk Totals | 3R-A0585-AA | 3R-A0584-AA |
|---|---|---|
| DB + System Disks | 87 | 104 |
| 10% Spare Disks | 9 | 11 |
| Total | 96 | 115 |

# 2. Logical Database Design Related Items

## 2.1 Table Definitions

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

Appendix B contains the database definition files that were used to set up the database.

## 2.2 Table Organization

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

Physical space was allocated to Sybase Adaptive Server on the server disks according to the details provided in Appendix B. The charts in Section 5.2 also describe the layout. The size of the segments on each disk was calculated to provide even distribution of data across the disk subsystem. A fill factor was used on the Warehouse and District tables to minimize the amount of data per page. The indices were defined at table definition and were built at the initial table load by executing the database build script in Appendix B.

## 2.3 Insert/Delete Operations

*It must be ascertained that insert and/or delete operations to any of the tables can occur concurrently with the TPC-C mix. Furthermore, any restrictions in the SUT database implementation that precludes inserts beyond the limits defined in Clause 1.4.11 must be disclosed. This includes the maximum number of rows that can be inserted and the maximum key value for these new rows.*

There were no restrictions on insert and/or delete operations to any of the tables. The space required for an additional 5**%** of the initial table cardinality was allocated to Sybase Adaptive Server and priced as static space.

## 2.4 Disclosure of Partitioning

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

Horizontal partitioning was used on the HISTORY table using functionality provided by Sybase Adaptive Server.

## 2.5 Replication of Tables

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

No tables were replicated in this benchmark test.

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

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

No attributes were added or replicated in this benchmark test.

# 3. Transaction and Terminal Profiles Related Items

## 3.1 Random Number Generation

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

Random numbers were generated using the drand48() and lrand48() UNIX calls. These functions generate pseudo random numbers using the linear congruential algorithm and 48-bit integer arithmetic. The random number generators are initially seeded using the srand48() call.

## 3.2 Terminal Input/Output Screen Layouts

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

The screen layouts match the *TPC Benchmark C Standard Specification*.

## 3.3 Features in Priced Terminals

*The method used to verify that the priced terminals provide all the features described in Clause 2.2.2.4 must be explained.*

Each of the five transaction types was tested by the auditor from an Intel 486DX2/66 running Windows NT 4.0 SP2 and Netscape Navigator V3.0. The auditor verified that all the features specified in Clause 2.2.2.4 were provided. Any PC configured with any WWW browser will properly display the TPC-C screens.

## 3.4 Presentation Managers

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

The code to generate the input and menu screens and display the results runs on the front-end clients. The data is passed to the user's PC using the HTML (HyperText Markup Language) format, which can be displayed with any Web browser, such as Netscape Navigator or MicroSoft Internet Explorer. Both of these products come as standard software with many operating systems.

## 3.5 Home and Remote Order-Lines

*The percentage of home and remote order-lines in the New-Order transactions must be provided.*

The table in Section 3.10 shows the percentage of home and remote transactions that occurred during the measurement period for the New-Order transactions.

## 3.6 New Order Roll Back Transition

*The percentage of New-Order transactions that were rolled back as a result of an invalid item number musts be provided.*

The table in Section 3.10 shows the percentage of New-Order transactions that were rolled back due to an invalid item being entered.

## 3.7 Number of Order-Lines

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

The table in Section 3.10 shows the average number of items ordered per New-Order transaction.

## 3.8 Home and Remote Payment Transactions

*The percentage of home and remote Payment transactions must be provided.*

The table in Section 3.10 shows the percentage of home and remote transactions that occurred during the measurement period for the Payment transactions.

## 3.9 Non-Primary Key Access in Payment and Order-Status

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

The table in Section 3.10 shows the percentage of non-primary key accesses to the database by the Payment and Order-Status transactions.

## 3.10 Skipped Deliveries

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

The following table summarizes the data required for disclosure from Sections 3.5 through 3.10. The range of acceptable and the measured results are listed.

| Description | Section | Acceptible Requirement | Measured Result |
|---|---|---|---|
| % home order lines in New Order | 3.5 | (98.05 - 99.05) | 99.00% |
| % remote order lines in New Order | 3.5 | (0.95 - 1.05) | 1.00% |
| % New Order transactions rolled back | 3.6 | (0.9 - 1.1) | 1.00% |
| Average number of items per order | 3.7 | (9.5 - 10.5) | 10.00 |
| % home Payment transactions | 3.8 | (84.0 - 86.0) | 84.98% |
| % remote Payment transactions | 3.8 | (14.0 - 16.0) | 15.02% |
| % non-primary key access, Payment | 3.9 | (57.0-63.0) | 59.99% |
| % non-primary key access, Order Status | 3.9 | (57.0-63.0) | 59.93% |
| % skipped deliveries | 3.10 | (0.0 - 1.0) | 0% |

## 3.11 Transaction Mix

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

The following table summarizes the transaction mix.

**Transaction Mix** in percent of total transactions

| Transaction | Total Occurrences | Percentage |
|---|---|---|
| New-Order | 4472909 | 44.961% |
| Payment | 4279518 | 43.017% |
| Order-Status | 398619 | 4.007% |
| Delivery (interactive) | 398647 | 4.007% |
| Stock-Level | 398810 | 4.009% |

## 3.12 Queuing Mechanism

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

The delivery transactions were transmitted a separate delisrv process using a pipe. The pipe acts as a FIFO queue. The delisrv has multiple threads that can do the delivery transaction in the database. The delivery data is written to a file. The number of threads in the delisrv is configurable.

# 4. Transaction and System Properties Related Items

## 4.1 ACID Properties

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

Clause 3 of the TPC Benchmark C Standard Specification lists specific tests to ensure the Atomicity, Consistency, Isolation, and Durability (ACID) properties of the SUT. The following subsections show how the tests required in Clause 3 were performed and the results verified. All mechanisms needed to ensure full ACID properties were enabled during both the measurement and test periods. A fully-sized, 3000 warehouse database was used for the Atomicity and Isolation for the loss of log and loss of data file Durability tests.

Case A was followed for the execution of Isolation Test 7, as described in the TPC-C Standard Specification, Clause 3.4.2.7.

## 4.2 Atomicity Tests

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

### 4.2.1 Atomicity of Completed Transaction

*Perform the Payment transaction for a randomly selected warehouse, district, and customer (by customer number as specified in Clause 2.5.1.2) and verify that the records in the CUSTOMER, DISTRICT, and WAREHOUSE tables have been changed appropriately.*

The following test was performed, and it verified the atomicity of completed transactions:

1. Select a random warehouse, district, customer, and payment amount.
2. For the selected warehouse, district, and customer, record their contents.
3. Perform a PAYMENT transaction, and COMMIT the transaction.
4. For the selected warehouse, district, and customer, verify the following:
   A. W_YTD in the warehouse is increased by the payment amount.
   B. D_YTD in the district is increased by the payment amount.
   C. C_YTD_PAYMENT in the customer is increased by the payment amount, C_BALANCE is decreased by the payment amount, and C_PAYMENT_CNT is incremented by 1.

### 4.2.2 Atomicity of Aborted Transaction

*Perform the Payment transaction for a randomly selected warehouse, district, and customer (by customer number as specified in Clause 2.5.1.2) 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 following test was performed, and verified the atomicity of aborted transactions:

1. Select a random warehouse, district, customer, and payment amount.
2. For the selected warehouse, district, and customer, record their contents.
3. Perform a PAYMENT transaction and substitute a ROLLBACK for the COMMIT.
4. For the selected warehouse, district, and customer, verify that records have not been changed.

## 4.3 Consistency Tests

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

The consistency of the database was checked before and after the power fail Durability test. The following consistency conditions were run and verified that all four conditions were met:

### 4.3.1 Consistency Condition 1

Entries in the WAREHOUSE and DISTRICT tables satisfy:

W_YTD = sum(D_YTD) for each warehouse defined by (W_ID = D_W_ID)

### 4.3.2 Consistency Condition 2

Entries in the DISTRICT, ORDER, and NEW-ORDER tables satisfy:

D_NEXT_O_ID - 1 = max(O_ID) = max(NO_O_ID) for each district defined by

(D_W_ID = O_W_ID = NO_W_ID) and (D_ID = O_D_ID = NO_D_ID)

### 4.3.3 Consistency Condition 3

Entries in the NEW-ORDER table satisfy:

max(NO_O_ID) - min(NO_O_ID) = [# of rows in NEW-ORDER of this district] for each district defined by NO_W_ID and NO_D_ID

### 4.3.4 Consistency Condition 4

Entries in the ORDER and ORDER-LINE tables satisfy:

sum(O_OL_CNT) = [# of rows in ORDER-LINE of this district] for each district defined by (O_W_ID = OL_W_ID) and (O_D_ID = OL_D_ID)

## 4.4 Isolation Tests

The TPC Benchmark C Standard Revision 3.3.2 defines seven required tests to be performed to demonstrate that the required levels of transaction isolation are met. All seven required tests were performed successfully. In addition to those seven tests, two more tests specified by the auditor were performed successfully. These additional tests demonstrated phantom protection within any mix of TPC-C transactions.

### 4.4.1 Isolation Test 1

*This test demonstrates isolation for read-write conflicts of Order-Status and New-Order transactions.*

The following steps were performed to satisfy the test of isolation for Order-Status and New-Order transactions.

1. 1st terminal: Start a New-Order transaction with the necessary inputs. The transaction is delayed for 20 seconds just prior to the Commit.
2. 2nd terminal: Start an Order-Status transaction for the same customer as used in the New-Order transaction.
3. 2nd terminal: The Order-Status transaction attempts to read the file but is locked out by the New-Order transaction waiting to complete.
4. 1st terminal: The New-Order transaction is released, and the Commit is executed releasing the record. With the CUSTOMER record now released, the Order-Status transaction can now complete.
5. 2nd terminal: Verify that the Order-Status transaction delays for approximately 20 seconds and that the results displayed for the Order-Status transaction match the input for the New-Order transaction.

### 4.4.2 Isolation Test 2

*This test demonstrates isolation for read-write conflicts of Order-Status and New-Order transactions when the New-Order transaction is rolled back.*

The following steps were performed to satisfy the test of isolation for Order-Status and a rolled back New-Order transactions.

1. 1st terminal: Perform an Order-Status transaction for a random customer. The transaction is completed.
2. 2nd terminal: Perform a New-Order transaction for the same customer in the Order-Status transaction in Step 1; include an invalid item number in the last order. The transaction is delayed for 20 seconds just prior to the roll back.
3. 2nd terminal: Start another Order-Status transaction for the same customer used in the New-Order transaction. The Order-Status transaction attempts to read the CUSTOMER table but is locked by the New-Order transaction.
4. 2nd terminal: Roll back the New-Order transaction. With the CUSTOMER record now released, the Order-Status transaction completes.
5. Verify the results returned from the 1st and 2nd Order-Status transactions match.

### 4.4.3 Isolation Test 3

*This test demonstrates isolation for write-write conflicts of two New-Order transactions.*

The following steps were performed to verify isolation of two New-Order transactions.

1. 1st terminal: Start a New-Order transaction using the necessary inputs. The transaction is delayed for 20 seconds just prior to the Commit.
2. 2nd terminal: Start a second New-Order transaction for the same customer used by the 1st terminal. This transaction is forced to wait while the 1st terminal holds a lock on the CUSTOMER record requested by the 2nd terminal.
3. 1st terminal: The New-Order transaction is allowed to complete and Commit the transaction. With the CUSTOMER record released, the 2nd terminal New-Order transaction will complete.

4. Verify that the order number from the 2nd terminal New-Order transaction is 1 greater than the order number from the 1st terminal. Verify that D_NEXT_O_ID is 1 greater than the order number of the New-Order transaction from the 2nd terminal.

### 4.4.4 Isolation Test 4

*This test demonstrates isolation for write-write conflicts of two New-Order transactions when one transaction is rolled back.*

The following steps were performed to verify the isolation of two New-Order transactions after one is rolled back.

1. 1st terminal: Start a New-Order transaction using the necessary inputs to cause a roll back (invalid item number). The transaction is delayed for 20 seconds just prior to the roll back.
2. 2nd terminal: Start a second New-Order transaction for the same customer used by the 1st terminal. This transaction is forced to wait while the 1st terminal holds a lock on the CUSTOMER record requested by the 2nd terminal.
3. 1st terminal: The New-Order transaction is allowed to complete, and the transaction is rolled back due to the invalid item number.
4. 2nd terminal: With the CUSTOMER record released, the 2nd terminal New-Order transaction will complete normally.
5. Verify that the order number from the 2nd terminal New-Order transaction is equal to the next order number before either New-Order transaction was started. Verify that D_NEXT_O_ID is 1 greater than D_NEXT_O_ID before either transaction was started and is 1 greater than the order number for the 2nd New-Order transaction.

### 4.4.5 Isolation Test 5

*This test demonstrates isolation for write-write conflicts of Payment and Delivery transactions.*

The following steps were performed to successfully conduct this test.

1. 1st terminal: A Delivery transaction is started. The Delivery transaction batch job is started with code added to the transaction to delay the transaction just prior to the Commit. (Note: This delay is only used during the Isolation tests.)
2. 2nd terminal: Start a Payment transaction for a customer that will have an order delivered in the transaction started in Step 1. The Payment transaction is forced to wait while the Delivery transaction holds a lock on the CUSTOMER record.
3. 1st terminal: After the delay time period is expired for the Delivery transaction, the transaction is Committed.
4. 2nd terminal: With the CUSTOMER record released, the Payment transaction is now able to complete.
5. The record is viewed from the CUSTOMER table for the customer and C_BALANCE is verified to reflect the changes from the Delivery and Payment transactions.

### 4.4.6 Isolation Test 6

*This test demonstrates isolation for write-write conflicts of Payment and Delivery transactions when the Delivery transaction is rolled back.*

The following steps were performed to successfully conduct this test.

1. 1st terminal: Start a Delivery transaction using the Delivery batch job with the delay coded in to halt the transaction just prior to the roll back.

2. 2nd terminal: Start a Payment transaction for a customer that will have an order delivered in the transaction started in Step 1. The Payment transaction is forced to wait while the Delivery transaction holds a lock on the CUSTOMER record.
3. 1st terminal: The Delivery transaction is rolled back after the time period expires.
4. 2nd terminal: With the CUSTOMER record released, the Payment transaction is now able to complete.
5. The record is viewed from the CUSTOMER table for the customer, and C_BALANCE is verified to reflect the change only from the Payment transaction.

### 4.4.7 Isolation Test 7

*This test demonstrates repeatable reads for the New-Order transaction while an interactive transaction updates the price of an item.*

The following test demonstrates that this test was conducted successfully.

1. 1st terminal: Using interactive SQL, view and record prices for two items (x, y) selected at random.
2. 2nd terminal: A New-Order transaction is started that contains item x twice and y once. This transaction is stopped after reading the price of item x from the item file the first time.
3. 1st terminal: Using interactive SQL, an update transaction is started for items x and y, increasing their price by 10%. Case A, transaction 3 stalls.
4. 2nd terminal: The New-Order transaction is allowed to complete. It is verified that the prices for items x and y are the same throughout the entire transaction and that they match the results of Step 1.
5. 1st terminal: After the New-Order transaction completes, the update transaction completes and is committed.

### 4.4.8 Isolation Test 8

*This test demonstrates isolation for phantom protection between New-Order and Order-Status transactions.*

The execution of the above test proceeded as follows.

1. For a randomly selected warehouse and district, the NO_D_ID column in NEW_ORDER is changed to 11.
2. 1st terminal: A Delivery transaction is started for the selected warehouse. The earliest New-Order for the selected warehouse and district is printed out and should be NULL. The delivery is paused for 30 seconds after reading the New-Order table.
3. 2nd terminal: A New-Order transaction is started for the selected warehouse and district. It is blocked by the other transaction.
4. 1st terminal: After the 30 seconds pause, the Delivery transaction re-reads the NEW_ORDER entries for the selected warehouse and district and verifies that no new orders exist. The Delivery transaction commits, showing nothing delivered for the selected district.
5. 2nd terminal: The blocked New-Order completes only after the Delivery commits.
6. The NO_D_IDs that were set to 11 are restored to their original values.

### 4.4.9 Isolation Test 9

*This test demonstrates isolation for phantom protection between New-Order and Delivery transactions.*

The execution of the above test proceeded as follows.

1. 1st terminal: An Order-Status transaction is started for a randomly selected customer. It is paused for 30 seconds after reading the ORDERS table for that customer. The most recent order is recorded.

2. 2nd terminal: A New-Order transaction is started for the same customer. It is blocked by the paused Order-Status transaction.
3. 1st terminal: After the 30 seconds pause, the Order-Status transaction re-reads the ORDERS entry for the selected customer and verifies that the most recent order is the same in Step 1. The Order-Status commits.
4. 2nd terminal: The blocked New-Order transaction completes only after the Order-Status transaction finishes.

## 4.5 Durability Tests

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

- *Permanent irrecoverable failure of any single durable medium containing database, ABTH files/tables, or recovery log data.*
- *Instantaneous interruption (system crash/system hang) in processing which requires system reboot to recover.*
- *Failure of all or part of memory (loss of contents).*

Tests were conducted for each of the preceding types of failures and successfully demonstrated that the durability properties were met.

### 4.5.1 Failure of Durable Medium containing TPC-C Database Tables and Failure of Durable Medium containing Recovery Log Data

This test was conducted on a 3000 warehouse database. The following steps were performed successfully.

1. The database was dumped to extra disks using DUMP DATABASE.
2. The current number of orders in the database was counted, giving ORDER_COUNT_BEFORE.
3. A test was started and allowed to run at steady state for 5 minutes.
4. One of the log disks from a mirrored pair was removed. The test continued to run, using the remaining disk. An error was logged in the system error log.
5. The test was allowed to run for 2 more minutes.
6. One of the data disks was removed. Errors were reported by both the operating system and the database.
7. The emulated users received errors.
8. Sybase Adaptive Server was restarted and was unable to recover due to the missing disk.
9. The transaction log was dumped to a file using DUMP TRANSACTION.
10. The backup of the database was restored.
11. The saved transaction log was replayed.
12. The current number of orders in the database was counted giving ORDER_COUNT_AFTER. It was verified that ORDER_COUNT_AFTER - ORDER_COUNT_BEFORE was greater than or equal to the number of committed orders recorded by the RTE.
13. Several orders recorded by the RTE were checked in the database to make sure they existed.

### 4.5.2 Failure of Memory and Instantaneous Interruption

This test was conducted on the fully scaled 3000 warehouse database using 30,000 emulated PCs.

1. The current number of orders in the database was counted, giving ORDER_COUNT_BEFORE.

   1a. Consistency was verified.

2. A test was started and allowed to run at steady state for 5 minutes.
3. The system was powered off.
4. The test was aborted on the RTE.
5. The system was powered back on and rebooted.
6. Sybase Adaptive Server was restarted and recovered the database from the transaction log.
7. The current number of orders in the database was counted giving ORDER_COUNT_AFTER. It was verified that ORDER_COUNT_AFTER - ORDER_COUNT_BEFORE was greater than or equal to the number of committed orders recorded by the PRTE.
8. Several orders recorded by the PRTE were checked in the database to make sure they existed.
9. Consistency was verified again.

# 5. Scaling and Database Population Related Items

## 5.1 Cardinalities of the Database Tables

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

The initial cardinalities of the database tables are shown in the following table.

| Table Name | Cardinality |
|---|---|
| WAREHOUSE | 3000 |
| DISTRICT | 30,000 |
| CUSTOMER | 90,000,000 |
| HISTORY | 90,000,000 |
| NEW-ORDER | 27,000,000 |
| ORDER | 90,000,000 |
| ORDERLINE | 900,000,000 |
| STOCK | 300,000,000 |
| ITEM | 100000 |

## 5.2 Distribution of Tables and Logs

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

The following benchmark configuration table indicates how the database files were allocated on the tested system to meet the 8-hour steady state requirement.

The distribution of the database tables over all the disks of the priced system is an extension of the distribution in the tested system. One hundred eighty (180) day storage requirements are satisfied with the unused space on the tested system disks. System was configured with enough mirrored log disk capacity to support 8 hours of run time.

**Distribution of Data on the AlphaServer ES40**

| | | | |
|---|---|---|---|
| /dev/rdisk/dsk11d | cidx01 | customer index | 25% |
| /dev/rdisk/dsk23d | cidx02 | customer index | 25% |
| /dev/rdisk/dsk21h | cidx_ext | customer index | 25% |
| /dev/rdisk/dsk7h | cidx_ext2 | customer index | 25% |
| /dev/rdisk/dsk4d | cust01 | customer | 8.33% |
| /dev/rdisk/dsk4e | cust02 | customer | 8.33% |
| /dev/rdisk/dsk5d | cust03 | customer | 8.33% |
| /dev/rdisk/dsk5e | cust04 | customer | 8.33% |
| /dev/rdisk/dsk6d | cust05 | customer | 8.33% |
| /dev/rdisk/dsk6e | cust06 | customer | 8.33% |
| /dev/rdisk/dsk7d | cust07 | customer | 8.33% |
| /dev/rdisk/dsk7e | cust08 | customer | 8.33% |
| /dev/rdisk/dsk8d | cust09 | customer | 8.33% |
| /dev/rdisk/dsk8e | cust10 | customer | 8.33% |
| /dev/rdisk/dsk21d | cust11 | customer | 8.33% |
| /dev/rdisk/dsk21e | cust12 | customer | 8.33% |
| /dev/rdisk/dsk23f | history01 | history | 100% |
| /dev/rdisk/dsk22b | log01 | log | 100% |
| /dev/rdisk/dsk23e | orders01 | orders | 50% |
| /dev/rdisk/dsk11e | orders02 | orders | 50% |
| /dev/rdisk/dsk4f | ordlne01 | order_line | 16.66% |
| /dev/rdisk/dsk5f | ordlne02 | order_line | 16.66% |
| /dev/rdisk/dsk6f | ordlne03 | order_line | 16.66% |
| /dev/rdisk/dsk7f | ordlne04 | order_line | 16.66% |
| /dev/rdisk/dsk8f | ordlne05 | order_line | 16.66% |
| /dev/rdisk/dsk21f | ordlne06 | order_line | 16.66% |
| /dev/rdisk/dsk4g | stock01 | stock | 6.66% |
| /dev/rdisk/dsk4b | stock02 | stock | 6.66% |
| /dev/rdisk/dsk5g | stock03 | stock | 6.66% |
| /dev/rdisk/dsk5b | stock04 | stock | 6.66% |
| /dev/rdisk/dsk6g | stock05 | stock | 6.66% |
| /dev/rdisk/dsk6b | stock06 | stock | 6.66% |
| /dev/rdisk/dsk7g | stock07 | stock | 6.66% |
| /dev/rdisk/dsk7b | stock08 | stock | 6.66% |
| /dev/rdisk/dsk8g | stock09 | stock | 6.66% |
| /dev/rdisk/dsk8b | stock10 | stock | 6.66% |
| /dev/rdisk/dsk21g | stock11 | stock | 6.66% |
| /dev/rdisk/dsk21b | stock12 | stock | 6.66% |
| /dev/rdisk/dsk23g | stock13 | stock | 6.66% |
| /dev/rdisk/dsk23b | stock14 | stock | 6.66% |
| /dev/rdisk/dsk11g | stock15 | stock | 6.66% |

## 5.3 Type of Database

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, all level) and access language (e.g., SQL, DL/1, COBOL read/write) used to implement the TPC-C transactions. If more than one interface/access language is used to implement TPC-C, each interface/access language must be described and a list of which interface/access language is used with which transaction type must be disclosed.*

The database used for this testing was Sybase Adaptive Server Enterprise 12.0.0.3 from Sybase Incorporated. Sybase Adaptive Server is a relational DBMS.

The database was built for 3000 warehouses.

## 5.4 Database Partitions/Replications

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

Horizontal partitioning was used on the History Table. The functionality for this was provided by Sybase Adaptive Server. For further details of the partitioning of the database, see Appendix B.

## 5.5 180-Days Space Requirement

*The calculations for arriving at the 180-day space computations, as defined in Clause 4.2.3 must be disclosed.*

Note : Numbers are in KBytes unless otherwise specified

| **Warehouses** | 3000 | **tpmC** | 37274.24 | **tpmC/W** | 12.42 | |
|---|---|---|---|---|---|---|

| **Table** | **Rows** | **Data** | **Index** | **5% Space** | **8H Space** | **Total Space** |
|---|---|---|---|---|---|---|
| Warehouse | 3,000 | 6,000 | 24 | 301 | | 6,325 |
| District | 30,000 | 60,000 | 242 | 3,012 | | 63,254 |
| Item | 100,000 | 9,524 | 86 | 192 | | 9,802 |
| New-order | 27,000,000 | 295,082 | 3,554 | | 60,000 | 358,636 |
| History | 90,000,000 | 5,040,032 | 0 | | 838,805 | 5,878,837 |
| Orders | 90,000,000 | 2,432,434 | 29,306 | | 409,704 | 2,871,444 |
| Customer | 90,000,000 | 60,000,000 | 5,019,100 | 1,300,382 | | 66,319,482 |
| Order-line | 900,000,000 | 54,545,456 | 717,700 | | 9,197,362 | 64,460,518 |
| Stock | 300,000,000 | 100,000,000 | 552,492 | 2,011,050 | | 102,563,542 |
| **Totals** | | 222,388,528 | 6,322,504 | 3,314,937 | 10,505,870 | 242,531,839 |

| **Segment** | **LogDev Cnt.** | **Seg. Size** | **Needed** | **Overhead** | **Not Needed** |
|---|---|---|---|---|---|
| wdino | 1 | 1,236,992 | 442,398 | 4,424 | 790,170 |
| history | 1 | 7,680,000 | 5,937,625 | 59,376 | 1,682,999 |
| order | 2 | 3,840,000 | 2,900,158 | 29,002 | 910,840 |
| customer | 16 | 68,038,656 | 66,982,677 | 669,827 | 386,152 |
| order_line | 6 | 76,800,000 | 65,105,123 | 651,051 | 11,043,826 |
| stock | 15 | 106,291,200 | 103,589,177 | 1,035,892 | 1,666,131 |
| **Totals** | | 263,886,848 | 244,957,158 | 2,449,572 | 16,480,119 |

| | | |
|---|---|---|
| **Dynamic space** | 60,343,438 | Sum of Data for Order, Order-Line and History (excluding free extents) |
| **Static space** | 174,132,103 | Data + Index + 5% Space + Overhead - Dynamic space |
| **Free space** | 12,931,188 | Total Seg. Size - Dynamic Space - Static Space - Not Needed |
| **Daily growth** | 11,996,031 | (Dynamic space/W * 62.5)* tpmC |
| **Daily spread** | (5,062,858) | Free space - 1.5 * Daily growth (zero if negative) |

| | | |
|---|---|---|
| **180 day (KB)** | 2,333,417,665 | Static space + 180 (daily growth + daily spread) |
| **180 day (GB)** | 2225.32 | Excludes OS, Paging and RDBMS Logs |
| **Log per N-O txn** | 2 | Numbe of 2K blocks per New-Order transaction |
| **8 Hour Log (GB)** | 68.25 | |

**Total Space (GB) Required on System (except for logs)**

| | |
|---|---|
| **180 day (GB)** | 2,225.32 |
| **OS + Sybase + Swap** | 8.87 |
| | 2,234.19 |

**Space Allocated for Benchmarked Configuration**

| **(Excluding logs)** | | | Total | Needed | Space |
|---|---|---|---|---|---|
| **Drive Type** | Number | Cap. (GB) | Capacity (GB) | Space | Need |
| 3R-A0585-AA | 86 | 17.36 | 1492.96 | | |
| 3R-A0584-AA | 84 | 8.67 | 728.28 | | |
| | | | 2221.24 | 13 | 1 |

**Space Allocated for Logs**

| **Drive Type** | Number | Cap. (GB) | Capacity (GB) | |
|---|---|---|---|---|
| 3R-A0585-AA | 20 | 8.67 | 173.40 | unmirrored capacity |

**Space Needed for Logs**

| | | | | |
|---|---|---|---|---|
| 3R-A0585-AA | 10 | 8.67 | 86.70 | unmirrored capacity |
| **Total** | 20 | | | mirrored devices |

**Total Priced devices**

| | | |
|---|---|---|
| **3R-A0585-AA** | 87 | |
| **3R-A0584-AA** | 104 | |
| **Spares** | 9 | |
| **Spares** | 11 | |
| **Total Priced devices** | 211 | mirrored logs + space allocated |
| | | 10% extra |

# 6. Performance Metrics and Response Time Related Items

## 6.1 Reporting All Data

*Measured tpmC must be reported.*

All the data required by Clause 5 is reported below in Section 6.2 through 6.10. The measured tpmC for the Compaq AlphaServer ES40 4 CPU C/S configuration was 37,274 tpmC.

## 6.2 Response Times

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

**Response Times** in seconds

| Transaction | 90th percentile | Average | Maximum |
|---|---|---|---|
| New-Order | 0.548 | 0.368 | 97.848 |
| Payment | 1.200 | 0.646 | 98.003 |
| Order-Status | 0.603 | 0.402 | 8.277 |
| Delivery (interactive) | 0.635 | 0.357 | 10.215 |
| Delivery (deferred) | 0.704 | 0.486 | 3.329 |
| Stock-Level | 1.098 | 0.583 | 42.734 |
| Menu | 0.341 | 0.228 | 56.016 |

## 6.3 Think and Keying Times

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

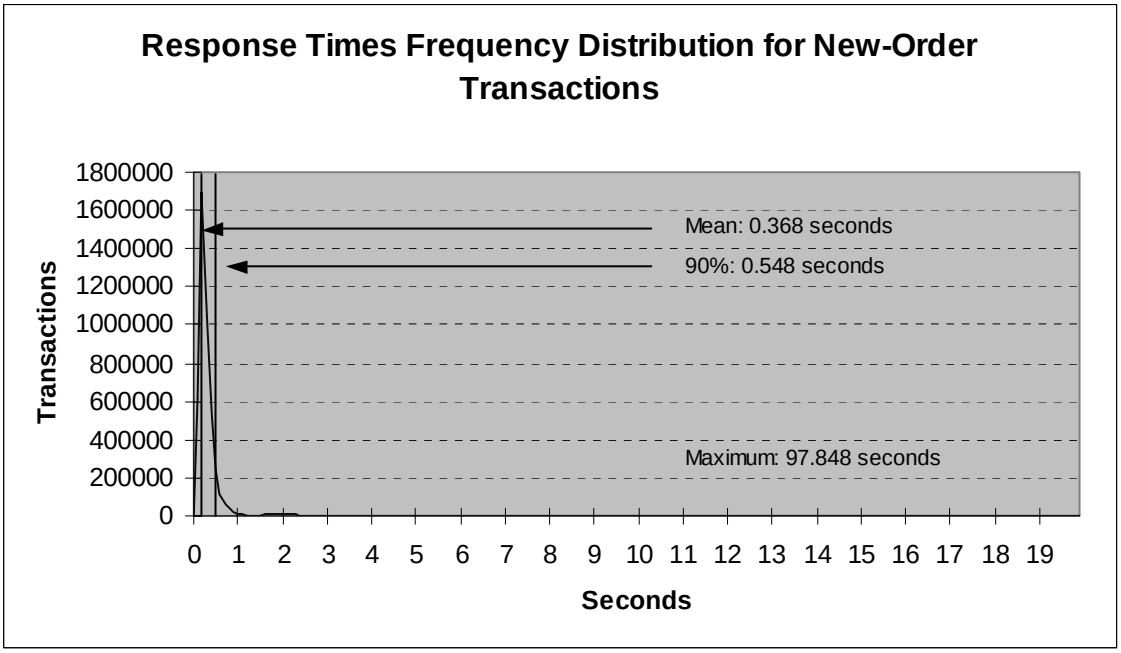
**Keying/Think Times** in seconds

| Transaction | Minimum | Average | Maximum |
|---|---|---|---|
| New-Order | 18.000/0.000 | 18.001/12.000 | 18.041/119.913 |
| Payment | 3.000/0.000 | 3.002/12.004 | 3.041/119.890 |
| Order-Status | 2.000/0.000 | 2.001/10.001 | 2.034/ 99.139 |
| Delivery (interactive) | 2.000/0.000 | 2.001/ 5.004 | 2.033/ 49.771 |
| Stock-Level | 2.000/0.000 | 2.001/ 5.009 | 2.034/ 49.763 |

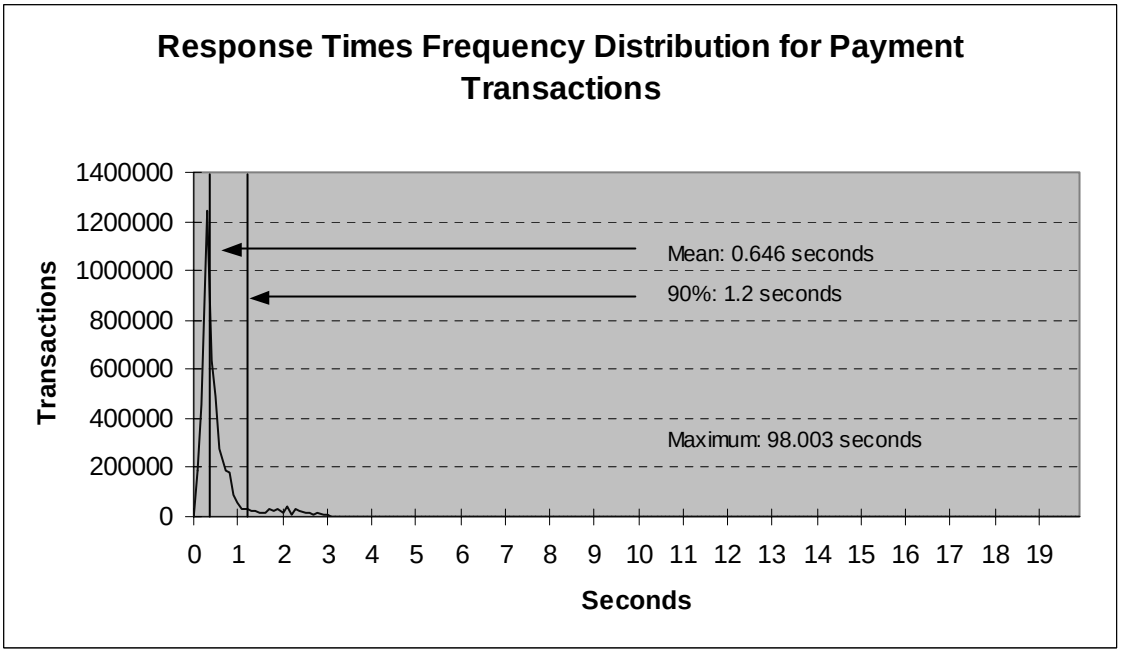
## 6.4 Response Times Frequency Distribution

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

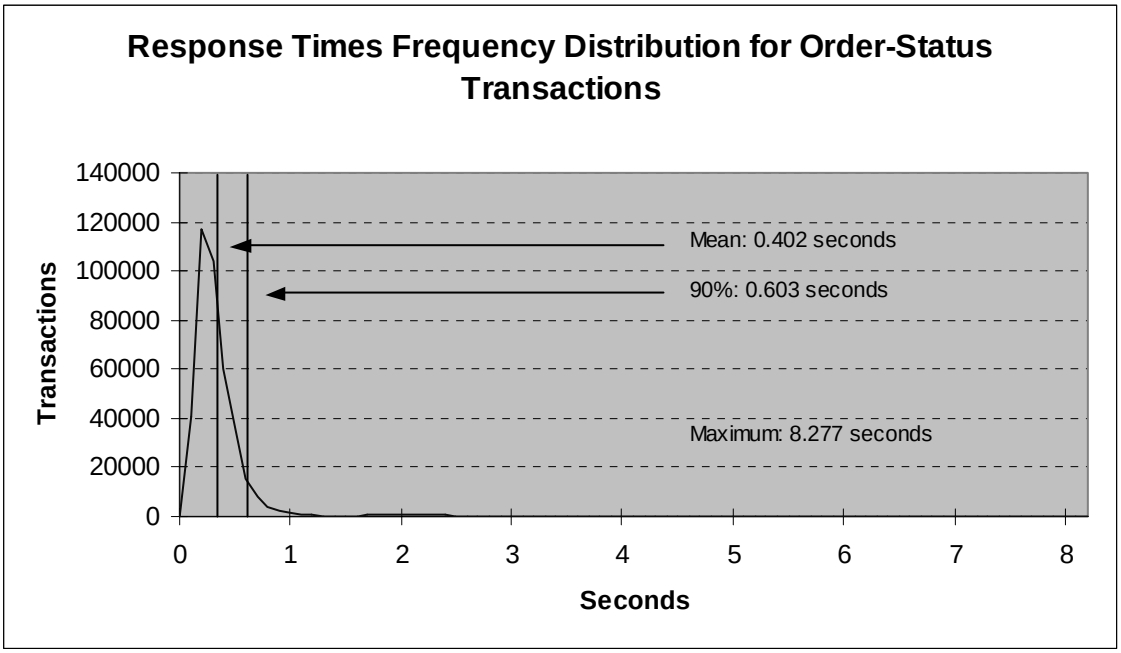
**Response Times Frequency Distribution for New-Order Transactions**



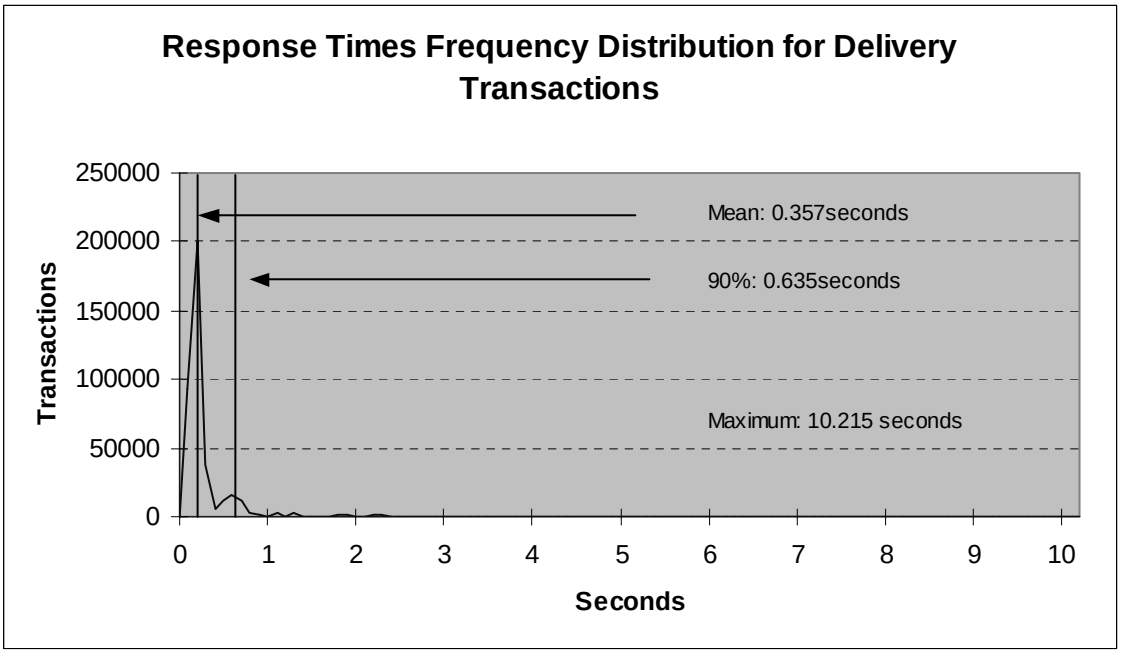

**Response Times Frequency Distribution for Payment Transactions**



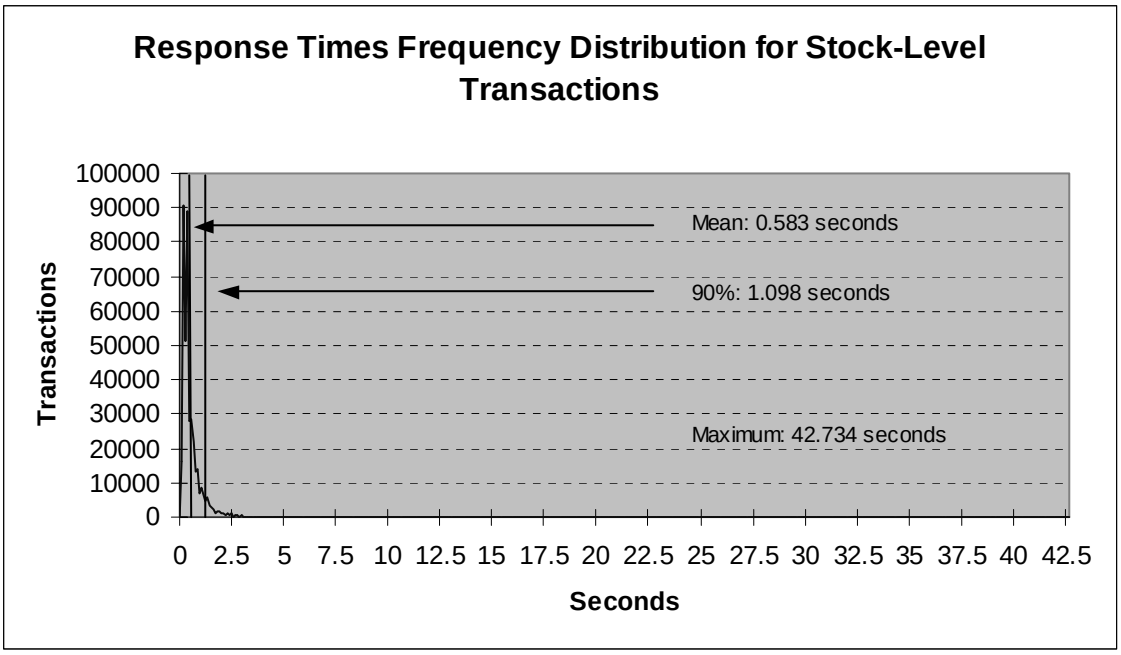
**Response Times Frequency Distribution for Order-Status Transactions**




**Response Times Frequency Distribution for Delivery Transactions**

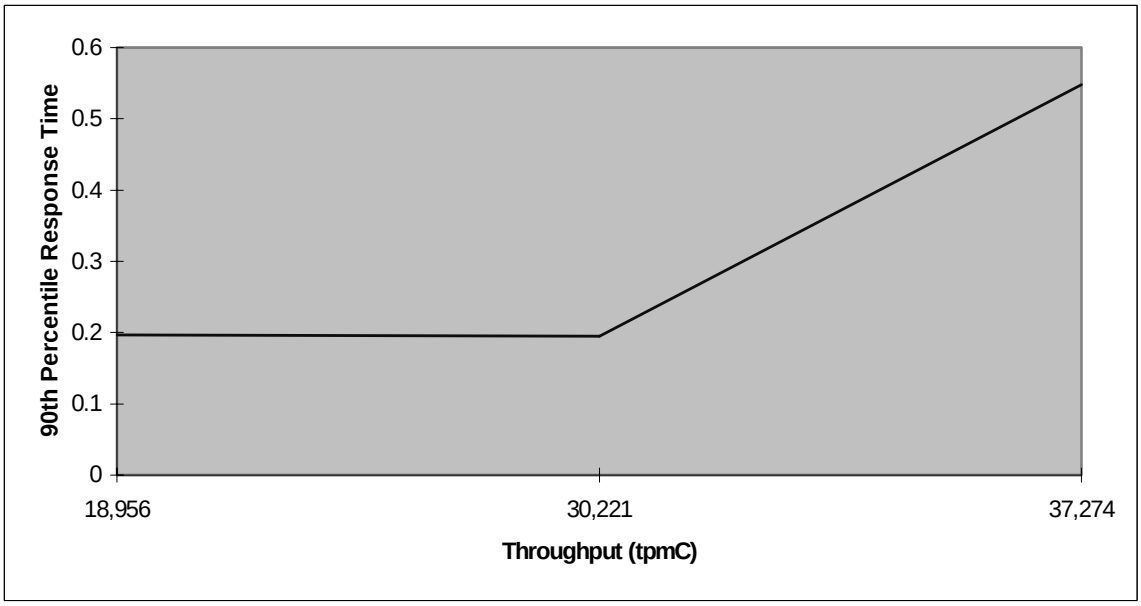


**Response Times Frequency Distribution for Stock-Level Transactions**




**Response Time versus Throughput Performance Curve**

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

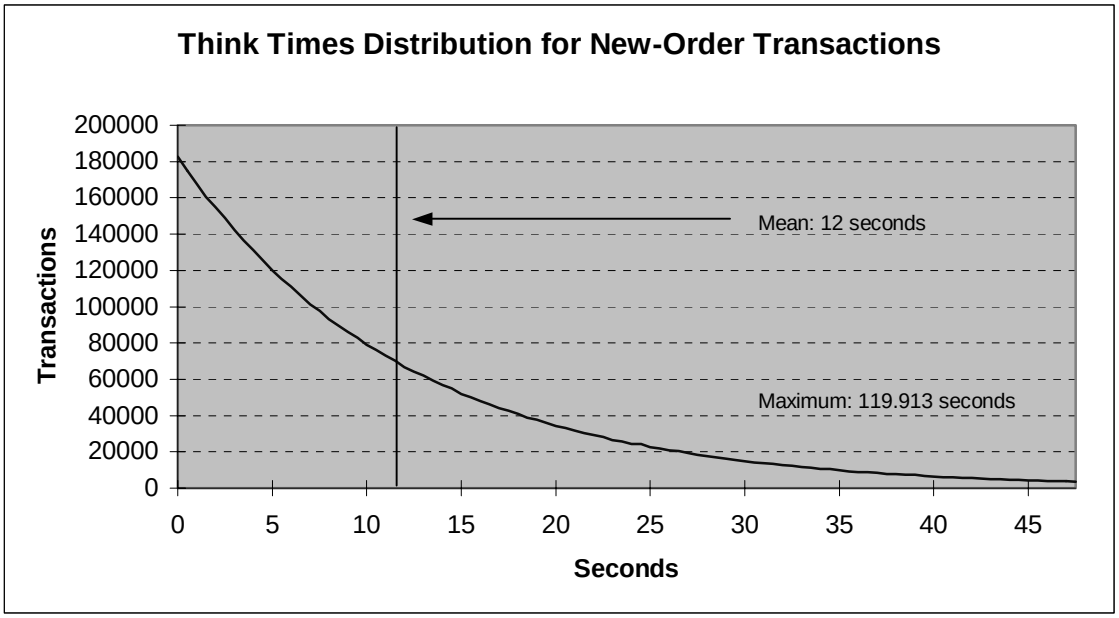


*New-Order Response Time versus Throughput*

**Think Times Frequency Distribution**

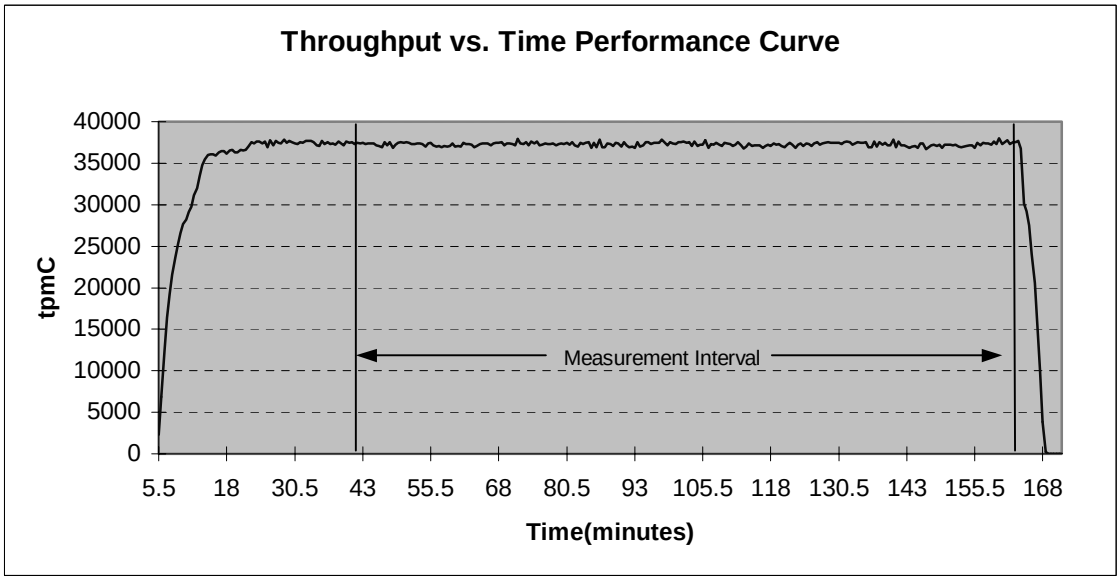
*Think times frequency distribution curves (see Clause 5.6.3) must be reported for each transaction type.*

**Think Times Distribution for New-Order Transactions**




## 6.5 New-Order Throughput vs. Elapsed Time

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



## 6.6 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.*

Confirmation that the SUT has reached steady state prior to the beginning of the data collection measurement interval is based on a visual inspection of the plots of tpmC versus time.

The graph in Section 6.6 plots the average tpmC versus time, averaged over 30 second intervals, and shows that steady state was reached before the data was collected. The ramp-up and steady-state stages are clearly visible.

### 6.6.1 Transaction Flow

For each of the TPC Benchmark C transaction types, the following steps are executed.

Compaq DB Web Connector V1.1 was used as the transaction manager (TM). Each transaction was divided into two pieces. The front-end portion handled all screen I/O, while the back-end portion handled all database operations. Both front-end and back-end pieces ran on the client system.

The front-end portion communicates with the back-end portion through shared memory. The back-end portion communicates with the server system over ethernet using Sybase Adaptive DB-Library/C calls. Compaq DB Web Connector V1.1 routes the transaction and balances the load according to values in the registry governing the number of processing procedure servers. The transaction flow is described below.

- Each TPC-C user invokes the TPC-C main front-end portion.
- The front-end portion displays the TPC-C transaction menu on the user terminal.
- The TPC-C user chooses the transaction type and proceeds to fill the screen fields required for that transaction.
- The TPC-C front-end accepts all values entered by the user and transmits those values to one of the TPC-C back-end processing procedures. The back-end procedures are generic in that they can serve any of the transaction types.
- A TPC-C back-end processing procedure receives a workspace and proceeds to execute all database operations related to the transaction type specified. All the information entered on the user terminal is contained in the Compaq DB Web Connector V1.1 workspace.
- Once the transaction is committed, the TPC-C back-end processing procedure loads the workspace with the transaction output and returns control to the Compaq DB Web Connector V1.1 transaction manager.
- Compaq DB Web Connector V1.1 passes the workspace back to the TPC-C main front-end.

## 6.7 Database Transaction

All database operations are performed by the TPC-C back-end programs. The process is described next.

- Using Sybase Open Client DB-Library calls, the TPC-C back-end program interacts with Sybase Adaptive Server to perform SQL data manipulations such as update, select, delete, and insert, as

- required by the transaction. After all database operations are performed for a transaction, the transaction is committed.
- Sybase Adaptive Server proceeds to update the database as follows:

When Sybase Adaptive Server changes a database table with an update, insert, or delete operation, the change is initially made in memory, not on disk. When there is not enough space in the memory buffer to read in or write additional data pages, Sybase Adaptive Server will make space by flushing some modified pages to disk. Modified pages are also written to disk when a checkpoint occurs. Before a change is made to the database, it is first recorded in the transaction log. This ensures that the database can be recovered completely in the event of a failure. Using the transaction log, transactions that started but did not complete prior to a failure can be undone, and transactions recorded as complete in the transaction log but not yet written to disk can be redone.

## 6.8 Work Performed During Steady State

*A description of how the work normally performed during a sustained test actually occurred during the measurement interval must be reported.*

For each of the TPC Benchmark C transaction types, the following steps are executed.

Each emulated user starts an Internet browser and asks to attach to the tpcc.dll on the desired client. The tpcc.dll formats the menus, input forms and data output using HTML (HyperText Markup Language). The HTML strings are transmitted over TCP/IP back to the client, where they can be displayed by any Web Browser software. The tpcc.dll on the client is run under the control of the Internet Information Server.

Deferred delivery processing is handled by a separate process, delisrv. The tpcc.dll takes delivery requests from the user and puts them on a pipe for the delisrv to handle.

Transactions are submitted by the RTE in accordance with the rules of the TPC-C benchmark. The emulated user chooses a transaction from the menu. The RTE records the time it takes from selecting the menu item to receiving the requested form. Data is generated for input to the form, then the user waits the specified keying time. The submit is sent and the RTE records the time it takes for the transaction to be processed and all the output data to be returned. The user then waits for the randomly generated think time before starting the process over again. All timings taken by the RTE generate a start and end timestamp. Keying and think times are calculated as the difference between end-time of a timing to the start of the next.

The database records transactions in the database tables and also the transaction log. Writes to the database may stay in SQL Server's in-memory data cache for a while before being written to disk. Checkpoints are done every 30 minutes to flush the contents of the data cache to disk.

## 6.9 Determining Reproducibility

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

The experiment at the maximum targeted tpmC level was repeated once to ensure reproducibility. The computed tpmC for each experiment was within .185% of the reported tpmC, and all 90th percentile response times were under their respective limits.

## 6.10 Duration of Measurement Period

*A statement of the duration of the measurement period for the reported maximum qualified throughput (tpmC) must be included.*

Each experiment was run for a minimum of 2 hours. The data collection period was 2 hours and

started 30 minutes after all simulated users had begun executing transactions followed by a 5 minute ramp-down.

## 6.11 Method of Regulation of the 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 weighted distribution method was used. No adjustments were made by the RTE scripts. See Appendix C for more details.

## 6.12 Percentage of the Total Mix

*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 numbers must be disclosed. The average number of 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.*

See Table in Section 3.10.

## 6.13 Percentage of New-Order Transactions Rolled Back

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

See Section 3.10.

## 6.14 Average Number of Order-Lines

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

See Section 3.10.

## 6.15 Percentage of Remote Order-Lines

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

See Section 3.10.

## 6.16 Percentage of Remote Payment Transactions

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

See Section 3.10.

## 6.17 Percentage of Customer Selections

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

See Section 3.10.

## 6.18 Percentage of Delivery Transactions

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

See Section 3.10.

## 6.19 Number of Checkpoints

*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.*

A checkpoint is the process of writing all modified data pages to disk. The TPC-C benchmark on the Compaq AlphaServer ES40 4 CPU C/S system was set up to automatically checkpoint every 30 minutes. One checkpoint occurs during the warm-up period, and four occured during the measurement period.

# 7. SUT, Driver, and Communication Definition Related Items

## 7.1 Description of RTE

*If the RTE is commercially available, then its inputs must be specified. Otherwise, a description must be supplied of what inputs (e.g., scripts) to the RTE had been used.*

In order to simulate terminal users and record response times, a proprietary emulation package, PRTE, was used to simulate terminal users, generate random data, and record response times. This package runs on a processor that is distinct from the system under test. The scripts used to execute the tests are included as Appendix C.

## 7.2 Driver Functionality and Performance

*It must be demonstrated that the functionality and performance of the components being emulated in the Driver System are equivalent to that of the priced system. The results of the test described in Clause 6.6.3.4 must be disclosed.*

Due to the large number of PCs and associated hardware that would be required to run these tests, a Remote Terminal Emulator was used to emulate the connected PCs and LAN.

As configured for this test, the driver software emulates the traffic that would be observed from the users' PCs connected by Ethernet to the DEChubs using HTTP (HyperText Transfer Protocol) over TCP/IP.

## 7.3 Functional Diagrams and Details of Driver System

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

The diagrams in Section 1.7 show the tested and priced benchmark configurations.

## 7.4 Network Configurations and Driver System

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

Section 1.7 in this report has a picture of the network configurations of both the tested service and the proposed (target) services.

In the priced configuration, the client machines are connected over 100 megabits per second (Mbps) ethernet. The emulated PCs are connected on 100 mbps LANs to the clients. Each client has 16 Ethernet ports, each of which is connected to a PC Lan with 937 PCs.

## 7.5 Network Bandwidth

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

The Ethernet used in the local area network (LAN) between the emulated terminals and the front-end systems complies with the IEEE 802.3 standard and has a bandwidth of 100 megabits per second (Mbps).

The ethernet between the front-end clients and the server has a bandwidth of 100 Mbps.

## 7.6 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.

# 8. Pricing Related Items

## 8.1 Hardware and Software Components

*A detailed list of hardware and software used in the priced system. Each 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, contents of the package must be disclosed.*

This section lists the separate components in the priced system.

### 8.1.1 Hardware Pricing

Compaq Computer Corporation's TPC Benchmark C tests used packaged hardware systems whenever possible to simplify configurations to the fewest number of line items.

All hardware and software products have been priced to satisfy the 3 year warranty and 7 x 24 with 4 hour response requirements.

The hardware prices for the Compaq AlphaServer ES40 4 CPU, 2 Compaq ProLiant ML350 computers and their associated components (e.g., memory, storage subsystem, etc.) are based on IC System Solutions, MicroWarehouse and Compaq Computer Corporation price quotations.

### 8.1.2 Software Pricing

The priced system uses the following software products:

- Compaq Tru64 UNIX operating system
- Compaq DB Web Connector V1.1
- Windows 2000 C++ compiler
- Sybase Adaptive Server relational database management system
- Microsoft Windows 2000 Server

The license purchase includes 1 year of warranty service. Two years of additional software warranty is provided for a total of 3 years extended warranty. The software warranty and service level are the same as the service level for the hardware system on which the software operates.

The level of post-warranty software service is Layered Product Support (LPS).

### 8.1.3 Warranty Pricing

In addition to the base warranty, additional warranty has been priced to satisfy the 3-year TPC-C warranty requirements of all products.

### 8.1.4 Price Discounts

See Appendix F.

## 8.2 Availability Status

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

The Compaq AlphaServer ES40 hardware components and Compaq Tru64 UNIX V5.1 used in the measurement are available now. The Sybase Adaptive Server Enterprise 12.0.0.3 will be available on May 1, 2001.

## 8.3 Performance and Price/Performance

*A statement of the measured tpmC, as well as the respective calculations for 3-year pricing and price/performance (price/tpmC) and the availability date must be included.*

The following table shows the measured tpmC and price/tpmC results for the tested systems:

| CPU Model | Configuration | Software | tpmC | Price per tpmC $tpmC |
|---|---|---|---|---|
| Compaq AlphaServer ES40 | 4 CPU | Compaq Tru64 UNIX 5.1 Sybase Adaptive Server Enterprise 12.0.0.3 | 37,274 | $16.83/tpmC |

## 8.4 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.

## 8.5 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.*

None.

# 9. Audit Related Items

## 9.1 Audit

*If the bench benchmark has been independently audited, the auditor's name, address, phone number, and a brief audit summary report indicating compliance must be included in the Full Disclosure Report. A statement should be included, specifying when the complete audit report will become available and who to contact in order to obtain a copy.*

Appendix E contains the complete independent auditor's letter by Francois Raab of Infosizing for the test described in this report.

# Appendix A

## Client Application

## crestdl.c

```
/*+**************************************************************
*************
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 *                                                              *
 *                                                              *

**************************************************************
************/
#include <stdlib.h>
#include <stdio.h>
#include <time.h>
#include <windows.h>


#include <tpcc_acmsxp.h>

#define MAX(a,b) ((a)>(b)?(a):(b))

int __cdecl
main(int argc, char *argv[])
{
  FILE *fptr;
  char filename[] = "tpcc_stdl_workspaces.stdl";
  char fname[132];
  char *dir;
  int  iMaxSize;

  dir = getenv( "USR_OBJ" );

  if( 1 < argc ) {
    if( 0 == strcmp( "-o", argv[1] ))
      dir = argv[2];
  }

  sprintf(fname, "%s\\%s", dir, filename);
  if ( (fptr=fopen(fname,"w")) == NULL)
  {
   printf("\nCould not open file %s\n",fname);
   exit (0);
  }

  iMaxSize = 0;
  iMaxSize = MAX(iMaxSize,sizeof(DeliveryData));
  iMaxSize = MAX(iMaxSize,sizeof(NewOrderData));
  iMaxSize = MAX(iMaxSize,sizeof(OrderStatusData));
  iMaxSize = MAX(iMaxSize,sizeof(PaymentData));
  iMaxSize = MAX(iMaxSize,sizeof(StockLevelData));

  fprintf(fptr, "RECORD io_login_wksp\n");
  fprintf(fptr, "\tlogin_data TEXT SIZE %d;\n",sizeof( LoginData ));
  fprintf(fptr, "END RECORD;\n\n");
  fprintf(fptr, "RECORD io_dy_wksp\n");
  fprintf(fptr, "\tdy_data TEXT SIZE %d;\n",sizeof( DeliveryData ));
  fprintf(fptr, "END RECORD;\n\n");
  fprintf(fptr, "RECORD io_no_wksp\n");
  fprintf(fptr, "\tno_data TEXT SIZE %d;\n",sizeof( NewOrderData ));
  fprintf(fptr, "END RECORD;\n\n");
  fprintf(fptr, "RECORD io_pt_wksp\n");
  fprintf(fptr, "\tpt_data TEXT SIZE %d;\n",sizeof( PaymentData ));
  fprintf(fptr, "END RECORD;\n\n");
  fprintf(fptr, "RECORD io_os_wksp\n");
  fprintf(fptr, "\tos_data TEXT SIZE %d;\n",sizeof( OrderStatusData ));
  fprintf(fptr, "END RECORD;\n\n");
  fprintf(fptr, "RECORD io_sl_wksp\n");
  fprintf(fptr, "\tsl_data TEXT SIZE %d;\n",sizeof( StockLevelData ));
  fprintf(fptr, "END RECORD;\n\n");
  fprintf(fptr, "RECORD io_gc_wksp\n");
  fprintf(fptr, "\tgc_data TEXT SIZE %d;\n", iMaxSize );
  fprintf(fptr, "END RECORD;\n\n");
  fprintf(fptr, "RECORD int_gc_wksp\n");
  fprintf(fptr, "\ttrans INTEGER;\n");
  fprintf(fptr, "END RECORD;\n\n");

  fclose(fptr);
  printf("\n File %s generated.\n",fname);

  return 0;
}
```

## deli_cli.c

```
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```

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 *                                                                *

******************************************************************
***********/

/*+
 * Abstract: This file contains functions for the delivery server client code.
 *
 * Author:  W Carr
 * Creation Date: July 1997
 *
 * Modified history:
 *
 *
*/

#define DELI_CLI_C

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


#include <tpccstruct.h>
#include <tpccapi.h>
#include <tpccerr.h>

#include <buf.h>
#include <deli_srv.h>


/* FUNCTION: int DELIClientStartup( void )
 *
 * PURPOSE:              This function prepares the delivery client for
processing.
 *
 * ARGUMENTS:            None
 *
 * RETURNS:              int                     Error code if unsuccessful
 *                                               ERR_SUCCESS if no error

 *
 * COMMENTS:             This code presumes that the server portion of the code
 *                       has been started first, otherwise, a call to the delivery
 *                       function will fail.
 *
 */

int DELIClientStartup( void )
{
 return ERR_SUCCESS;
}

/* FUNCTION: int DELIClientShutdown( void )
 *
 * PURPOSE:              This function cleans up allocated objects to allow for
 *                       termination of the delivery subsystem.
 *
 * ARGUMENTS:            None
 *
 * RETURNS:              int                     Error code if unsuccessful
 *                                               ERR_SUCCESS if no error

 *
 * COMMENTS:             None
 *
 */

int DELIClientShutdown( void )
{
 return ERR_SUCCESS;
}

/* FUNCTION: int TPCCDelivery( CallersContext *pCC, int iConnectionID,
 *                                      int iSyncID, DBContext *pdbContext,
 *                                      int deadlock_retry, pDeliveryData
pDelivery )
 *
 * PURPOSE:              Writes the input portion the the delivery structure to the
 *                       server.
 *
 * ARGUMENTS:            CallersContext          *pCC
                callers context struct ptr.
 *                       int                     iTermId
                terminal id of browser
 *                       int                     iSyncId                 sync
id of browser
 *                       DBPROCESS               *dbproc
                connection db process id
 *                       int                     deadlock_retry
                deadlock retry count
 *                       DeliveryData            *pDelivery  Delivery data i/o
struct ptr
 *
 * RETURNS:              int             ERR_DB_SUCCESS
                success
 *                                      ERR_DB_NOT_COMMITED
                other error
 *
 * COMMENTS:
 *
 */

int TPCCDelivery( pDeliveryData pDelivery,
                                pDeliveryData
CompletedDeliveries[DELIVERY_RESPONSE_COUNT] )
{
 size_t                                 bw;
 size_t                                 br;
 int                                            ii;
 int                                            status;

 /* get local queue time if nothing supplied */
 if( 0 == pDelivery->queue_time )
  time( &pDelivery->queue_time );

 if( gbUsePipe ) {
  if( 0 == WriteFile( ghPipeInputWrite, pDelivery, sizeof(DeliveryDataInput),
                                                &bw, NULL )) {
   status = GetLastError( );
   return ERR_DB_DELIVERY_NOT_QUEUED;
  }
 }
 else {
  /* Overload the delta time to be the local queue time in milliseconds. */
  /* On the server side, we will get the tick count and subtract to                */
  /* calcuate the delta.
                */
  pDelivery->delta_time = GetTickCount( );

  /* Since the delivery transaction data structure has been reserved by */
  /* the caller, we only wish to pass its address to the delivery server. */
  /* Since the buffer code assumes that you wish to copy what is at the */
```

```
   /* pointer value (it will dereference the pointer) what we want to pass */
   /* is a pointer to the pointer. */
   if( BUF_SUCCESS != bufwrite( &pDelivery, sizeof( pDeliveryData ),
                                                &bw, INFINITE, inputbuf ))
    return ERR_DB_DELIVERY_NOT_QUEUED;

   for( ii = 0; ii < DELIVERY_RESPONSE_COUNT; ii++ ) {
    if( gbDisplayCompletions ) {
                status = bufread( &CompletedDeliveries[ii], sizeof( pDeliveryData ),
                                        &br, 0, outputbuf );
                if( BUF_READTIMEOUT == status )
                  /* there was not a completed transaction waiting */
                  CompletedDeliveries[ii] = NULL;
                else if( BUF_SUCCESS != status )
                  return ERR_DELIVERY_OUTPUT_PIPE_READ;
    }
    else {
                /* no completion records are being sent */
                CompletedDeliveries[ii] = NULL;
    }
   }
  }

  return ERR_DB_SUCCESS;
}
```

## deli_cli.h

```
#ifndef DELI_CLI_H
#define DELI_CLI_H
/*+*************************************************************
*************
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 *                                                  *
 *                                                  *

*************************************************************
*************/
/*+
 * Abstract: This file contains definitions and declarations for the
 *                              delivery server client code.
 *
 * Author: W Carr
 * Creation Date: July 1997
 *
 * Modified history:
 *
 *
*/

int DELIClientStartup( void );
int DELIClientShutdown( void );

#endif /* DELI_CLI_H */
```

## deli_srv.c

```
/*+*************************************************************
*************
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 *                                                  *
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*************************************************************
*************/

/*+
 * Abstract: This file contains functions for the delivery server queue.
 *
 * Author:  W Carr
 * Creation Date: July 1997
 *
 * Modified history:
 *
 *
*/

#define DELI_SRV_C

#include <windows.h>
#include <winsock.h>
#include <time.h>
```

```
#include <stdio.h>
#include <stdlib.h>
#include <process.h>
#include <crtdbg.h>

#include <tpccstruct.h>
#include <tpccapi.h>
#include <tpccerr.h>

#include <buf.h>
#include <tpcc.h>
#include <deli_srv.h>

#define FILENAMESIZE 256

static int      giDeliInitStatus = ERR_SUCCESS;
static LONG             gDeliThreadStartCtr;
static HANDLE           gDeliThreadStartEvent;

static int      iNumThreads             = 4;                    /* number
threads to create */
static int      iNumQueued              = 10;                   /* size of
delivery queue */
static int      iDeadlockRetry          = 3;                    /* number read
check retries. */
static int      giLoginDelay            = 0;                    /* delay between
db logins */

static FILE   *fpLog = NULL;                                    /* pointer to log
file */
static char     szLogPath[256] = {0};

static BOOL bDone;                                              /* termination
request flag */
static BOOL bLog = FALSE;                                       /* log
transactions to file ? */
static BOOL bFlush = FALSE;                                     /* Flush log info
when written*/
static BOOL bDirectConnect = FALSE;                             /* Use transport
or connect */

/* Used for OS pipe deliveries */
static HANDLE           hPipeInputRead = INVALID_HANDLE_VALUE;

/* function prototypes */
void                    DELIErrorMessage(int iError);
void                    DELILog( pDeliveryData pDelivery );
unsigned        __stdcall DELIThread( void *ptr );
int                     DELIReadRegistrySettings(void);

/* FUNCTION: int DELIGetTransportData( BOOL *deli_direct_connect,
 *                                                      int *num_dy_servers )
 *
 * PURPOSE:             This function prepares the delivery subsystem for
execution.
 *
 * ARGUMENTS:           None
 *
 * RETURNS:             int             iError                  Error code if
unsuccessfull
 *                                      ERR_SUCCESS             No error
successfull code
 *
 *
 * COMMENTS:            None
 *
 */

int
DELIGetTransportData( BOOL *dy_use_transport, int *num_dy_servers,
                                int *num_queued_deliveries, int
*num_queued_responses )
{
  int                                   status;

  if ( ERR_SUCCESS != (status = DELIReadRegistrySettings()) )
    return status;

  *dy_use_transport = !bDirectConnect;
  *num_dy_servers = iNumThreads;
  *num_queued_deliveries = iNumQueued;
  if( gbDisplayCompletions && !gbUsePipe )
    *num_queued_responses = iNumQueued;
  else
    *num_queued_responses = 0;

  return ERR_SUCCESS;
}

/* FUNCTION: int DELIServerStartup( BOOL deli_direct_connect,
 *                                                      int num_dy_servers )
 *
 * PURPOSE:             This function prepares the delivery subsystem for
execution.
 *
 * ARGUMENTS:           None
 *
 * RETURNS:             int             iError                  Error code if
unsuccessfull
 *                                      ERR_SUCCESS             No error
successfull code
 *
 *
 * COMMENTS:            None
 *
 */

int
DELIServerStartup( BOOL dy_use_transport, int num_dy_servers,
                                int num_queued_deliveries, int
num_queued_responses )
{
  int                                   iError;
  int                                   ii;
  size_t                inputbufsize;
  size_t                outputbufsize;
  unsigned              tid;
  unsigned long                         ulhThread;
  HANDLE                hThread;

  if( gbUsePipe ) {
    /* start delivery pipe */
    inputbufsize = num_dy_servers *
      num_queued_deliveries * sizeof( DeliveryData );
    if(0 == CreatePipe(&hPipeInputRead, &ghPipeInputWrite, NULL,
inputbufsize)){
      iError = GetLastError( );
      return ERR_DELIVERY_PIPE_CREATE;
    }
  }
  else {
    /* create delivery buffer */
    inputbufsize = num_queued_deliveries * sizeof( pDeliveryData );
    if( BUF_SUCCESS != bufopen( inputbufsize, &inputbuf ))
      return ERR_DELIVERY_PIPE_OPEN;

    if( gbDisplayCompletions ) {
      /* create response buffer */
      outputbufsize = num_queued_responses * sizeof( pDeliveryData );
      if( BUF_SUCCESS != bufopen( outputbufsize, &outputbuf ))
                return ERR_DELIVERY_PIPE_OPEN;
    }
  }
```

```
 /* prepare to start and verify starting of delivery threads */
 gDeliThreadStartCtr = iNumThreads;

 gDeliThreadStartEvent = CreateEvent( NULL, TRUE, FALSE, NULL );
 if ( gDeliThreadStartEvent == NULL )
  return ERR_CANT_CREATE_FORCE_THRED_STRT_EVENT;

 bDone = FALSE;

 if ( !bDone ){
  for( ii = 0; ii < iNumThreads; ii++ ) {
   ulhThread = _beginthreadex( NULL, 0, DELIThread, NULL, 0, &tid );
   if( 0 == ulhThread )
            return ERR_CANT_START_DELIVERY_THREAD;
   hThread = ( HANDLE )ulhThread;
   CloseHandle( hThread );
   if( !dy_use_transport )
            Sleep( giLoginDelay );
  }
 }

 WaitForSingleObject( gDeliThreadStartEvent, INFINITE );

 return giDeliInitStatus;
}

/* FUNCTION: int DELIServerShutdown( void )
 *
 * PURPOSE:          This function cleans up allocated objects to allow for
 *                   termination of the delivery subsystem.
 *
 * ARGUMENTS:        None
 *
 * RETURNS:          None
 *
 * COMMENTS:         None
 *
 */

int
DELIServerShutdown( void )
{
 bDone = TRUE;

 if( gbUsePipe ) {
  CloseHandle( hPipeInputRead );
  CloseHandle( ghPipeInputWrite );
 }
 else {
  bufclose( inputbuf );
  bufclose( outputbuf );
 }

 if ( fpLog )
  fclose(fpLog);

 fpLog = NULL;

 return ERR_SUCCESS;
}

/* FUNCTION: void DELIErrorMessage(int iError)
 *
 * PURPOSE:          This function writes an error message to the error log
file.
 *
 * ARGUMENTS:        int                 iError        error id to be
logged
 *
 * RETURNS:          None
 *
 * COMMENTS:         None
 *
 */

void
DELIErrorMessage(int iError)
{
 int ii;

 for( ii = 0; errorMsgs[ii].szMsg[0]; ii++ ) {
  if ( iError == errorMsgs[ii].iError ) {
   TPCCErr( "*Error(%d): %s\r\n", iError, errorMsgs[ii].szMsg );
   return;
  }
 }

 TPCCErr( "*Error(%d): Unknown Error.\r\n", iError );
 return;
}

/* FUNCTION: int DELIReadRegistrySettings(void)
 *
 * PURPOSE:          This function reads the registry for initialization
information.
 *
 * ARGUMENTS:        None
 *
 * RETURNS:          int          ERR_SUCCESS
            Reqistry read Successful
 *
 *
 * COMMENTS:         None
 */

int
DELIReadRegistrySettings(void)
{
 HKEY     hKey;
 DWORD    size;
 DWORD    type;
 char     szTmp[FILENAMESIZE];
 int      status;
 int      iTmp;

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

 size = sizeof(szTmp);
 status = RegQueryValueEx(hKey, "LoginDelay", 0, &type, szTmp, &size);
 if ( status == ERROR_SUCCESS )
  giLoginDelay = atoi(szTmp);

 size = sizeof(szTmp);
 status = RegQueryValueEx(hKey, "NumberOfDeliveryThreads",
                                          0, &type, szTmp, &size);
 if ( status == ERROR_SUCCESS )
  if ( 0 != ( iTmp = atoi(szTmp) ))
   iNumThreads = iTmp;

 size = sizeof(szTmp);
 status = RegQueryValueEx(hKey, "NumberOfQueuedDeliveryTransactions",
                                          0, &type, szTmp, &size);
 if ( status == ERROR_SUCCESS )
  if ( 0 != ( iTmp = atoi(szTmp) ))
   iNumQueued = iTmp;

 size = sizeof(szTmp);
 status = RegQueryValueEx(hKey, "DeadlockRetry", 0, &type, szTmp, &size);
 if ( status == ERROR_SUCCESS )
  if ( 0 != ( iTmp = atoi(szTmp) ))
```

```
    iDeadlockRetry = iTmp;

  size = sizeof(szTmp);
  status =RegQueryValueEx(hKey, "DeliveryServerConnectsToDB",
                                        0, &type, szTmp, &size);
  if ( status == ERROR_SUCCESS )
    if ( 0 == stricmp(szTmp, "TRUE") || 0 == strcmp(szTmp, "1"))
      bDirectConnect = TRUE;

  size = sizeof(szTmp);
  status =RegQueryValueEx(hKey, "FlushDeliveryLog", 0, &type, szTmp,
&size);
  if ( status == ERROR_SUCCESS )
    if ( 0 == stricmp(szTmp, "TRUE") || 0 == strcmp(szTmp, "1"))
      bFlush = TRUE;

  size = sizeof(szTmp);
  status =RegQueryValueEx(hKey, "DisplayDeliveryCompletions", 0, &type,
szTmp, &size);
  if ( status == ERROR_SUCCESS )
    if ( 0 == stricmp(szTmp, "FALSE") || 0 == strcmp(szTmp, "0"))
      gbDisplayCompletions = FALSE;

  size = sizeof(szTmp);
  status =RegQueryValueEx(hKey, "UseDeliveryPipe", 0, &type, szTmp, &size);
  if ( status == ERROR_SUCCESS )
    if ( 0 == stricmp(szTmp, "TRUE") || 0 == strcmp(szTmp, "1"))
      gbUsePipe = TRUE;

  size = sizeof(szTmp);
  status =RegQueryValueEx(hKey, "WriteDeliveryLog", 0, &type, szTmp,
&size);
  if ( status == ERROR_SUCCESS )
    if ( 0 == stricmp(szTmp, "TRUE") || 0 == strcmp(szTmp, "1"))
      bLog = TRUE;

  size = sizeof(szTmp);
  status = RegQueryValueEx(hKey, "PATH", 0, &type, szTmp, &size);
  if ( status != ERROR_SUCCESS )
    return ERR_CANT_FIND_PATH_VALUE;
  if( bLog ) {
    strcpy(szLogPath, szTmp);
    strcat(szLogPath, "delilog.");
    fpLog = fopen(szLogPath, "wb");
    if ( NULL == fpLog )
      return ERR_CANNOT_CREATE_RESULTS_FILE;
  }

  RegCloseKey(hKey);

  return ERR_SUCCESS;
}

/* FUNCTION: void TPCCDeliveryDeferredResponse( DeliveryData
*deliveryData )
 *
 * PURPOSE:             This function writes the completed delivery transaction
 *                      record to the log file and to the queue for reporting
 *                      to the browser.
 *
 * ARGUMENTS:           EXTENSION_CONTROL_BLOCK *pECB
 *                      int                             iTermId
                client browser terminal id
 *                      int                             iSyncId
                client browser sync id
 *                      DBContext               *pdb    pointer to the
database context
 *                      int                             retcode  return
code from db
 *                      DeliveryData                    *deliveryData
pointer to the delivery
 *                                                                      data
structure.
 *
 * RETURNS:             none
 *
 * COMMENTS:            none
 */

void
TPCCDeliveryDeferredResponse( int retcode, pDeliveryData pDelivery )
{
  size_t                        bw;
  int                                   status;

  if ( ERR_DB_PENDING == retcode )
  {
    return;
  }
  else
  {
  /* The delta time was overloaded by the client to be the local queue time */
  /* in milliseconds.  Here we get the tick count and subtract to      */
  /* calcuate the delta.
                */
    if( ERR_DB_SUCCESS != retcode)
    {
      /* send a flag to the reducer to mark an error on the delivery */
      pDelivery->queue_time = 1;
      DELIErrorMessage(retcode);
    }
    pDelivery->delta_time = GetTickCount( ) - pDelivery->delta_time;

    /* update log */
    if( bLog )
      DELILog( pDelivery );

    if( gbDisplayCompletions && !gbUsePipe ) {
      /* send a delivery completion record */
      status = bufwrite( &pDelivery, sizeof(pDeliveryData),
                                        &bw, INFINITE, outputbuf );
      if( BUF_SUCCESS != status ) {
                DELIErrorMessage( ERR_DELIVERY_OUTPUT_PIPE_WRITE );
                return;
      }
    }
    else {
      /* The delivery transaction is at the end of its life */
      UNRESERVE_TRANSACTION_STRUCT( DELIVERY_TRANS,
pDelivery );
    }
  }
}

/* FUNCTION: void DELIThread( void *ptr )
 *
 * PURPOSE:             This function is executed by each delivery thread.
 *                      A thread will block on a read of the buffer from the
client.
 *                      Return from the read will indicate either data is to be
 *                      processed, an error has occured, or the buffer has been
closed.
 *
 * ARGUMENTS:           void            *ptr            unused, passed by thread
creation routine.
 *
 * RETURNS:             None
 *
 * COMMENTS:            The registry key value NumberOfDeliveryThreads
controls how
 *                      many of these functions are running.
 *
 */
```

```
unsigned __stdcall
DELIThread( void *ptr )
{
  size_t                    br;
  pDeliveryData                     pDelivery;
  int                               retcode;
  int                               CC;
  CallersContext            *pCC;
  LoginData                 login;
  char                              tmp[16];
  int                               status;
  DBContext                 DBC;

  /* Initialize calling parameters */
  CC = 0;
  pCC = &CC;
  DBC = INVALID_DB_CONTEXT;

  /* Should we connect directly ourselves, or should we use the transport to */
  /* perform the deliveries in the same manner as the other 4 transactions?  */
  if( bDirectConnect ) {
    gethostname(tmp, sizeof(tmp));
    login.w_id = 0;
    login.ld_id = 0;
    login.pCC = pCC;
    strcpy( login.szServer, gszServer );
    strcpy( login.szDatabase, gszDatabase );
    strcpy( login.szUser, gszUser );
    strcpy( login.szPassword, gszPassword );
    sprintf( login.szApplication, "%s:delisrv - %d",
                    tmp, GetCurrentThreadId());
    status = TPCCConnectDB( &DBC, &login );
    if( ERR_DB_SUCCESS != status && ERR_SUCCESS != giDeliInitStatus )
      giDeliInitStatus = status;
  }

  /* wait until all threads are started */
  if ( InterlockedDecrement( &gDeliThreadStartCtr ) == 0 )
    SetEvent( gDeliThreadStartEvent );

  WaitForSingleObject( gDeliThreadStartEvent, INFINITE );

  if( ERR_SUCCESS != giDeliInitStatus )
    return giDeliInitStatus;

  /* while delisrv running i.e. user has not requested termination */
  while( !bDone ){

    if( gbUsePipe ) {
      RESERVE_TRANSACTION_STRUCT( DELIVERY_TRANS, pDelivery );
      if( 0 == ReadFile( hPipeInputRead, pDelivery, sizeof( DeliveryDataInput ),
                                        &br, NULL )) {
                status = GetLastError( );
                DELIErrorMessage( ERR_DELIVERY_PIPE_READ );
                continue;
      }
    }
    else {
      if(BUF_SUCCESS != bufread( &pDelivery, sizeof( pDeliveryData ), &br,
                                                    INFINITE, inputbuf )) {
                DELIErrorMessage( ERR_DELIVERY_PIPE_READ );
                continue;
      }

    }
    if( bDirectConnect )
      retcode = TPCCDeliveryDB( DBC, pDelivery );
    else
      retcode = TPCCDeliveryDeferred( pDelivery );

    TPCCDeliveryDeferredResponse( retcode, pDelivery );
  }

  return ERR_SUCCESS;
}

/* FUNCTION: void DELILog( pDeliveryData pDelivery )
 *
 * PURPOSE:          Writes the delivery results to the delivery log file.
 *
 * ARGUMENTS:        LPSYSTEMTIME        lpBegin
                Local delivery start time.
 *                  pDeliveryData       pDelivery    Delivery data to
be written.
 *
 * RETURNS:          None
 *
 * COMMENTS:         None
 *
 */

void
DELILog( pDeliveryData pDelivery )
{
  struct tm                 start;
  struct tm                 *end;
  time_t                    endt;
  unsigned                  delta_time_seconds;
  unsigned                  delta_time_milliseconds;

  delta_time_seconds = pDelivery->delta_time / 1000;
  delta_time_milliseconds = pDelivery->delta_time - (delta_time_seconds *
1000);

  CopyMemory( &start, localtime( &pDelivery->queue_time ), sizeof( start ));
  endt = pDelivery->queue_time + delta_time_seconds;
  end = localtime( &endt );

  fprintf( fpLog,
                    "%2.2d/%2.2d/%2.2d,"
                    "%2.2d:%2.2d:%2.2d:%3.3d,"
                    "%2.2d:%2.2d:%2.2d:%3.3d,"
                    "%8.8d,"
                    "%5.5d,%2.2d,"
                    "%4.4d,%4.4d,%4.4d,%4.4d,%4.4d,"
                    "%4.4d,%4.4d,%4.4d,%4.4d,%4.4d\r\n",
                    start.tm_year, start.tm_mon, start.tm_mday,
                    start.tm_hour, start.tm_min, start.tm_sec, 0,
                    end->tm_hour, end->tm_min, end->tm_sec,
delta_time_milliseconds,
                    pDelivery->delta_time,
                    pDelivery->w_id, pDelivery->o_carrier_id,
                    pDelivery->o_id[0], pDelivery->o_id[1],
                    pDelivery->o_id[2], pDelivery->o_id[3],
                    pDelivery->o_id[4], pDelivery->o_id[5],
                    pDelivery->o_id[6], pDelivery->o_id[7],
                    pDelivery->o_id[8], pDelivery->o_id[9] );

  if ( bFlush )
    fflush(fpLog);

  return;
}
```

## deli_srv.h

```
#ifndef DELI_SRV_H
#define DELI_SRV_H
```

```
/*+**********************************************************************
*************
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**********************************************************************
************/

/*+
 * Abstract: This file contains definitions of the delivery server queue.
 *
 * Author:  W Carr
 * Creation Date: July 1997
 *
 * Modified history:
 *              21-Oct-1997 WCarr       Replaced NamedPipe with buffer code.
 *
*/

#ifdef DELI_SRV_C
# define DELI_GLOBAL(thing,init) thing = init
#else
# define DELI_GLOBAL(thing,init) extern thing
#endif

#if defined DELI_CLI_C || defined DELI_SRV_C
DELI_GLOBAL(BOOL gbDisplayCompletions,TRUE);        /* Send comp.
back to UI? */
DELI_GLOBAL(BUFPTR inputbuf,NULL);                  /* submitted
deliveries */
DELI_GLOBAL(BUFPTR outputbuf,NULL);                 /* completed
deliveries */

/* Used for OS pipe deliveries */
DELI_GLOBAL(BOOL gbUsePipe,FALSE);                  /* Use OS pipe
delivery code */
DELI_GLOBAL(HANDLE ghPipeInputWrite,INVALID_HANDLE_VALUE);
#endif

int DELIGetTransportData( BOOL *dy_use_transport,
                          int *num_dy_servers,
                          int *num_queued_deliveries,
                          int *num_queued_responses );
int DELIServerStartup( BOOL dy_use_transport, int num_dy_servers,
                       int num_queued_deliveries, int
num_queued_responses );
int DELIServerShutdown( void );

#endif /* DELI_SRV_H */
```

## tpcc.c

```
/*+          FILE:       TPCC.C
 *                       Microsoft TPC-C Kit Ver. 3.00.000
 *                       Audited 08/23/96          By Francois Raab
 *
 *                       Copyright Microsoft, 1996
 *                       Copyright Digital Equipment Corp., 1997
 *
 *          PURPOSE:  Main module for TPCC.DLL which is an ISAPI service
dll.
 *          Author:             Philip Durr
 *                                      philipdu@Microsoft.com
 *
 *          MODIFICATIONS:
 *
 *                       Routines substantially modified by:
 *                                      Anne Bradley              Digital
Equipment Corp.
 *                                      Bill Carr      Digital Equipment Corp.
 *
 */
/*+**********************************************************************
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 *                                                                      *

**********************************************************************
************/


#include <windows.h>
#include <stdio.h>
#include <stdarg.h>
#include <malloc.h>
#include <stdlib.h>
```

```
#include <string.h>
#include <time.h>
#include <sys\timeb.h>
#include <io.h>

#define TPCC_C

#include <tpccerr.h>
#include <tpccstruct.h>
#include <tpccapi.h>
#include <httpext.h>

#include <tpcc.h>
#include <web_ui.h>

/* FUNCTION: void FormatString(char *szDest, char *szPic, char *szSrc)
 *
 * PURPOSE:          This function formats a character string for inclusion in
the
 *                   HTML formatted page being constructed.
 *
 * ARGUMENTS:        char        *szDest
                Destination buffer where
 *
                formatted string is to be
 *
                placed
 *                 char        *szPic
                picture string which describes
 *                                                                    how
character value is to be
 *
                formatted.
 *                 char        *szSrc
                character string value.
 *
 * RETURNS:          None
 *
 * COMMENTS:         This functions is used to format TPC-C phone and zip
value
 *                   strings.
 *
 */

void FormatString(char *szDest, char *szPic, char *szSrc)
{
  while( *szPic )
  {
    if ( *szPic == 'X' )
    {
      if ( *szSrc )
                *szDest++ = *szSrc++;
      else
                *szDest++ = ' ';
    }
    else
      *szDest++ = *szPic;
    szPic++;
  }
  *szDest = 0;

  return;
}

/* FUNCTION: int ParseNewOrderQuery( char *pProcessedQuery[],
 *                                                    NewOrderData
*pNewOrderData )
 *
 * PURPOSE:          This function extracts and validates the new order
query
 *                   from an http command string.
 *
 * ARGUMENTS:        char        *pProcessedQuery[]    array of char*
that points to
 *                                                                    the
value of each name-value
 *                                                                    pair.
 *                   NewOrderData  *pNewOrderData      pointer to new
order data
 *
                structure
 *
 * RETURNS:          int         ERR_SUCCESS
                input data successfully parsed
 *                                error_code            reason for failure
 *
 * COMMENTS:         None
 *
 */

int ParseNewOrderQuery(char *pQueryString, NewOrderData
*pNewOrderData)
{
  char    *ptr;
  int             i;
  short       items;
  BOOL        bCheck;
  char        *pProcessedQuery[MAXNEWORDERVALS];


  PARSE_QUERY_STRING(pQueryString, MAXNEWORDERVALS,
                        newOrderStrs, pProcessedQuery);

  if ( !GetValuePtr(pProcessedQuery, DID, &ptr) )
    return ERR_NEWORDER_FORM_MISSING_DID;

  GetNumeric(ptr, &pNewOrderData->d_id);
  if(0 == pNewOrderData->d_id)
    return ERR_NEWORDER_DISTRICT_INVALID;


  if ( !GetValuePtr(pProcessedQuery, CID, &ptr) )
    return ERR_NEWORDER_CUSTOMER_KEY;

  if( !GetNumeric(ptr, &pNewOrderData->c_id))
    return ERR_NEWORDER_CUSTOMER_INVALID;

  bCheck = FALSE;
  pNewOrderData->o_all_local = 1;


  for(i=0, items=0; i<15; i++)
  {
    if( !GetValuePtr(pProcessedQuery, i*3+IID00, &ptr))
      return ERR_NEWORDER_MISSING_IID_KEY;
    if(*ptr != '&' && *ptr)
    {
      /* if blank lines between item ids */
      if ( bCheck )
                return ERR_NEWORDER_ITEM_BLANK_LINES;
      if(!GetNumeric(ptr, &pNewOrderData->o_ol[i].ol_i_id))
                return ERR_NEWORDER_ITEMID_INVALID;

      if(!GetValuePtr(pProcessedQuery, i*3+SP00, &ptr))
                return ERR_NEWORDER_MISSING_SUPPW_KEY;
      if(!GetNumeric(ptr, &pNewOrderData->o_ol[i].ol_supply_w_id))
                return ERR_NEWORDER_SUPPW_INVALID;
      if ( pNewOrderData->o_all_local &&
                  pNewOrderData->o_ol[i].ol_supply_w_id !=
                  pNewOrderData->w_id )
                pNewOrderData->o_all_local = 0;
      if(!GetValuePtr(pProcessedQuery, i*3+QTY00, &ptr))
                return ERR_NEWORDER_MISSING_QTY_KEY;
      if(!GetNumeric(ptr, &pNewOrderData->o_ol[i].ol_quantity))
```

```
            return ERR_NEWORDER_QTY_INVALID;
    items++;
    if ( pNewOrderData->o_ol[i].ol_i_id >= 1000000 ||
            pNewOrderData->o_ol[i].ol_i_id < 1 )
            return ERR_NEWORDER_ITEMID_RANGE;
    if ( pNewOrderData->o_ol[i].ol_quantity >= 100 ||
            pNewOrderData->o_ol[i].ol_quantity < 1 )
            return ERR_NEWORDER_QTY_RANGE;
   }
   else
   {
    if(!GetValuePtr(pProcessedQuery, i*3+SP00, &ptr))
            return ERR_NEWORDER_MISSING_QTY_KEY;
    if(*ptr != '&' && *ptr)
            return ERR_NEWORDER_SUPPW_WITHOUT_ITEMID;

    if(!GetValuePtr(pProcessedQuery, i*3+QTY00, &ptr))
            return ERR_NEWORDER_MISSING_QTY_KEY;
    if(*ptr != '&' && *ptr)
            return ERR_NEWORDER_QTY_WITHOUT_ITEMID;
    bCheck = TRUE;
   }
  }
  if ( items == 0 )
   return ERR_NEWORDER_NOITEMS_ENTERED;

  pNewOrderData->o_ol_cnt = items;

  return ERR_SUCCESS;
}

/* FUNCTION: int ParseOrderStatusQuery( char *pProcessedQuery[],
 *                                                      OrderStatusData
*pOrderStatusData )
 *
 * PURPOSE:          This function extracts and validates the order status
query
 *                   from an http command string.
 *
 * ARGUMENTS:        char        *pProcessedQuery[]    array of char*
that points to
 *                                                          the
value of each name-value
 *                                                          pair.
 *                   OrderStatusData *pOrderStatusData pointer to new
order data
 *
structure
 *
 * RETURNS:          int         ERR_SUCCESS
            input data successfully parsed
 *                              error_code              reason for failure
 *
 * COMMENTS:         None
 *
 */
int ParseOrderStatusQuery(char *pQueryString,
                                    OrderStatusData *pOrderStatusData)
{
  char      szTmp[26];
  char    *ptr;
  char      *pSzTmp;
  char      *pProcessedQuery[MAXORDERSTATUSVALS];


  PARSE_QUERY_STRING(pQueryString, MAXORDERSTATUSVALS,
                        orderStatusStrs, pProcessedQuery);

  if ( !GetValuePtr(pProcessedQuery, DID, &ptr) )
   return ERR_ORDERSTATUS_MISSING_DID_KEY;
  if ( !GetNumeric(ptr, &pOrderStatusData->d_id) )
   return ERR_ORDERSTATUS_DID_INVALID;

  if ( !GetValuePtr(pProcessedQuery, CID, &ptr) )
   return ERR_ORDERSTATUS_MISSING_CID_KEY;

  if ( *ptr == '&' || !(*ptr))
  {
   pSzTmp = szTmp;
   pOrderStatusData->c_id = 0;
   if ( !GetValuePtr(pProcessedQuery, CLT_O, &ptr) )
    return ERR_ORDERSTATUS_MISSING_CLT_KEY;
   while(*ptr != '&' && *ptr)
   {
    *pSzTmp = *ptr;
    pSzTmp++;
    ptr++;
   }
   *pSzTmp = '\0';
   _strupr( szTmp );
   strcpy(pOrderStatusData->c_last, szTmp);
   if ( strlen(pOrderStatusData->c_last) > 16 )
    return ERR_ORDERSTATUS_CLT_RANGE;
  }
  else
  {
   if (!GetNumeric(ptr, &pOrderStatusData->c_id))
    return ERR_ORDERSTATUS_CID_INVALID;
   if ( !GetValuePtr(pProcessedQuery, CLT_O, &ptr) )
    return ERR_ORDERSTATUS_MISSING_CLT_KEY;
   if ( *ptr != '&' && *ptr)
    return ERR_ORDERSTATUS_CID_AND_CLT;
  }

  return ERR_SUCCESS;
}

/* FUNCTION: int ParsePaymentQuery( char *pProcessedQuery[],
 *                                                      PaymentData
*pPaymentData )
 *
 * PURPOSE:          This function extracts and validates the payment query
 *                   from an http command string.
 *
 * ARGUMENTS:        char        *pProcessedQuery[]    array of char*
that points to
 *                                                          the
value of each name-value
 *                                                          pair.
 *                   PaymentData  *pPaymentData        pointer to
payment data
 *
            structure
 *
 * RETURNS:          int         ERR_SUCCESS
            input data successfully parsed
 *                              error_code              reason for failure
 *
 * COMMENTS:         None
 *
 */

int ParsePaymentQuery(char *pQueryString, PaymentData *pPaymentData)
{
  char      szTmp[26];
  char      *ptr;
  char    *pPtr;
  char      *pSzTmp;
  char      *pProcessedQuery[MAXPAYMENTVALS];


  PARSE_QUERY_STRING(pQueryString, MAXPAYMENTVALS,
                        paymentStrs, pProcessedQuery);
```

```
if ( !GetValuePtr(pProcessedQuery, DID, &ptr) )
 return ERR_PAYMENT_MISSING_DID_KEY;
if ( !GetNumeric(ptr, &pPaymentData->d_id) )
 return ERR_PAYMENT_DISTRICT_INVALID;

if ( !GetValuePtr(pProcessedQuery, CID, &ptr) )
 return ERR_PAYMENT_MISSING_CID_KEY;

pPaymentData->c_id = 0;
if ( (*ptr != '&' && *ptr) && !GetNumeric(ptr, &pPaymentData->c_id) )
 return ERR_PAYMENT_CUSTOMER_INVALID;


if(*ptr == '&' || !(*ptr))
{
 pSzTmp = szTmp;
 if ( !GetValuePtr(pProcessedQuery, CLT_P, &ptr) )
  return ERR_PAYMENT_MISSING_CLT;
 while(*ptr != '&' && *ptr)
 {
  *pSzTmp = *ptr;
  pSzTmp++;
  ptr++;
 }
 *pSzTmp = '\0';
 _strupr( szTmp );

 strcpy(pPaymentData->c_last, szTmp);
 if ( strlen(pPaymentData->c_last) > 16 )
  return ERR_PAYMENT_LAST_NAME_TO_LONG;
}
else
{
 if ( !GetValuePtr(pProcessedQuery, CLT_P, &ptr) )
  return ERR_PAYMENT_MISSING_CLT_KEY;
 if(*ptr != '&' && *ptr)
  return ERR_PAYMENT_CID_AND_CLT;
}

if ( !GetValuePtr(pProcessedQuery, CDI, &ptr) )
 return ERR_PAYMENT_MISSING_CDI_KEY;
if ( !GetNumeric(ptr, &pPaymentData->c_d_id) )
 return ERR_PAYMENT_CDI_INVALID;

if ( !GetValuePtr(pProcessedQuery, CWI, &ptr) )
 return ERR_PAYMENT_MISSING_CWI_KEY;

if ( !GetNumeric(ptr, &pPaymentData->c_w_id) )
 return ERR_PAYMENT_CWI_INVALID;



if ( !GetValuePtr(pProcessedQuery, HAM, &ptr) )
 return ERR_PAYMENT_MISSING_HAM_KEY;

pPtr = ptr;
while( *pPtr != '&' && *pPtr)
{
 if ( *pPtr == '.' )
 {
  pPtr++;
  if ( !*pPtr )
   break;
  if ( *pPtr < '0' || *pPtr > '9' )
   return ERR_PAYMENT_HAM_INVALID;
  pPtr++;
  if ( !*pPtr )
   break;
  if ( *pPtr < '0' || *pPtr > '9' )
   return ERR_PAYMENT_HAM_INVALID;
  if ( !*pPtr )
   return ERR_PAYMENT_HAM_INVALID;
 }
 else if ( *pPtr < '0' || *pPtr > '9' )
  return ERR_PAYMENT_HAM_INVALID;
 pPtr++;
}

pPaymentData->h_amount = atof(ptr);
if ( pPaymentData->h_amount >= 10000.00 || pPaymentData->h_amount < 0 )
 return ERR_PAYMENT_HAM_RANGE;

return ERR_SUCCESS;
}

/* FUNCTION: BOOL ReadRegistrySettings(void)
 *
 * PURPOSE:          This function reads the NT registry for startup
parameters.
 *                   There parameters are under the TPCC key.
 *
 * ARGUMENTS:  None
 *
 * RETURNS:          None
 *
 * COMMENTS:         This function also sets up required operation variables
to
 *                   their default value so if registry is not setup the default
 *                   values will be used.
 *
 */

int ReadRegistrySettings(void)
{
 HKEY      hKey;
 DWORD   size;
 DWORD   type;
 char      szTmp[FILENAMESIZE];
 int   status;
 int       iTmp;


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

 size = sizeof(szTmp);
 status = RegQueryValueEx(hKey, "PATH", 0, &type, szTmp, &size);
 if ( status != ERROR_SUCCESS )
  return ERR_CANT_FIND_PATH_VALUE;
 strcpy(szTpccLogPath, szTmp);

 size = sizeof(szTmp);
 status = RegQueryValueEx(hKey, "Server", 0, &type, szTmp, &size);
 if ( status != ERROR_SUCCESS )
  /* required */
  return ERR_CANT_FIND_SERVER_VALUE;
 strcpy(gszServer, szTmp);

 size = sizeof(szTmp);
 status = RegQueryValueEx(hKey, "Database", 0, &type, szTmp, &size);
 if ( status != ERROR_SUCCESS )
  /* required */
  return ERR_CANT_FIND_DATABASE_VALUE;
 strcpy(gszDatabase, szTmp);

 size = sizeof(szTmp);
 status = RegQueryValueEx(hKey, "User", 0, &type, szTmp, &size);
 if ( status != ERROR_SUCCESS )
  /* required */
  return ERR_CANT_FIND_USER_VALUE;
 strcpy(gszUser, szTmp);
```

```
  size = sizeof(szTmp);
  status = RegQueryValueEx(hKey, "Password", 0, &type, szTmp, &size);
  if ( status != ERROR_SUCCESS )
    /* required */
    return ERR_CANT_FIND_PASSWORD_VALUE;
  strcpy(gszPassword, szTmp);

  size = sizeof(szTmp);
  status = RegQueryValueEx(hKey, "CkptUser", 0, &type, szTmp, &size);
  if ( status != ERROR_SUCCESS )
    strcpy(gszCkptUser, gszUser);
  else
    strcpy(gszCkptUser, szTmp);

  size = sizeof(szTmp);
  status = RegQueryValueEx(hKey, "CkptPassword", 0, &type, szTmp, &size);
  if ( status != ERROR_SUCCESS )
    strcpy(gszCkptPassword, gszPassword);
  else
    strcpy(gszCkptPassword, szTmp);

  size = sizeof(szTmp);
  status = RegQueryValueEx(hKey, "LOG", 0, &type, szTmp, &size);
  if ( status == ERROR_SUCCESS  && 0 == stricmp(szTmp, "ON") )
    bLog = TRUE;

  size = sizeof(szTmp);
  status = RegQueryValueEx(hKey, "MaximumWarehouses", 0, &type, szTmp,
&size);
  if ( status == ERROR_SUCCESS  && 0 != (iTmp = atoi(szTmp)) )
    iMaxWareHouses = iTmp;

  size = sizeof(szTmp);
  status = RegQueryValueEx(hKey, "MaxConnections", 0, &type, szTmp, &size);
  if ( status == ERROR_SUCCESS && 0 != (iTmp = atoi(szTmp)) )
    iMaxConnections = iTmp;

  RegCloseKey(hKey);

  if( RegOpenKeyEx(HKEY_LOCAL_MACHINE,

"SYSTEM\\CurrentControlSet\\Services\\InetInfo\\Parameters",
                                0, KEY_READ, &hKey) != ERROR_SUCCESS )
    return ERR_CANT_FIND_INETINFO_KEY;

  size = sizeof(gdwPoolThreadLimit);
  if ( RegQueryValueEx(hKey, "PoolThreadLimit", 0, &type,
                              (LPBYTE)&gdwPoolThreadLimit, &size) !=
ERROR_SUCCESS )
    return ERR_CANT_FIND_POOLTHREADLIMIT;

  RegCloseKey(hKey);

  return ERR_SUCCESS;

}
```

## tpcc.h

```
#ifndef TPCC_H
#define TPCC_H

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**********************************************************************
************/

/*+
 * Abstract: This is the header file for web_ui.c.  it contains the
 *              function prototypes for the routines that are called outside web_ui.c
 *
 * Author: A Bradley
 * Creation Date: May 1997
 *
 * Modified history:
 *
 *
 */


#define FILENAMESIZE 256

#if defined WEB_UI_C || defined TPCC_C

void FormatString(char *szDest, char *szPic, char *szSrc);

int ParseNewOrderQuery(char *pQueryString, NewOrderData
*pNewOrderData);
int ParsePaymentQuery(char *pQueryString, PaymentData *pPaymentData);
int ParseOrderStatusQuery(char *pQueryString,
                                        OrderStatusData *pOrderStatusData);
#endif /* defined WEB_UI_C || defined TPCC_C */

BOOL ReadRegistrySettings(void);

/* global variables */
#ifdef TPCC_C
#define GLOBAL(thing,initializer) thing = initializer
#else
#define GLOBAL(thing,initializer) extern thing
#endif /* TPCC_C */

#if defined WEB_UI_C || defined TPCC_C
#endif /* defined WEB_UI_C || defined TPCC_C */
GLOBAL(int iMaxConnections,25);
GLOBAL(BOOL bLog,FALSE);
GLOBAL(int iDeadlockRetry,3);
GLOBAL(char szTpccLogPath[FILENAMESIZE],{'\0'});
GLOBAL(int iMaxWareHouses,500);
```

```
GLOBAL(char gszServer[32],{'\0'});
GLOBAL(char gszDatabase[32],"tpcc");
GLOBAL(char gszUser[32],"sa");
GLOBAL(char gszPassword[32],{'\0'});
GLOBAL(char gszCkptUser[32],"sa");
GLOBAL(char gszCkptPassword[32],{'\0'});
GLOBAL(pTransactionPoolStruct gpTransactionPool,{0});

#endif /* TPCC_H */
```

## tpcc_acmsxp.h

```
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*****************************************************************
************/

#ifndef TPCC_ACMSXP_H
#define TPCC_ACMSXP_H

#include <tpccstruct.h>


#define TYPE_NO 1
#define TYPE_OS 2
#define TYPE_PT 3
#define TYPE_SL 4
#define TYPE_GC 5
#define TYPE_DY 6

int ACMSxpStartup( int maxDBConnections, long totalGovValue );
int ACMSxpShutdown( void );
BOOL getGovernorValue( char *group, long *ctr );


#endif /* TPCC_ACMSXP_H */
```

## tpcc_acmsxp_pp.stdl

```
#Cinclude "tpcc_stdl_workspaces"
!
! STDL DY Processing group definition for TPC-C
!
PROCESSING GROUP tpcc_dy
 UUID "11111111-8322-11cf-1111-08002be44c83";
 VERSION 1.0;
 SOURCE LANGUAGE IS C;

PROCEDURE dy_transaction_init
 ARGUMENT IS
        io_login_wksp PASSED AS INOUT;

PROCEDURE dy_transaction
 ARGUMENT IS
        io_dy_wksp PASSED AS INOUT;

END PROCESSING GROUP;

!
! STDL NO Processing group definition for TPC-C
!
PROCESSING GROUP tpcc_no
 UUID "2402d1dc-8322-11cf-ba68-08002be44c83";
 VERSION 1.0;
 SOURCE LANGUAGE IS C;

PROCEDURE no_transaction_init
 ARGUMENT IS
        io_login_wksp PASSED AS INOUT;

PROCEDURE no_transaction
 ARGUMENT IS
        io_no_wksp PASSED AS INOUT;

END PROCESSING GROUP;

!
! STDL OS Processing group definition for TPC-C
!
PROCESSING GROUP tpcc_os
 UUID "4d654a5f-8322-11cf-b420-08002be44c83";
 VERSION 1.0;
 SOURCE LANGUAGE IS C;

PROCEDURE os_transaction_init
 ARGUMENT IS
        io_login_wksp PASSED AS INOUT;

PROCEDURE os_transaction
 ARGUMENT IS
        io_os_wksp PASSED AS INOUT;

END PROCESSING GROUP;

!
! STDL PT Processing group definition for TPC-C
!
PROCESSING GROUP tpcc_pt
 UUID "70e38ff0-8322-11cf-99f7-08002be44c83";
 VERSION 1.0;
 SOURCE LANGUAGE IS C;

PROCEDURE pt_transaction_init
 ARGUMENT IS
        io_login_wksp PASSED AS INOUT;
```

```
PROCEDURE pt_transaction
 ARGUMENT IS
            io_pt_wksp PASSED AS INOUT;

END PROCESSING GROUP;

!
! STDL SL Processing group definition for TPC-C
!
PROCESSING GROUP tpcc_sl
 UUID "c02bdfc2-8322-11cf-b76e-08002be44c83";
 VERSION 1.0;
 SOURCE LANGUAGE IS C;

PROCEDURE sl_transaction_init
 ARGUMENT IS
            io_login_wksp PASSED AS INOUT;

PROCEDURE sl_transaction
 ARGUMENT IS
            io_sl_wksp PASSED AS INOUT;

END PROCESSING GROUP;

!
! STDL GC Processing group definition for TPC-C
!
PROCESSING GROUP tpcc_gc
 UUID "00000000-8322-11cf-0000-08002be44c83";
 VERSION 1.0;
 SOURCE LANGUAGE IS C;

PROCEDURE gc_transaction_init
 ARGUMENT IS
            io_login_wksp PASSED AS INOUT;

PROCEDURE gc_transaction
 ARGUMENT IS
            io_gc_wksp PASSED AS INOUT,
            int_gc_wksp PASSED AS INPUT;

END PROCESSING GROUP;
```

## tpcc_fct.c

```
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**********************************************************************
************/

#include <windows.h>
#include <string.h>
#include <stdio.h>
#include <process.h>
#include <stdldefs.h>
#define STDL_SYNCHRONOUS ((void*)0xffffffff)

#include <tpccstruct.h>
#include <tpccapi.h>
#include <tpccerr.h>

#include <tpcc_acmsxp.h>
#include <tpcc_acmsxp_pp.h>

#include <tpcc.h>

#include <deli_cli.h>
#include <deli_srv.h>

#ifdef FFE_DEBUG
# include <crtdbg.h>
#endif

#define TOTAL_ADMIN_CONNECTIONS 1

#define FILENAMESIZE 256

static HANDLE gForceAllThreadsEvent;
static int    gForceAllThreadsCtr;
static int    gInitRetStatus;
static int    giLoginDelay = 0;
static BOOL   gbGeneric = FALSE;

void _STDL_CALL_ dy_callback( void *);
void _STDL_CALL_ no_callback( void *);
void _STDL_CALL_ os_callback( void *);
void _STDL_CALL_ pt_callback( void *);
void _STDL_CALL_ sl_callback( void *);

struct int_gc_wksp dy = { TYPE_DY };
struct int_gc_wksp no = { TYPE_NO };
struct int_gc_wksp os = { TYPE_OS };
struct int_gc_wksp pt = { TYPE_PT };
struct int_gc_wksp sl = { TYPE_SL };
struct int_gc_wksp gc = { TYPE_GC };

typedef struct {
  int type;
} force_connect_args;

void __cdecl force_connect( void *arglist );
BOOL getGovernorValue( char *group, long *ctr );
#ifdef USE_MUX
stdl_call_dll_init( DWORD why_called );
#endif

#ifdef FFE_DEBUG
pDeliveryData gpDelivery = NULL;
pNewOrderData gpNewOrder = NULL;
pOrderStatusData gpOrderStatus = NULL;
pPaymentData gpPayment = NULL;
```

```
pStockLevelData gpStockLevel = NULL;
#endif

void _STDL_CALL_
dy_callback( void *data )
{
 pDeliveryData pDelivery = data;

#ifdef FFE_DEBUG
 _ASSERT( VALID_DB_ERR(pDelivery->status) );
#endif

 TPCCDeliveryDeferredResponse( pDelivery->status, pDelivery );

 /* batch transactions do not return to the UI, so no response complete */
 /* call is necessary.
                                */
}
void _STDL_CALL_
no_callback( void *data )
{
 pNewOrderData pNewOrder = data;
 pCallersContext pCC;

#ifdef FFE_DEBUG
 _ASSERT( VALID_DB_ERR(pNewOrder->status) );
#endif

 pCC = pNewOrder->pCC;

 TPCCNewOrderResponse( pNewOrder->status, pNewOrder );

 TPCCResponseComplete( pCC );
}
void _STDL_CALL_
os_callback( void *data )
{
 pOrderStatusData pOrderStatus = data;
 pCallersContext pCC;

#ifdef FFE_DEBUG
 _ASSERT( VALID_DB_ERR(pOrderStatus->status) );
#endif

 pCC = pOrderStatus->pCC;

 TPCCOrderStatusResponse( pOrderStatus->status, pOrderStatus );

 TPCCResponseComplete( pCC );
}
void _STDL_CALL_
pt_callback( void *data )
{
 pPaymentData pPayment = data;
 pCallersContext pCC;

#ifdef FFE_DEBUG
 _ASSERT( VALID_DB_ERR(pPayment->status) );
#endif

 pCC = pPayment->pCC;

 TPCCPaymentResponse( pPayment->status, pPayment );

 TPCCResponseComplete( pCC );
}
void _STDL_CALL_
sl_callback( void *data )
{
 pStockLevelData pStockLevel = data;
 pCallersContext pCC;

#ifdef FFE_DEBUG
 _ASSERT( VALID_DB_ERR(pStockLevel->status) );
#endif

 pCC = pStockLevel->pCC;

 TPCCStockLevelResponse( pStockLevel->status, pStockLevel );

 TPCCResponseComplete( pCC );
}

/*************************************************/
int
TPCCDeliveryDeferred( pDeliveryData ptr )
{
 int retcode = ERR_DB_PENDING;

#ifdef FFE_DEBUG
 ptr->iStage |= IN_LH;
 ptr->iSynchronous = 0;
#endif

 /** Call ACMSxp for New Order **/
 if( 2 == gbGeneric ) {
#ifdef FFE_DEBUG
 ptr->iSynchronous = 1;
#endif
   gc_transaction( STDL_SYNCHRONOUS, NULL, (struct io_gc_wksp *) ptr,
&dy );
   retcode = ptr->status;
 }
 else if( gbGeneric )
   gc_transaction( dy_callback, (void *)ptr, (struct io_gc_wksp *) ptr, &dy );
 else
   dy_transaction( dy_callback, (void *)ptr, (struct io_dy_wksp *) ptr );

#ifdef FFE_DEBUG
 ptr->iStage |= LEAVING_LH;
 _ASSERT( VALID_DB_ERR(retcode));
#endif

 return retcode;
}

/*************************************************/
int
TPCCNewOrder( pNewOrderData ptr )
{
 int retcode = ERR_DB_PENDING;

#ifdef FFE_DEBUG
 ptr->iStage |= IN_LH;
 ptr->iSynchronous = 0;
#endif

 /** Call ACMSxp for New Order **/
 if( 2 == gbGeneric ) {
#ifdef FFE_DEBUG
 ptr->iSynchronous = 1;
#endif
   gc_transaction( STDL_SYNCHRONOUS, NULL, (struct io_gc_wksp *) ptr,
&no );
   retcode = ptr->status;
 }
 else if( gbGeneric )
   gc_transaction( no_callback, (void *)ptr, (struct io_gc_wksp *) ptr, &no );
 else
   no_transaction( no_callback, (void *)ptr, (struct io_no_wksp *) ptr );

#ifdef FFE_DEBUG
 ptr->iStage |= LEAVING_LH;
 _ASSERT( VALID_DB_ERR(retcode));
```

```
#endif

  return retcode;
}

/***********************************************/
int
TPCCOrderStatus( pOrderStatusData ptr )
{
  int retcode = ERR_DB_PENDING;

#ifdef FFE_DEBUG
  ptr->iStage |= IN_LH;
  ptr->iSynchronous = 0;
#endif

  /** Call ACMSxp for order status **/
  if( 2 == gbGeneric ) {
#ifdef FFE_DEBUG
  ptr->iSynchronous = 1;
#endif
    gc_transaction( STDL_SYNCHRONOUS, NULL, (struct io_gc_wksp *) ptr,
&os );
    retcode = ptr->status;
  }
  else if( gbGeneric )
    gc_transaction( os_callback, (void *)ptr, (struct io_gc_wksp *) ptr, &os );
  else
    os_transaction( os_callback, (void *)ptr, (struct io_os_wksp *) ptr );

#ifdef FFE_DEBUG
  ptr->iStage |= LEAVING_LH;
  _ASSERT( VALID_DB_ERR(retcode));
#endif

  return retcode;
}

/***********************************************/
int
TPCCPayment( pPaymentData ptr )
{
  int retcode = ERR_DB_PENDING;

#ifdef FFE_DEBUG
  ptr->iStage |= IN_LH;
  ptr->iSynchronous = 0;
#endif

  /** Call ACMSxp for payment **/
  if( 2 == gbGeneric ) {
#ifdef FFE_DEBUG
  ptr->iSynchronous = 1;
#endif
    gc_transaction( STDL_SYNCHRONOUS, NULL, (struct io_gc_wksp *) ptr,
&pt );
    retcode = ptr->status;
  }
  else if( gbGeneric )
    gc_transaction( pt_callback, (void *)ptr, (struct io_gc_wksp *) ptr, &pt );
  else
    pt_transaction( pt_callback, (void *)ptr, (struct io_pt_wksp *) ptr );

#ifdef FFE_DEBUG
  ptr->iStage |= LEAVING_LH;
  _ASSERT( VALID_DB_ERR(retcode));
#endif

  return retcode;
}

/***********************************************/
int
TPCCStockLevel( pStockLevelData ptr )
{
  int retcode = ERR_DB_PENDING;

#ifdef FFE_DEBUG
  ptr->iStage |= IN_LH;
  ptr->iSynchronous = 0;
#endif

  /** Call ACMSxp for stock level **/
  if( 2 == gbGeneric ) {
#ifdef FFE_DEBUG
  ptr->iSynchronous = 1;
#endif
    gc_transaction( STDL_SYNCHRONOUS, NULL, (struct io_gc_wksp *) ptr,
&sl );
    retcode = ptr->status;
  }
  else if( gbGeneric )
    gc_transaction( sl_callback, (void *)ptr, (struct io_gc_wksp *) ptr, &sl );
  else
    sl_transaction( sl_callback, (void *)ptr, (struct io_sl_wksp *) ptr );

#ifdef FFE_DEBUG
  ptr->iStage |= LEAVING_LH;
  _ASSERT( VALID_DB_ERR(retcode));
#endif

  return retcode;
}

/*
**++
**  FUNCTION NAME: getGovernorValue
**--
*/
BOOL
getGovernorValue( char *group, long *ctr )
{
  HKEY      hKey;
  DWORD     size;
  DWORD     type;
  char      keyname[256];
  BOOL      status;

  sprintf( keyname,
             "SOFTWARE\\DigitalEquipmentCorporation\\TPware\\Group
Settings\\%s",
              group );

  if( ERROR_SUCCESS != RegOpenKeyEx( HKEY_LOCAL_MACHINE,
keyname,
                                     0, KEY_READ, &hKey ))
{
    TPCCErr( "Error, group settings not found for %s\r\n", keyname );
    return FALSE;
  }

  size = sizeof( *ctr );
  if ( ERROR_SUCCESS ==
      RegQueryValueEx( hKey, "MaxThreads", 0, &type, (LPBYTE) ctr, &size ))
{
    status = TRUE;
  }
  else {
    TPCCErr( "Error, MaxThreads value not found for key %s\r\n", keyname );
    status = FALSE;
  }

  RegCloseKey( hKey );
```

```
 return status;
}

/*
**++
**  FUNCTION NAME: TPCCGetTransportData
**--
*/
int
TPCCGetTransportData( pTransportData pTransport )
{
 HKEY      hKey;
 DWORD     size;
 DWORD     type;
 char      szTmp[FILENAMESIZE];
 int   status;
 long  total;
 long dyGovValue;
 long noGovValue;
 long osGovValue;
 long ptGovValue;
 long slGovValue;
 long gcGovValue;

 memset( pTransport, 0, sizeof( *pTransport ));
 pTransport->asynchronous = TRUE;

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

 size = sizeof(szTmp);
 status = RegQueryValueEx(hKey, "GenericTransactionServers",
                                      0, &type, szTmp, &size);
 if ( status == ERROR_SUCCESS )
  gbGeneric = atoi(szTmp);


 RegCloseKey(hKey);

 /**** Read the ACMSxp Governor values from the registry. ****/
 if( !gbGeneric ) {
  pTransport->generic = FALSE;
  total = 0;
  if ( ! getGovernorValue( "tpcc_dy", &dyGovValue ))
   return ERR_GOVERNOR_VALUE_NOT_FOUND;
  total += dyGovValue;
  pTransport->num_dy = dyGovValue;
  if ( ! getGovernorValue( "tpcc_no", &noGovValue ))
   return ERR_GOVERNOR_VALUE_NOT_FOUND;
  total += noGovValue;
  pTransport->num_no = noGovValue;
  if ( ! getGovernorValue( "tpcc_os", &osGovValue ))
   return ERR_GOVERNOR_VALUE_NOT_FOUND;
  total += osGovValue;
  pTransport->num_os = osGovValue;
  if ( ! getGovernorValue( "tpcc_pt", &ptGovValue ))
   return ERR_GOVERNOR_VALUE_NOT_FOUND;
  total += ptGovValue;
  pTransport->num_pt = ptGovValue;
  if ( ! getGovernorValue( "tpcc_sl", &slGovValue ))
   return ERR_GOVERNOR_VALUE_NOT_FOUND;
  total += slGovValue;
  pTransport->num_sl = slGovValue;
 }
 else {
  pTransport->generic = TRUE;
  if ( ! getGovernorValue( "tpcc_gc", &gcGovValue ))
   return ERR_GOVERNOR_VALUE_NOT_FOUND;
  total = gcGovValue;
  pTransport->num_gc = gcGovValue;
 }

 status = DELIGetTransportData( &pTransport->dy_use_transport,
                                                    &pTransport-
>num_dy_servers,
                                                    &pTransport-
>num_queued_deliveries,
                                                    &pTransport-
>num_queued_responses );

 if( ERR_SUCCESS != status )
  return status;

 return ERR_SUCCESS;
}

/*
**++
**  FUNCTION NAME: TPCCStartup
**--
*/
int
TPCCStartup( int iNumUsers, pTransportData pTransport )
{
 HKEY      hKey;
 DWORD     size;
 DWORD     type;
 char      szTmp[FILENAMESIZE];
 int   status;
 unsigned long ulhThread;
 force_connect_args fca;
 int counts[5];
 int count;
 long total;
 int maxDBConnections;

#ifdef USE_MUX
 stdl_call_dll_init( DLL_PROCESS_ATTACH );
#endif

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

 /**** Obtain the name of the server machine into which ACMSxp
  processing servers will log.  ****/
 size = sizeof(szTmp);
 status = RegQueryValueEx(hKey, "Server", 0, &type, szTmp, &size);
 if ( status != ERROR_SUCCESS )
  /* required */
  return ERR_CANT_FIND_SERVER_VALUE;
 strcpy(gszServer, szTmp);

 size = sizeof(szTmp);
 status = RegQueryValueEx(hKey, "Database", 0, &type, szTmp, &size);
 if ( status != ERROR_SUCCESS )
  /* required */
  return ERR_CANT_FIND_DATABASE_VALUE;
 strcpy(gszDatabase, szTmp);

 size = sizeof(szTmp);
 status = RegQueryValueEx(hKey, "User", 0, &type, szTmp, &size);
 if ( status != ERROR_SUCCESS )
  /* required */
  return ERR_CANT_FIND_USER_VALUE;
 strcpy(gszUser, szTmp);

 size = sizeof(szTmp);
 status = RegQueryValueEx(hKey, "Password", 0, &type, szTmp, &size);
```

```
 if ( status != ERROR_SUCCESS )
  /* required */
  return ERR_CANT_FIND_PASSWORD_VALUE;
 strcpy(gszPassword, szTmp);

 size = sizeof(szTmp);
 status = RegQueryValueEx(hKey, "LoginDelay", 0, &type, szTmp, &size);
 if ( status == ERROR_SUCCESS )
  giLoginDelay = atoi(szTmp);

 RegCloseKey(hKey);

 /**** start up server specific stuff ****/
 total = 0;
 if( !gbGeneric ) {
  counts[TYPE_DY] = pTransport->num_dy;
  total += pTransport->num_dy;
  counts[TYPE_NO] = pTransport->num_no;
  total += pTransport->num_no;
  counts[TYPE_OS] = pTransport->num_os;
  total += pTransport->num_os;
  counts[TYPE_PT] = pTransport->num_pt;
  total += pTransport->num_pt;
  counts[TYPE_SL] = pTransport->num_sl;
  total += pTransport->num_sl;
 }
 else
  total = pTransport->num_gc;

 maxDBConnections = total + TOTAL_ADMIN_CONNECTIONS;
 if( !pTransport->dy_use_transport )
  maxDBConnections += pTransport->num_dy_servers;

 status = ACMSxpStartup( maxDBConnections, total );
 if ( status != ERR_DB_SUCCESS )
  return status;

 /* start the delivery subsystem */
 status = DELIServerStartup( pTransport->dy_use_transport,
                             pTransport->num_dy_servers,
                             pTransport->num_queued_deliveries,
                             pTransport->num_queued_responses );
 if( ERR_SUCCESS != status )
  return status;

 status = DELIClientStartup( );
 if( ERR_SUCCESS != status )
  return status;

 gInitRetStatus = ERR_DB_SUCCESS;     /** preset to success */
 gForceAllThreadsCtr = total;
 gForceAllThreadsEvent = CreateEvent( 0, TRUE, FALSE, 0 );
 if ( NULL == gForceAllThreadsEvent ) return
ERR_CANT_CREATE_ALL_THREADS_EVENT;

 if( !gbGeneric ) {
  for( fca.type = TYPE_NO; fca.type <= TYPE_SL; fca.type++ ) {
   for( count = 0; count < counts[fca.type]; count++ ) {
            ulhThread = _beginthread( force_connect, 0, (void *) fca.type );
            if( -1 == ulhThread ) {
              return ERR_CANT_START_FRCDINIT_THREAD;
            }
            Sleep( giLoginDelay );
   }
  }
 }
 else {
  for( count = 0; count < pTransport->num_gc; count++ ) {
   ulhThread = _beginthread( force_connect, 0, (void *) TYPE_GC );
   if( -1 == ulhThread ) {
            return ERR_CANT_START_FRCDINIT_THREAD;
   }
    Sleep( giLoginDelay );
  }
 }

 WaitForSingleObject( gForceAllThreadsEvent, INFINITE );

 return gInitRetStatus;
}


/*
**++
**  FUNCTION NAME: TPCCConnect
**--
*/
int
TPCCConnect( pLoginData pLogin )
{

 if( 0 != strcmp( pLogin->szServer, gszServer ))
  return ERR_SERVER_MISMATCH;

 if( 0 != strcmp( pLogin->szDatabase, gszDatabase ))
  return ERR_DATABASE_MISMATCH;

 if( 0 != strcmp( pLogin->szUser, gszUser ))
  return ERR_USER_MISMATCH;

 if( 0 != strcmp( pLogin->szPassword, gszPassword ))
  return ERR_PASSWORD_MISMATCH;

 return ERR_DB_SUCCESS;
}

/*
**++
**  FUNCTION NAME: TPCCDisconnect
**--
*/
int
TPCCDisconnect( pCallersContext pCC )
{
 return ERR_DB_SUCCESS;
}


/*
**++
**  FUNCTION NAME: TPCCShutdown
**--
*/
int
TPCCShutdown( void )
{
 int                                    retcode;

 retcode = ACMSxpShutdown( );
 if( ERR_SUCCESS != retcode )
  return retcode;

 retcode = DELIClientShutdown( );
 if( ERR_SUCCESS != retcode )
  return retcode;

 retcode = DELIServerShutdown( );
 if( ERR_SUCCESS != retcode )
  return retcode;

 return retcode;
}
```

```
void __cdecl
force_connect( void *arglist )
{
 LoginData                login;
 int                                txnType;

 login.w_id = 0;
 login.ld_id = 0;
 login.pCC = 0;
 login.szApplication[0] = '\0';
 strcpy( login.szServer, gszServer );
 strcpy( login.szDatabase, gszDatabase );
 strcpy( login.szUser, gszUser );
 strcpy( login.szPassword, gszPassword );

 txnType = (int) arglist;
 switch ( txnType ) {
 case TYPE_DY:
  dy_transaction_init( STDL_SYNCHRONOUS, &login,
                                (struct io_login_wksp *)&login );
  break;

 case TYPE_NO:
  no_transaction_init( STDL_SYNCHRONOUS, &login,
                                (struct io_login_wksp *)&login );
  break;

 case TYPE_OS:
  os_transaction_init( STDL_SYNCHRONOUS, &login,
                                (struct io_login_wksp *)&login );
  break;

 case TYPE_PT:
  pt_transaction_init( STDL_SYNCHRONOUS, &login,
                                (struct io_login_wksp *)&login );
  break;

 case TYPE_SL:
  sl_transaction_init( STDL_SYNCHRONOUS, &login,
                                (struct io_login_wksp *)&login );
  break;

 case TYPE_GC:
  gc_transaction_init( STDL_SYNCHRONOUS, &login,
                                (struct io_login_wksp *)&login );
  break;
 }
 if ( login.status != ERR_DB_SUCCESS) {
  /** Only store the first failure **/
  if ( ERR_DB_SUCCESS == gInitRetStatus )
   gInitRetStatus = ERR_FORCE_CONNECT_THREAD_FAILED;

  TPCCErr( "Connect Transaction returned %8X\r\n", login.status );
 }
 if ( InterlockedDecrement( &gForceAllThreadsCtr ) == 0 )
  SetEvent( gForceAllThreadsEvent );
 return;
}
```

## tpcc_proc.sh

```
#################################################################
#################
#
# tpcc_proc_case.sh
#
#################################################################
#################
#
# This is the version of procs which was used in the Compaq-Sybase 11.G
# TPC-C benchmark (with the last-minute fixes) - March 26 1997
#
# This case script has the following changes from tpcc_proc_spec.sh
#   In new_order (both local and remote), the stock-item cursor, c_no_is
#   has been removed and replaced with an update-set-local variable stmt.
# Also CASE statements replace the nested if's.
#
# Also modified delivery proc where the ol and order table cursors have
#   been replaced by update_set_local_variable statements.
#
# In Payment procs, the cursor on customer, c_pay_c has been removed. Instead.
# added two update statements (with set local variables).
#
# Reinstated c_find cursor to find cust_id given c_last;
# Stock_level is back o its "single query" state!
#
#
#################################################################
#################
#
#!/bin/sh -f

# Stored procedure for TPC-C 3.2 on SQL Server 11.1 and later
# Copyright Sybase 1997
#
isql -Usa -P <<EOF
use tpcc
go
if exists ( SELECT name FROM sysobjects WHERE name = 'neworder_local')
        DROP PROC neworder_local
go

CREATE PROC neworder_local (
        @w_id           smallint,
        @d_id           tinyint,
        @c_id           int,
        @o_ol_cnt  tinyint,

        @i_id       int = 0, @ol_qty       tinyint = 0,
        @i_id2      int = 0, @ol_qty2      tinyint = 0,
        @i_id3      int = 0, @ol_qty3      tinyint = 0,
        @i_id4      int = 0, @ol_qty4      tinyint = 0,
        @i_id5      int = 0, @ol_qty5      tinyint = 0,
        @i_id6      int = 0, @ol_qty6      tinyint = 0,
        @i_id7      int = 0, @ol_qty7      tinyint = 0,
        @i_id8      int = 0, @ol_qty8      tinyint = 0,
        @i_id9      int = 0, @ol_qty9      tinyint = 0,
        @i_id10     int = 0, @ol_qty10     tinyint = 0,
        @i_id11     int = 0, @ol_qty11     tinyint = 0,
        @i_id12     int = 0, @ol_qty12     tinyint = 0,
        @i_id13     int = 0, @ol_qty13     tinyint = 0,
        @i_id14     int = 0, @ol_qty14     tinyint = 0,
        @i_id15     int = 0, @ol_qty15     tinyint = 0
)
as

declare
        @w_tax          real,           @d_tax
        real,
        @c_last         char(16),   @c_credit   char(2),
        @c_discount     real,           @commit_flag
        tinyint,

        @i_price    real,
        @i_name         char(24),   @i_data
        char(50),

        @s_quantity     smallint,
        @s_ytd          int,            @s_order_cnt
        int,
        @s_dist         char(24),   @s_data
        char(50),
```

```
        @ol_number      tinyint,    @o_id           int,
        @o_entry_d      datetime,   @b_g            char(1)

declare c_no_wdc CURSOR FOR
        SELECT  w_tax, d_tax, d_next_o_id,
                c_last, c_discount, c_credit
                ,1,0
                ,getdate()
                FROM    district HOLDLOCK,
                        warehouse HOLDLOCK,
                        customer (index c_clu prefetch 2 lru)
HOLDLOCK
                WHERE   d_w_id  = @w_id
                AND     d_id    = @d_id
                AND     w_id    = d_w_id
                AND     c_w_id  = d_w_id
                AND     c_d_id  = d_id
                AND     c_id    = @c_id
                FOR UPDATE OF d_next_o_id

begin

        begin transaction NO

        OPEN c_no_wdc
        FETCH c_no_wdc INTO
                @w_tax, @d_tax, @o_id,
                @c_last, @c_discount, @c_credit
                ,@commit_flag, @ol_number
                ,@o_entry_d
        UPDATE  district
                SET     d_next_o_id = @o_id + 1
                WHERE CURRENT OF c_no_wdc
        CLOSE c_no_wdc

        while (@ol_number < @o_ol_cnt) begin
                SELECT @ol_number = @ol_number + 1
                ,@i_id = case @ol_number
         when 1 then @i_id2
              when 2 then @i_id3
              when 3 then @i_id4
              when 4 then @i_id5
              when 5 then @i_id6
              when 6 then @i_id7
              when 7 then @i_id8
              when 8 then @i_id9
              when 9 then @i_id10
              when 10 then @i_id11
              when 11 then @i_id12
              when 12 then @i_id13
              when 13 then @i_id14
              when 14 then @i_id15
              else @i_id
              end
                      , @ol_qty = case @ol_number
              when 1 then @ol_qty2
              when 2 then @ol_qty3
              when 3 then @ol_qty4
              when 4 then @ol_qty5
              when 5 then @ol_qty6
              when 6 then @ol_qty7
              when 7 then @ol_qty8
              when 8 then @ol_qty9
              when 9 then @ol_qty10
              when 10 then @ol_qty11
              when 11 then @ol_qty12
              when 12 then @ol_qty13
              when 13 then @ol_qty14
              when 14 then @ol_qty15
              else @ol_qty
              end

        /* set i_id, ol_qty for this lineitem */
        /* this is replaced by case statement */

        /* convert c_no_is cursor to a simple select */
        /* get item data (no one update item) */

                        select @i_price = i_price,
                             @i_name = i_name,
                             @i_data = i_data
                          from item HOLDLOCK
                                where i_id = @i_id

                        if (@@rowcount = 0)
                          begin
                            select @commit_flag = 0
                            select NULL, NULL, NULL, NULL
                            continue
                          end
                  /*Otherwise if the item is found */
                          update stock
                            set s_ytd = s_ytd + @ol_qty,
                                    @s_quantity = s_quantity - @ol_qty +
                                  case when (s_quantity - @ol_qty < 10)
                                  then 91 else 0 end,
                                s_quantity = s_quantity - @ol_qty +
                                  case when (s_quantity - @ol_qty < 10)
                                  then 91 else 0 end,
                                        s_order_cnt = s_order_cnt + 1,
                                @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_w_id = @w_id and
                                            s_i_id = @i_id
                          if (@@rowcount = 0)
                            begin
                              select @commit_flag = 0
                              select NULL, NULL, NULL, NULL
                              continue
                                    end
                           /*Otherwise if the Stock is found */
        /* Compaq NT loader used Jan 01 1800 as NULL date */
                        INSERT INTO order_line (
                          ol_o_id, ol_d_id, ol_w_id, ol_number, ol_i_id,
                          ol_supply_w_id, ol_delivery_d, ol_quantity,
                          ol_amount, ol_dist_info)
                        VALUES (
                          @o_id, @d_id, @w_id, @ol_number, @i_id,
                          @w_id, "18000101", @ol_qty,
                          @ol_qty * @i_price, @s_dist)


                /* send line-item data to client */
                select
                  @i_name,
                  @s_quantity,
                  @i_price,
                  b_g= case when((patindex("%ORIGINAL%", @i_data) > 0) and
                            (patindex("%ORIGINAL%", @s_data) > 0))
                         then "B" else "G" end

                      end /* while */
```

```
        INSERT INTO orders (
                o_id, o_c_id, o_d_id, o_w_id,
                o_entry_d, o_carrier_id, o_ol_cnt, o_all_local)
        VALUES (
                @o_id, @c_id, @d_id, @w_id,
                @o_entry_d, -1, @o_ol_cnt, 1)
        INSERT INTO new_order (no_o_id, no_d_id, no_w_id)
        VALUES (@o_id, @d_id, @w_id)

        if (@commit_flag = 1)
                commit transaction NO
        else
                rollback transaction NO

        select                  /* Return to client */
                @w_tax, @d_tax, @o_id, @c_last,
                @c_discount, @c_credit, @o_entry_d
end
go

if exists ( SELECT name FROM sysobjects WHERE name = 'neworder_remote')
        DROP PROC neworder_remote
go
CREATE PROC neworder_remote (
        @w_id           smallint,
        @d_id           tinyint,
        @c_id           int,
        @o_ol_cnt       tinyint,

        @i_id       int = 0, @s_w_id        smallint = 0, @ol_qty
        tinyint = 0,
        @i_id2      int = 0, @s_w_id2       smallint = 0, @ol_qty2
        tinyint = 0,
        @i_id3      int = 0, @s_w_id3       smallint = 0, @ol_qty3
        tinyint = 0,
        @i_id4      int = 0, @s_w_id4       smallint = 0, @ol_qty4
        tinyint = 0,
        @i_id5      int = 0, @s_w_id5       smallint = 0, @ol_qty5
        tinyint = 0,
        @i_id6      int = 0, @s_w_id6       smallint = 0, @ol_qty6
        tinyint = 0,
        @i_id7      int = 0, @s_w_id7       smallint = 0, @ol_qty7
        tinyint = 0,
        @i_id8      int = 0, @s_w_id8       smallint = 0, @ol_qty8
        tinyint = 0,
        @i_id9      int = 0, @s_w_id9       smallint = 0, @ol_qty9
        tinyint = 0,
        @i_id10     int = 0, @s_w_id10      smallint = 0, @ol_qty10
        tinyint = 0,
        @i_id11     int = 0, @s_w_id11      smallint = 0, @ol_qty11
        tinyint = 0,
        @i_id12     int = 0, @s_w_id12      smallint = 0, @ol_qty12
        tinyint = 0,
        @i_id13     int = 0, @s_w_id13      smallint = 0, @ol_qty13
        tinyint = 0,
        @i_id14     int = 0, @s_w_id14      smallint = 0, @ol_qty14
        tinyint = 0,
        @i_id15     int = 0, @s_w_id15      smallint = 0, @ol_qty15
        tinyint = 0
)
as

declare
        @w_tax          real,           @d_tax
        real,
        @c_last         char(16),   @c_credit   char(2),
        @c_discount     real,           @commit_flag
        tinyint,

        @i_price    real,
        @i_name         char(24),   @i_data
        char(50),

        @s_quantity     smallint,
        @s_ytd          int,            @s_order_cnt
        int,
        @s_dist         char(24),   @s_data
        char(50),
        @s_remote_cnt   int,            @remote
        int,

        @ol_number      tinyint,    @o_id               int,
        @o_entry_d      datetime,   @b_g                char(1)

declare c_no_wdc CURSOR FOR
        SELECT  w_tax, d_tax, d_next_o_id,
                c_last, c_discount, c_credit
                ,1,0
                ,getdate()
                FROM    district HOLDLOCK,
                        warehouse HOLDLOCK,
                        customer (index c_clu prefetch 2 lru)
HOLDLOCK
                WHERE   d_w_id  = @w_id
                AND     d_id    = @d_id
                AND     w_id    = d_w_id
                AND     c_w_id  = d_w_id
                AND     c_d_id  = d_id
                AND     c_id    = @c_id
                FOR UPDATE OF d_next_o_id

begin

        begin transaction NO

        OPEN c_no_wdc
        FETCH c_no_wdc INTO
                @w_tax, @d_tax, @o_id,
                @c_last, @c_discount, @c_credit
                ,@commit_flag, @ol_number
                ,@o_entry_d
        UPDATE  district
                SET     d_next_o_id = @o_id + 1
                WHERE CURRENT OF c_no_wdc
        CLOSE c_no_wdc

        while (@ol_number < @o_ol_cnt) begin
                SELECT @ol_number = @ol_number + 1
                ,@i_id = case @ol_number
         when 1 then @i_id2
              when 2 then @i_id3
              when 3 then @i_id4
              when 4 then @i_id5
              when 5 then @i_id6
              when 6 then @i_id7
              when 7 then @i_id8
              when 8 then @i_id9
              when 9 then @i_id10
              when 10 then @i_id11
              when 11 then @i_id12
              when 12 then @i_id13
              when 13 then @i_id14
              when 14 then @i_id15
              else @i_id
              end
                      , @ol_qty = case @ol_number
              when 1 then @ol_qty2
              when 2 then @ol_qty3
              when 3 then @ol_qty4
              when 4 then @ol_qty5
              when 5 then @ol_qty6
              when 6 then @ol_qty7
```

```
            when 7 then @ol_qty8
            when 8 then @ol_qty9
            when 9 then @ol_qty10
            when 10 then @ol_qty11
            when 11 then @ol_qty12
            when 12 then @ol_qty13
            when 13 then @ol_qty14
            when 14 then @ol_qty15
            else @ol_qty
            end
                    ,@s_w_id = case @ol_number
        when 1 then @s_w_id2
            when 2 then @s_w_id3
            when 3 then @s_w_id4
            when 4 then @s_w_id5
            when 5 then @s_w_id6
            when 6 then @s_w_id7
            when 7 then @s_w_id8
            when 8 then @s_w_id9
            when 9 then @s_w_id10
            when 10 then @s_w_id11
            when 11 then @s_w_id12
            when 12 then @s_w_id13
            when 13 then @s_w_id14
            when 14 then @s_w_id15
            else @s_w_id
            end

        /* convert c_no_is cursor to a simple select */
        /* get item data (no one update item) */
                    select @i_price = i_price,
                        @i_name = i_name ,
                        @i_data = i_data
                     from item HOLDLOCK
                     where i_id = @i_id

                    if (@@rowcount = 0)
                      begin
                        select @commit_flag = 0
                        select NULL, NULL, NULL, NULL
                                continue
                      end
         /* Otherwise if the item is found */
           update stock
            set s_ytd = s_ytd + @ol_qty,
              @s_quantity = s_quantity - @ol_qty +
                    case when (s_quantity - @ol_qty < 10)
                    then 91 else 0 end,
             s_quantity = s_quantity - @ol_qty +
      case when (s_quantity - @ol_qty < 10)
       then 91 else 0 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,
                    s_order_cnt = s_order_cnt + 1,
                    s_remote_cnt = s_remote_cnt +
                    case when (@s_w_id = @w_id)
          then 0 else 1 end
where s_w_id = @w_id and
     s_i_id = @i_id

if (@@rowcount = 0)
            begin
              select @commit_flag = 0
              select NULL, NULL, NULL, NULL
              continue
            end
/* Compaq NT loader used Jan 01 1800 as NULL date */
                INSERT INTO order_line (
                    ol_o_id, ol_d_id, ol_w_id, ol_number, ol_i_id,
                    ol_supply_w_id, ol_delivery_d, ol_quantity,
                    ol_amount, ol_dist_info)
                VALUES (
                    @o_id, @d_id, @w_id, @ol_number, @i_id,
                    @w_id, "18000101", @ol_qty,
                    @ol_qty * @i_price, @s_dist)

                    /* send line-item to client */
                    select
                            @i_name,
            @s_quantity,
            @i_price,
            b_g = case when ((patindex("%ORIGINAL%", @i_data) > 0) and
                        (patindex("%ORIGINAL%", @s_data) > 0))
                 then "B" else "G" end
                end /* while */

                INSERT INTO orders (
                        o_id, o_c_id, o_d_id, o_w_id,
                        o_entry_d, o_carrier_id, o_ol_cnt, o_all_local)
                VALUES (
                        @o_id, @c_id, @d_id, @w_id,
                        @o_entry_d, -1, @o_ol_cnt, 0)
                INSERT INTO new_order (no_o_id, no_d_id, no_w_id)
                VALUES (@o_id, @d_id, @w_id)

                if (@commit_flag = 1)
                        commit transaction NO
                else
                        rollback transaction NO

                select                  /* Return to client */
                        @w_tax, @d_tax, @o_id, @c_last,
                        @c_discount, @c_credit, @o_entry_d
end
go
if exists (select * from sysobjects where name = 'payment_byid')
                DROP PROC payment_byid
go
CREATE PROC payment_byid
                @w_id                   smallint,       @c_w_id
                smallint,
                @h_amount               float,
                @d_id                   tinyint,        @c_d_id
                tinyint,
                @c_id           int
as
declare         @c_last                 char(16)

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),
                @w_ytd                  float

declare         @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),
                @d_ytd                  float

declare         @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(12,0),          @c_balance
        float,
        @c_discount             real,
        @data1      char(250),  @data2
        char(250),
        @c_data_1   char(250),  @c_data_2   char(250)

declare @screen_data    char(200),  @today      datetime

declare c_pay_wd CURSOR FOR
        SELECT  w_street_1, w_street_2, w_city,
                w_state, w_zip, w_name, w_ytd,
                d_street_1, d_street_2, d_city,
                d_state, d_zip, d_name, d_ytd
        FROM    district HOLDLOCK,
                warehouse HOLDLOCK
        WHERE   d_w_id  = @w_id
        AND     d_id    = @d_id
        AND     w_id    = d_w_id
        FOR UPDATE OF w_ytd, d_ytd

BEGIN TRANSACTION PID
        OPEN c_pay_wd
        FETCH c_pay_wd INTO
                @w_street_1, @w_street_2, @w_city,
                @w_state, @w_zip, @w_name, @w_ytd,
                @d_street_1, @d_street_2, @d_city,
                @d_state, @d_zip, @d_name, @d_ytd
        UPDATE district
                SET     d_ytd  = @d_ytd + @h_amount
                WHERE CURRENT OF c_pay_wd
        UPDATE warehouse
                SET w_ytd = @w_ytd + @h_amount
                WHERE CURRENT OF c_pay_wd
        CLOSE c_pay_wd

        /* Customer data */
        UPDATE customer SET
                 @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_balance = c_balance - @h_amount
                , @c_balance = c_balance - @h_amount
                , c_ytd_payment = c_ytd_payment + @h_amount
                , c_payment_cnt = c_payment_cnt + 1
                , @c_since = c_since
                , @data1 = c_data1
                , @data2 = c_data2
                , @today = getdate()
        where
                c_id = @c_id
                and c_w_id = @c_w_id
                and c_d_id = @c_d_id

        if (@c_credit = "BC")
        begin
                SELECT  @c_data_2 =
                        substring(@data1, 209, 42) +
                        substring(@data2, 1, 208)
                        ,@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/100) +
substring(@data1, 1, 208)

                UPDATE customer SET
                         c_data1 = @c_data_1
                        , c_data2 = @c_data_2
                        , @screen_data = substring(@c_data_1, 1,
200)
                WHERE
                        c_id = @c_id
                        AND c_w_id = @c_w_id
                        AND c_d_id = @c_d_id
        end /* if */

        /* Create the history record */
        INSERT INTO history (
                h_c_id, h_c_d_id, h_c_w_id, h_d_id, h_w_id,
                h_date, h_amount, h_data)
        VALUES (
                @c_id, @c_d_id, @c_w_id, @d_id, @w_id,
                @today, @h_amount, (@w_name + "    " + @d_name))

COMMIT TRANSACTION PID

        select                  /* Return to client */
                @c_id,
                @c_last,
                @today,
                @w_street_1,
                @w_street_2,
                @w_city,
                @w_state,
                @w_zip,

                @d_street_1,
                @d_street_2,
                @d_city,
                @d_state,
                @d_zip,

                @c_first,
                @c_middle,
                @c_street_1,
                @c_street_2,
                @c_city,
                @c_state,
                @c_zip,
                @c_phone,
                @c_since,
                @c_credit,
                @c_credit_lim,
                @c_discount,
                @c_balance,
                @screen_data
go
if exists (select * from sysobjects where name = 'payment_byname')
        DROP PROC payment_byname
go
CREATE PROC payment_byname
        @w_id           smallint,   @c_w_id
        smallint,
        @h_amount       float,
        @d_id           tinyint,    @c_d_id
        tinyint,
        @c_last     char(16)
as
```

```
declare     @n          int,          @c_id       int

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),
            @w_ytd                  float

declare     @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),
            @d_ytd                  float

declare     @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(12,0),            @c_balance
            float,
            @c_discount             real,
            @data1                  char(250),    @data2
            char(250),
            @c_data_1   char(250),  @c_data_2   char(250)

declare @screen_data    char(200),  @today      datetime

declare c_pay_wd CURSOR FOR
            SELECT      w_street_1, w_street_2, w_city,
                        w_state, w_zip, w_name, w_ytd,
                        d_street_1, d_street_2, d_city,
                        d_state, d_zip, d_name, d_ytd
            FROM        district HOLDLOCK,
                        warehouse HOLDLOCK
            WHERE       d_w_id      = @w_id
            AND         d_id        = @d_id
            AND         w_id        = d_w_id
            FOR UPDATE OF w_ytd, d_ytd

declare c_find CURSOR FOR
            SELECT  c_id
            FROM customer (index c_non1 prefetch 2 lru) HOLDLOCK
            WHERE   c_w_id  =     @c_w_id
            AND     c_d_id  =     @c_d_id
            AND     c_last  =     @c_last
            ORDER BY c_w_id, c_d_id, c_last, c_first, c_id
            FOR READ ONLY

BEGIN TRANSACTION PNM
            SELECT @n = (count(*)+1)/2
            FROM customer (index c_non1 prefetch 2 lru) HOLDLOCK
            WHERE       c_w_id = @c_w_id and
                        c_d_id = @c_d_id and
                        c_last = @c_last
            OPEN c_find
            while (@n>0) begin
                        FETCH c_find INTO @c_id
                        SELECT @n = @n-1
            end
            CLOSE c_find

            OPEN c_pay_wd
            FETCH c_pay_wd INTO
                        @w_street_1, @w_street_2, @w_city,
                        @w_state, @w_zip, @w_name, @w_ytd,
                        @d_street_1, @d_street_2, @d_city,
                        @d_state, @d_zip, @d_name, @d_ytd
            UPDATE district
                        SET     d_ytd  = @d_ytd + @h_amount
                        WHERE CURRENT OF c_pay_wd
            UPDATE warehouse
                        SET w_ytd = @w_ytd + @h_amount
                        WHERE CURRENT OF c_pay_wd
            CLOSE c_pay_wd

            /* Customer data */
            UPDATE customer SET
                         @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_balance = c_balance - @h_amount
                        , @c_balance = c_balance - @h_amount
                        , c_ytd_payment = c_ytd_payment + @h_amount
                        , c_payment_cnt = c_payment_cnt + 1
                        , @c_since = c_since
                        , @data1 = c_data1
                        , @data2 = c_data2
                        , @today = getdate()
            where
                        c_id = @c_id
                        and c_w_id = @c_w_id
                        and c_d_id = @c_d_id

            SELECT      @screen_data = NULL
            if (@c_credit = "BC")
            begin
                        SELECT  @c_data_2 =
                                    substring(@data1, 209, 42) +
                                    substring(@data2, 1, 208)
                                    ,@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/100) +
substring(@data1, 1, 208)

                        UPDATE customer SET
                                     c_data1 = @c_data_1
                                    , c_data2 = @c_data_2
                                    , @screen_data = substring(@c_data_1, 1,
200)
                        WHERE
                                    c_id = @c_id
                                    AND c_w_id = @c_w_id
                                    AND c_d_id = @c_d_id
            end /* if */

            /* Create the history record */
            INSERT INTO history (
                        h_c_id, h_c_d_id, h_c_w_id, h_d_id, h_w_id,
                        h_date, h_amount, h_data)
            VALUES (
                        @c_id, @c_d_id, @c_w_id, @d_id, @w_id,
                        @today, @h_amount, (@w_name + "    " + @d_name))

COMMIT TRANSACTION PNM

            select                  /* Return to client */
                        @c_id,
                        @c_last,
```

```
                @today,
                @w_street_1,
                @w_street_2,
                @w_city,
                @w_state,
                @w_zip,

                @d_street_1,
                @d_street_2,
                @d_city,
                @d_state,
                @d_zip,

                @c_first,
                @c_middle,
                @c_street_1,
                @c_street_2,
                @c_city,
                @c_state,
                @c_zip,
                @c_phone,
                @c_since,
                @c_credit,
                @c_credit_lim,
                @c_discount,
                @c_balance,
                @screen_data
go
if exists (select * from sysobjects where name = 'order_status_byid')
        DROP PROC order_status_byid
go
CREATE PROC order_status_byid
        @w_id           smallint,
        @d_id           tinyint,
        @c_id           int
as

DECLARE @o_id           int,
        @o_entry_d      datetime,
        @o_carrier_id   smallint

BEGIN TRANSACTION OSID

/* Get the latest order made by the customer */
        SELECT  @o_id = o_id, @o_carrier_id = o_carrier_id,
                @o_entry_d = o_entry_d
        FROM    orders (index o_clu prefetch 16 mru) HOLDLOCK
        WHERE   o_w_id  = @w_id
        AND     o_d_id  = @d_id
        AND     o_c_id  = @c_id
        /* ORDER BY o_w_id, o_d_id, o_id */

/* Select order lines for the current order */
        select  /* Return multiple rows to client */
                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

        select  /* Return single row to client */
                @c_id, c_last, c_first, c_middle, c_balance,
                @o_id,
                @o_entry_d,
                @o_carrier_id
        FROM    customer (index c_clu prefetch 2 lru) HOLDLOCK
        WHERE   c_id    = @c_id
        AND     c_d_id  = @d_id
        AND     c_w_id  = @w_id

COMMIT TRANSACTION OSID
go
if exists (select * from sysobjects where name = 'order_status_byname')
        DROP PROC order_status_byname
go
CREATE PROC order_status_byname
        @w_id           smallint,
        @d_id           tinyint,
        @c_last         char(16)
as

DECLARE @o_id           int,
        @o_entry_d      datetime,
        @o_carrier_id   smallint

declare @n      int,    @c_id   int
declare c_find CURSOR FOR
        SELECT  c_id
        FROM customer (index c_non1 prefetch 2 lru) HOLDLOCK
        WHERE   c_w_id  =       @w_id
        AND     c_d_id  =       @d_id
        AND     c_last  =       @c_last
        ORDER BY c_w_id, c_d_id, c_last, c_first, c_id
        FOR READ ONLY

BEGIN TRANSACTION OSNM
        SELECT @n = (count(*)+1)/2
        FROM customer (index c_non1 prefetch 2 lru) HOLDLOCK
        WHERE   c_w_id = @w_id and
                c_d_id = @d_id and
                c_last = @c_last
        OPEN c_find
        while (@n>0) begin
                FETCH c_find INTO @c_id
                SELECT @n = @n-1
        end
        CLOSE c_find

/* Get the latest order made by the customer */
        SELECT  @o_id = o_id, @o_carrier_id = o_carrier_id,
                @o_entry_d = o_entry_d
        FROM    orders (index o_clu prefetch 16 mru) HOLDLOCK
        WHERE   o_w_id  = @w_id
        AND     o_d_id  = @d_id
        AND     o_c_id  = @c_id
        /* ORDER BY o_w_id, o_d_id, o_id */

/* Select order lines for the current order */
        select  /* Return multiple rows to client */
                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

        select  /* Return single row to client */
                @c_id, c_last, c_first, c_middle, c_balance,
                @o_id,
                @o_entry_d,
                @o_carrier_id
        FROM    customer (index c_clu prefetch 2 lru) HOLDLOCK
        WHERE   c_id    = @c_id
        AND     c_d_id  = @d_id
        AND     c_w_id  = @w_id

COMMIT TRANSACTION OSNM
```

```
go
if exists (select * from sysobjects where name = 'delivery')
        drop proc delivery
go
CREATE PROC delivery
        @w_id                   smallint,
        @o_carrier_id           smallint,
        @d_id                   tinyint = 1
as

declare @no_o_id int,                   @o_c_id
        smallint,
        @ol_total float,                @ol_amount
        float,
        @junk_id smallint

declare c_del_no CURSOR FOR
        SELECT  no_o_id
        FROM    new_order (index no_clu) HOLDLOCK
        WHERE   no_d_id = @d_id
        AND     no_w_id = @w_id
        FOR UPDATE
        /*
        ** The only purpose of the index hint in the above is to ensure
        ** that the clustered index is used.  As it turns out, our optimizer
        ** chooses the clustered index anyway -- with or without the hint.
        */

begin

  while (@d_id <= 10) begin

        BEGIN TRANSACTION DEL
        OPEN c_del_no
        FETCH c_del_no INTO @no_o_id

        if (@@sqlstatus != 0)
        begin
                COMMIT TRANSACTION DEL
                select NULL
                CLOSE c_del_no
                select @d_id = @d_id + 1
                continue
        end

        DELETE  FROM new_order
        WHERE   CURRENT OF c_del_no
        CLOSE   c_del_no

/* Using the 'update' enhancement */
        UPDATE  orders
        SET     o_carrier_id = @o_carrier_id,
                @o_c_id  = o_c_id,
                @ol_total = 0.0
    WHERE       o_id        = @no_o_id
    AND   o_d_id    = @d_id
    AND   o_w_id    = @w_id

        UPDATE  order_line
        SET     ol_delivery_d = getdate(),
                @ol_total = ol_amount + @ol_total
        WHERE   ol_o_id     = @no_o_id
        AND     ol_d_id     = @d_id
        AND     ol_w_id     = @w_id
        UPDATE  customer
        SET   c_balance         = c_balance + @ol_total,
         c_delivery_cnt         = c_delivery_cnt + 1
        WHERE  c_id             = @o_c_id
        AND   c_d_id            = @d_id
        AND   c_w_id            = @w_id

        COMMIT TRANSACTION DEL

        select          /* Return to client */
                        @no_o_id
        select @d_id = @d_id + 1
  end /* while @d_id... */
end
go
if exists ( SELECT name FROM sysobjects WHERE name = 'stock_level')
  DROP PROC stock_level
go

CREATE PROC stock_level
        @w_id       smallint,
        @d_id       tinyint,
        @threshold smallint
as
        select  s_i_id
        FROM    district,
                order_line (index ol_clu prefetch 2 lru),
                stock (index s_clu prefetch 2 lru)
        WHERE   d_w_id      =       @w_id
        AND     d_id        =       @d_id
        AND     ol_w_id     =       @w_id
        AND     ol_d_id     =       @d_id
        AND     ol_o_id     between (d_next_o_id - 20) and
(d_next_o_id - 1)
        AND     s_w_id      =       ol_w_id
        AND     s_i_id      =       ol_i_id
        AND   s_quantity < @threshold
go
EOF
```

## tpcc_ps.c

```
/*+**********************************************************
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 *                                                *
 *                                                *
```

```
*****************************************************************
***********/
#include <errno.h>
#include <string.h>
#include <stdio.h>
#include <sys/types.h>
#include <windows.h>
#include <process.h>
#include <Winsock.h>

#include <tpccstruct.h>
#include <tpccapi.h>
#include <tpccerr.h>

#include <tpcc_stdl_workspaces.h>
#include <tpcc_acmsxp.h>

#include <tpcc.h>

#ifdef FFE_DEBUG
# include <crtdbg.h>
#endif

static DWORD  gTLSDBContext = 0;

static LONG   gForceThreadStartCtr;
static HANDLE gForceThreadStartEvent;


/*
**++
**  FUNCTION NAME: transaction_init
**--
*/
void
transaction_init( char *type, pLoginData pLogin )
{
  char                                  tmp[16];
  DWORD                                 dwTID;

  DBContext DBC  = (DBContext) TlsGetValue(gTLSDBContext);

  if (DBC == INVALID_DB_CONTEXT) {
    /* make up app_name */
    gethostname(tmp, sizeof(tmp));
    dwTID = GetCurrentThreadId( );
    sprintf( pLogin->szApplication, "%s:%s - %d", tmp, type, dwTID );

    pLogin->status = TPCCConnectDB( &DBC, pLogin );

    TPCCLog( "%s, dbprocptr = %8X\r\n", pLogin->szApplication, DBC );

    if ( pLogin->status == ERR_DB_SUCCESS ) {
      if (TlsSetValue(gTLSDBContext, DBC) == 0)
                pLogin->status =
ERR_CANT_SET_THREAD_LOCAL_STORAGE;
    }

    if ( InterlockedDecrement( &gForceThreadStartCtr ) == 0 )
      SetEvent( gForceThreadStartEvent );

    WaitForSingleObject( gForceThreadStartEvent, INFINITE );
  }
  else {
    pLogin->status = ERR_ALREADY_LOGGED_IN;
  }
}

/*
**++
**  FUNCTION NAME: dy_transaction_init
**--
*/
void
dy_transaction_init( struct io_login_wksp *login_wksp )
{
  transaction_init( "DY", (pLoginData)login_wksp );
}

/*
**++
**  FUNCTION NAME: no_transaction_init
**--
*/
void
no_transaction_init( struct io_login_wksp *login_wksp )
{
  transaction_init( "NO", (pLoginData)login_wksp );
}

/*
**++
**  FUNCTION NAME: os_transaction_init
**--
*/
void
os_transaction_init( struct io_login_wksp *login_wksp )
{
  transaction_init( "OS", (pLoginData)login_wksp );
}

/*
**++
**  FUNCTION NAME: pt_transaction_init
**--
*/
void
pt_transaction_init( struct io_login_wksp *login_wksp )
{
  transaction_init( "PT", (pLoginData)login_wksp );
}

/*
**++
**  FUNCTION NAME: sl_transaction_init
**--
*/
void
sl_transaction_init( struct io_login_wksp *login_wksp )
{
  transaction_init( "SL", (pLoginData)login_wksp );
}

/*
**++
**  FUNCTION NAME: gc_transaction_init
**--
*/
void
gc_transaction_init( struct io_login_wksp *login_wksp )
{
  transaction_init( "GC", (pLoginData)login_wksp );
}

/*
**++
**  FUNCTION NAME: dy_transaction
**--
*/
void
dy_transaction( struct io_dy_wksp *dy_wksp )
{
  DBContext DBC  = (DBContext) TlsGetValue(gTLSDBContext);
```

```
  pDeliveryData ptr;

  ptr = (pDeliveryData)dy_wksp;

#ifdef FFE_DEBUG
    ptr->iStage |= IN_RH;
    ptr->dwXPThreadId = GetCurrentThreadId( );
#endif

  if (DBC == INVALID_DB_CONTEXT) {
    ptr->status = ERR_DB_NOT_LOGGED_IN;
  }
  else {
    ptr->status = TPCCDeliveryDB( DBC, ptr );
  }

#ifdef FFE_DEBUG
    _ASSERT( VALID_DB_ERR(ptr->status) );
    ptr->iStage |= LEAVING_RH;
#endif
}

/*
**++
**  FUNCTION NAME: no_transaction
**--
*/
void
no_transaction( struct io_no_wksp *no_wksp )
{
  DBContext DBC  = (DBContext) TlsGetValue(gTLSDBContext);
  pNewOrderData ptr;

  ptr = (pNewOrderData)no_wksp;

#ifdef FFE_DEBUG
    ptr->iStage |= IN_RH;
    ptr->dwXPThreadId = GetCurrentThreadId( );
#endif

  if (DBC == INVALID_DB_CONTEXT) {
    ptr->status = ERR_DB_NOT_LOGGED_IN;
  }
  else {
    ptr->status = TPCCNewOrderDB( DBC, ptr );
  }

#ifdef FFE_DEBUG
    _ASSERT( VALID_DB_ERR(ptr->status) );
    ptr->iStage |= LEAVING_RH;
#endif
}

/*
**++
**  FUNCTION NAME: os_transaction
**--
*/
void
os_transaction( struct io_os_wksp *os_wksp )
{
  DBContext DBC  = (DBContext) TlsGetValue(gTLSDBContext);
  pOrderStatusData ptr;

  ptr = (pOrderStatusData)os_wksp;

#ifdef FFE_DEBUG
    ptr->iStage |= IN_RH;
    ptr->dwXPThreadId = GetCurrentThreadId( );
#endif

  if (DBC == INVALID_DB_CONTEXT) {
    ptr->status = ERR_DB_NOT_LOGGED_IN;
  }
  else {
    ptr->status = TPCCOrderStatusDB( DBC, ptr );
  }

#ifdef FFE_DEBUG
    _ASSERT( VALID_DB_ERR(ptr->status) );
    ptr->iStage |= LEAVING_RH;
#endif
}

/*
**++
**  FUNCTION NAME: pt_transaction
**--
*/
void
pt_transaction( struct io_pt_wksp *pt_wksp )
{
  DBContext DBC  = (DBContext) TlsGetValue(gTLSDBContext);
  pPaymentData ptr;

  ptr = (pPaymentData)pt_wksp;

#ifdef FFE_DEBUG
    ptr->iStage |= IN_RH;
    ptr->dwXPThreadId = GetCurrentThreadId( );
#endif

  if (DBC == INVALID_DB_CONTEXT) {
    ptr->status = ERR_DB_NOT_LOGGED_IN;
  }
  else {
    ptr->status = TPCCPaymentDB( DBC, ptr );
  }

#ifdef FFE_DEBUG
    _ASSERT( VALID_DB_ERR(ptr->status) );
    ptr->iStage |= LEAVING_RH;
#endif
}

/*
**++
**  FUNCTION NAME: sl_transaction
**--
*/
void
sl_transaction( struct io_sl_wksp *sl_wksp )
{
  DBContext DBC  = (DBContext) TlsGetValue(gTLSDBContext);
  pStockLevelData ptr;

  ptr = (pStockLevelData)sl_wksp;

#ifdef FFE_DEBUG
    ptr->iStage |= IN_RH;
    ptr->dwXPThreadId = GetCurrentThreadId( );
#endif

  if (DBC == INVALID_DB_CONTEXT) {
    ptr->status = ERR_DB_NOT_LOGGED_IN;
  }
  else {
    ptr->status = TPCCStockLevelDB( DBC, ptr );
  }

#ifdef FFE_DEBUG
    _ASSERT( VALID_DB_ERR(ptr->status) );
    ptr->iStage |= LEAVING_RH;
#endif
```

```
}

/*
**++
**  FUNCTION NAME: gc_transaction
**--
*/
void
gc_transaction( struct io_gc_wksp *gc_wksp, struct int_gc_wksp *ptype )
{
 int transaction_type;

 transaction_type = ptype->trans;
 switch( transaction_type ) {
 case TYPE_DY:
  dy_transaction( (struct io_dy_wksp *)gc_wksp );
  break;
 case TYPE_NO:
  no_transaction( (struct io_no_wksp *)gc_wksp );
  break;
 case TYPE_OS:
  os_transaction( (struct io_os_wksp *)gc_wksp );
  break;
 case TYPE_PT:
  pt_transaction( (struct io_pt_wksp *)gc_wksp );
  break;
 case TYPE_SL:
  sl_transaction( (struct io_sl_wksp *)gc_wksp );
  break;
 default:
#ifdef FFE_DEBUG
  _ASSERT( FALSE );
#else
  ;
#endif
 }
}

/*
**++
**  FUNCTION NAME: ACMSxpStartup
**--
*/
int ACMSxpStartup( int maxDBConnections, long totalGovValue )
{
int ret_status;

 /***** Allocate an index into Thread Local Storage ****/
 if ((gTLSDBContext = TlsAlloc()) == 0xFFFFFFFF)
  return ERR_CANT_ALLOCATE_THREAD_LOCAL_STORAGE;

 /***  Initial value of a counter is set to the maximum number of threads which
      can be created by ACMSxp; i.e. the total of the governor values in the
      registry.  By blocking each of these threads until they have all
            started, we guarantee that they will all be created.  Waiting until
            demand requires them is the worst time to be connecting to a DB.
            They are unblocked by the counter reaching zero which causes the
            event to be set.  ******/

 gForceThreadStartCtr = totalGovValue;

 gForceThreadStartEvent = CreateEvent( NULL, TRUE, FALSE, NULL );
 if ( gForceThreadStartEvent == NULL )
  return ERR_CANT_CREATE_FORCE_THRED_STRT_EVENT;

 ret_status = TPCCStartupDB( maxDBConnections );
 return ret_status;
}

/*
**++
**  FUNCTION NAME: ACMSxpShutdown
**--
*/
int ACMSxpShutdown( void )
{
 CloseHandle( gForceThreadStartEvent );
 TlsFree( gTLSDBContext );
 return( TPCCShutdownDB() );
}
```

# tpccapi.h

```
#ifndef TPCCAPI_H
#define TPCCAPI_H
/*+*****************************************************************
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*****************************************************************
************/

/*+*****************************************************************
*************
********************************  tpccapi.h
************************************
*****************************************************************
*************
*
**  tpccapi.h:  This header file declares function calls between TPCC
**          application and server
*
*
*  Authors: Tareef Kawaf and Bill Carr
**
**
**  02-05-97 FWM Added bQueueDelivery flag to startup call.
**  18-Feb-98 WCarr      Introduced TPCCAPI V2.0
**
*/


#define DELIVERY_RESPONSE_COUNT 2
```

```
int TPCCGetTransportData( pTransportData pTransport );

int TPCCStartup( int iMaxUsers, pTransportData pTransport );
int TPCCStartupDB( int iMaxDBConnections );

int TPCCConnect( pLoginData pLogin );
int TPCCConnectDB( DBContext *pDBC, pLoginData pLogin );

int TPCCDelivery( pDeliveryData pDelivery,
                  pDeliveryData
CompletedDeliveries[DELIVERY_RESPONSE_COUNT] );
int TPCCDeliveryDeferred( pDeliveryData pDelivery );
int TPCCDeliveryDB( DBContext DBC, pDeliveryData pDelivery );

int TPCCNewOrder( pNewOrderData pNewOrder );
int TPCCNewOrderDB( DBContext DBC, pNewOrderData pNewOrder );

int TPCCOrderStatus( pOrderStatusData pOrderStatus );
int TPCCOrderStatusDB( DBContext DBC, pOrderStatusData pOrderStatus );

int TPCCPayment( pPaymentData pPayment );
int TPCCPaymentDB( DBContext DBC, pPaymentData pPayment );

int TPCCStockLevel( pStockLevelData pStockLevel );
int TPCCStockLevelDB( DBContext DBC, pStockLevelData pStockLevel );

int TPCCCheckpoint( pCheckpointData pCheckpoint );
int TPCCCheckpointDB( DBContext DBC, pCheckpointData pCheckpoint );

int TPCCDisconnect( pCallersContext pCC );
int TPCCDisconnectDB( DBContext DBC, pCallersContext pCC );

int TPCCShutdown( void );
int TPCCShutdownDB( void );

void TPCCDeliveryResponse( int retcode, pDeliveryData pDelivery,
                           pDeliveryData
CompletedDeliveries[DELIVERY_RESPONSE_COUNT] );

void TPCCDeliveryDeferredResponse( int retcode, pDeliveryData pDelivery );

void TPCCNewOrderResponse( int retcode, pNewOrderData pNewOrder );

void TPCCOrderStatusResponse( int retcode, pOrderStatusData pOrderStatus );

void TPCCPaymentResponse( int retcode, pPaymentData pPayment );

void TPCCStockLevelResponse( int retcode, pStockLevelData pStockLevel );

void TPCCResponseComplete( CallersContext *pCC );

void ErrorMessage( CallersContext *pCC, int iError, int iErrorType,
                   char *pszMesasge );

int TPCCGetTransportErrorString( int iErrorCode, int iBufSize, char *pBuffer );
int TPCCGetDBErrorString( int iErrorCode, int iBufSize, char *pBuffer );

BOOL TPCCOpenLog( void );

BOOL TPCCCloseLog( void );

void TPCCLog( char *fmt, ... );

void TPCCErr( char *fmt, ... );

void TPCCTransactionErr( pConnData pConn, char *fmt, ... );
#endif /* TPCCAPI_H */
```

## tpccerr.h

```
#ifndef TPCCERR_H
#define TPCCERR_H

/*      FILE:           TPCCERR.H
 *
 *                      Copyright Microsoft, 1996
 *                      Copyright Digital Equipment Corp., 1997
 *
 *      PURPOSE:  Header file for ISAPI TPCC.DLL, defines structures
 *                      and error messages used by tpcc
benchmark code.
 *      Author:         Philip Durr
 *                              philipdu@Microsoft.com
 *
 *      Modified by:    William D. Carr
 *                              carr@perfom.enet.dec.com
 *
 */

#pragma message ("FIXME: the error types need to be made DB non-specific")
#define ERR_TYPE_WEBDLL
                        1
#define ERR_TYPE_SQL
                        2
#define ERR_TYPE_DBLIB
                        3

#define ERR_DB_SUCCESS                          0
#define ERR_DB_ERROR                            1
#define ERR_TRANSPORT_ERROR             2
#define ERR_DB_INTERFACE                3
#define ERR_DB_DEADLOCK_LIMIT                   4
#define ERR_DB_NOT_COMMITED                     5
#define ERR_DB_DEAD                             6
#define ERR_DB_PENDING                          7
#define ERR_DB_NOT_LOGGED_IN                    8
#define ERR_DB_LOGIN_FAILED             9
#define ERR_DB_USE_FAILED               10
#define ERR_DB_LOGOUT_FAILED                    11
/* NOTE: Be sure to update MAX_ERR if new error code is added. */
#define ERR_DB_MAX_ERR                          11

#define VALID_DB_ERR(err) (((err) >= ERR_DB_SUCCESS)&&((err) <=
ERR_DB_MAX_ERR))

#define ERR_SUCCESS                             1000
#define ERR_COMMAND_UNDEFINED                   1001
#define ERR_NOT_IMPLEMENTED_YET                 1002
#define ERR_CANNOT_INIT_TERMINAL        1003
#define ERR_OUT_OF_MEMORY                       1004
#define ERR_NEW_ORDER_NOT_PROCESSED             1005
#define ERR_PAYMENT_NOT_PROCESSED               1006
#define ERR_NO_SERVER_SPECIFIED                 1007
#define ERR_ORDER_STATUS_NOT_PROCESSED          1008
#define ERR_W_ID_INVALID                1009
#define ERR_CAN_NOT_SET_MAX_CONNECTIONS         1010
#define ERR_NOSUCH_CUSTOMER                     1011
#define ERR_D_ID_INVALID                1012
#define ERR_MAX_CONNECT_PARAM                   1013
#define ERR_INVALID_SYNC_CONNECTION             1014
#define ERR_INVALID_TERMID                      1015
#define ERR_PAYMENT_INVALID_CUSTOMER            1016
#define ERR_SQL_OPEN_CONNECTION                 1017
#define ERR_STOCKLEVEL_MISSING_THRESHOLD_KEY    1018
#define ERR_STOCKLEVEL_THRESHOLD_INVALID 1019
#define ERR_STOCKLEVEL_THRESHOLD_RANGE          1020
#define ERR_STOCKLEVEL_NOT_PROCESSED            1021
```

```
#define     ERR_NEWORDER_FORM_MISSING_DID          1022
#define     ERR_NEWORDER_DISTRICT_INVALID          1023
#define     ERR_NEWORDER_DISTRICT_RANGE            1024
#define     ERR_NEWORDER_CUSTOMER_KEY              1025
#define     ERR_NEWORDER_CUSTOMER_INVALID          1026
#define     ERR_NEWORDER_CUSTOMER_RANGE            1027
#define     ERR_NEWORDER_MISSING_IID_KEY           1028
#define     ERR_NEWORDER_ITEM_BLANK_LINES          1029
#define     ERR_NEWORDER_ITEMID_INVALID            1030
#define     ERR_NEWORDER_MISSING_SUPPW_KEY         1031
#define     ERR_NEWORDER_SUPPW_INVALID             1032
#define     ERR_NEWORDER_MISSING_QTY_KEY           1033
#define     ERR_NEWORDER_QTY_INVALID          1034
#define     ERR_NEWORDER_SUPPW_RANGE               1035
#define     ERR_NEWORDER_ITEMID_RANGE              1036
#define     ERR_NEWORDER_QTY_RANGE                 1037
#define     ERR_PAYMENT_DISTRICT_INVALID           1038
#define     ERR_NEWORDER_SUPPW_WITHOUT_ITEMID      1039
#define     ERR_NEWORDER_QTY_WITHOUT_ITEMID        1040
#define     ERR_NEWORDER_NOITEMS_ENTERED           1041
#define     ERR_PAYMENT_MISSING_DID_KEY            1042
#define     ERR_PAYMENT_DISTRICT_RANGE             1043
#define     ERR_PAYMENT_MISSING_CID_KEY            1044
#define     ERR_PAYMENT_CUSTOMER_INVALID           1045
#define     ERR_PAYMENT_MISSING_CLT                1046
#define     ERR_PAYMENT_LAST_NAME_TO_LONG          1047
#define     ERR_PAYMENT_CUSTOMER_RANGE             1048
#define     ERR_PAYMENT_CID_AND_CLT                1049
#define     ERR_PAYMENT_MISSING_CDI_KEY            1050
#define     ERR_PAYMENT_CDI_INVALID                1051
#define     ERR_PAYMENT_CDI_RANGE                  1052
#define     ERR_PAYMENT_MISSING_CWI_KEY            1053
#define     ERR_PAYMENT_CWI_INVALID                1054
#define     ERR_PAYMENT_CWI_RANGE                  1055
#define     ERR_PAYMENT_MISSING_HAM_KEY            1056
#define     ERR_PAYMENT_HAM_INVALID                1057
#define     ERR_PAYMENT_HAM_RANGE                  1058
#define     ERR_ORDERSTATUS_MISSING_DID_KEY        1059
#define     ERR_ORDERSTATUS_DID_INVALID            1060
#define     ERR_ORDERSTATUS_DID_RANGE              1061
#define     ERR_ORDERSTATUS_MISSING_CID_KEY        1062
#define     ERR_ORDERSTATUS_MISSING_CLT_KEY        1063
#define     ERR_ORDERSTATUS_CLT_RANGE              1064
#define     ERR_ORDERSTATUS_CID_INVALID            1065
#define     ERR_ORDERSTATUS_CID_RANGE              1066
#define     ERR_ORDERSTATUS_CID_AND_CLT            1067
#define     ERR_DELIVERY_MISSING_OCD_KEY           1068
#define     ERR_DELIVERY_CARRIER_INVALID           1069
#define     ERR_DELIVERY_CARRIER_ID_RANGE          1070
#define ERR_PAYMENT_MISSING_CLT_KEY          1071
#define ERR_CANT_FIND_TPCC_KEY                 1072
#define ERR_CANT_FIND_INETINFO_KEY           1073
#define ERR_CANT_FIND_POOLTHREADLIMIT          1074
#define ERR_DB_DELIVERY_NOT_QUEUED           1075
#define ERR_DELIVERY_NOT_PROCESSED           1076
#define ERR_TERM_ALLOCATE_FAILED             1077
#define ERR_PENDING                          1078
#define ERR_CANT_START_FRCDINIT_THREAD         1079
#define ERR_CANT_START_DELIVERY_THREAD         1080
#define ERR_GOVERNOR_VALUE_NOT_FOUND       1081
#define ERR_SERVER_MISMATCH            1082
#define ERR_DATABASE_MISMATCH          1083
#define ERR_USER_MISMATCH              1084
#define ERR_PASSWORD_MISMATCH          1085
#define ERR_CANT_CREATE_ALL_THREADS_EVENT    1086
#define ERR_CANT_CREATE_FORCE_THRED_STRT_EVENT 1087
#define ERR_CANT_ALLOCATE_THREAD_LOCAL_STORAGE 1088
#define ERR_CANT_SET_THREAD_LOCAL_STORAGE    1089
#define ERR_FORCE_CONNECT_THREAD_FAILED        1090
#define ERR_CANT_FIND_SERVER_VALUE           1091
#define ERR_NO_MESSAGE                         1092
#define ERR_CANT_FIND_PATH_VALUE             1093
#define     ERR_CANNOT_CREATE_RESULTS_FILE         1094
#define ERR_DELIVERY_PIPE_SECURITY       1095
#define ERR_DELIVERY_PIPE_CREATE         1096
#define ERR_DELIVERY_PIPE_OPEN                 1097
#define ERR_DELIVERY_PIPE_READ                 1098
#define ERR_DELIVERY_PIPE_DISCONNECT     1099
#define ERR_CANT_FIND_DATABASE_VALUE           1100
#define ERR_CANT_FIND_USER_VALUE         1101
#define ERR_CANT_FIND_PASSWORD_VALUE           1102
#define ERR_DELIVERY_OUTPUT_PIPE_WRITE         1103
#define ERR_DELIVERY_OUTPUT_PIPE_READ          1104
#define ERR_DELIVERY_MISSING_QUEUETIME_KEY 1105
#define ERR_DELIVERY_QUEUETIME_INVALID         1106
#define ERR_ALREADY_LOGGED_IN                  1107
#define ERR_INVALID_FORM                 1109
#define ERR_DELIVERY_MUST_CONNECTDB            1110
#define ERR_INVALID_FORM_AND_CMD_NOT_BEGIN 1111
#define ERR_MAX_CONNECTIONS_EXCEEDED           1112
#define ERR_CANNOT_FIND_CONNECTION       1113
#define ERR_CKPT_NOT_INITIALIZED         1114

/* 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;


#ifdef TPCC_C
SERRORMSG errorMsgs[] =
{
  { ERR_SUCCESS, "Success, no error." },
  { ERR_NO_MESSAGE, "No message string available for the specified error
code." },
  { ERR_COMMAND_UNDEFINED, "Command undefined." },
  { ERR_NOT_IMPLEMENTED_YET, "Not Implemented Yet." },
  { ERR_CANNOT_INIT_TERMINAL, "Cannot initialize client connection." },
  { ERR_OUT_OF_MEMORY, "Insufficient memory." },
  { ERR_NEW_ORDER_NOT_PROCESSED, "Cannot process new Order
form." },
  { ERR_PAYMENT_NOT_PROCESSED, "Cannot process payment form." },
  { ERR_NO_SERVER_SPECIFIED, "No Server name specified." },
  { ERR_ORDER_STATUS_NOT_PROCESSED, "Cannot process order status
form." },
  { ERR_W_ID_INVALID, "Invalid Warehouse ID." },
  { ERR_CAN_NOT_SET_MAX_CONNECTIONS, "Insufficient memory to
allocate # connections." },
  { ERR_NOSUCH_CUSTOMER, "No such customer." },
  { ERR_D_ID_INVALID, "Invalid District ID Must be 1 to 10." },
  { ERR_MAX_CONNECT_PARAM, "Max client connections exceeded, run
install to increase." },
  { ERR_INVALID_SYNC_CONNECTION, "Invalid Terminal Sync ID." },
  { ERR_INVALID_TERMID, "Invalid Terminal ID." },
  { ERR_PAYMENT_INVALID_CUSTOMER, "Payment Form, No such
Customer." },
  { ERR_SQL_OPEN_CONNECTION, "SQLOpenConnection API Failed." },
  { ERR_STOCKLEVEL_MISSING_THRESHOLD_KEY, "Stock Level missing
Threshold key \"TT*\"." },
  { ERR_STOCKLEVEL_THRESHOLD_INVALID, "Stock Level Threshold
invalid data type range = 1 - 99." },
  { ERR_STOCKLEVEL_THRESHOLD_RANGE, "Stock Level Threshold out
of range, range must be 1 - 99." },
  { ERR_STOCKLEVEL_NOT_PROCESSED, "Stock Level not processed." },
  { ERR_NEWORDER_FORM_MISSING_DID, "New Order missing District
key \"DID*\"." },
  { ERR_NEWORDER_DISTRICT_INVALID, "New Order District ID Invalid
range 1 - 10." },
  { ERR_NEWORDER_DISTRICT_RANGE, "New Order District ID out of
Range. Range = 1 - 10." },
  { ERR_NEWORDER_CUSTOMER_KEY, "New Order missing Customer key
\"CID*\"." },
```

```
  { ERR_NEWORDER_CUSTOMER_INVALID, "New Order customer id invalid data type, range = 1 to 3000." },
  { ERR_NEWORDER_CUSTOMER_RANGE, "New Order customer id out of range, range = 1 to 3000." },
  { ERR_NEWORDER_MISSING_IID_KEY, "New Order missing Item Id key \"IID*\"." },
  { ERR_NEWORDER_ITEM_BLANK_LINES, "New Order blank order lines all orders must be continuous." },
  { ERR_NEWORDER_ITEMID_INVALID, "New Order Item Id is wrong data type, must be numeric." },
  { ERR_NEWORDER_MISSING_SUPPW_KEY, "New Order missing Supp_W key \"SP##*\"." },
  { ERR_NEWORDER_SUPPW_INVALID, "New Order Supp_W invalid data type must be numeric." },
  { ERR_NEWORDER_MISSING_QTY_KEY, "New Order Missing Qty key \"Qty##*\"." },
  { ERR_NEWORDER_QTY_INVALID, "New Order Qty invalid must be numeric range 1 - 99." },
  { ERR_NEWORDER_SUPPW_RANGE, "New Order Supp_W value out of range range = 1 - Max Warehouses." },
  { ERR_NEWORDER_ITEMID_RANGE, "New Order Item Id is out of range. Range = 1 to 999999." },
  { ERR_NEWORDER_QTY_RANGE, "New Order Qty is out of range. Range = 1 to 99." },
  { ERR_PAYMENT_DISTRICT_INVALID, "Payment District ID is invalid must be 1 - 10." },
  { ERR_NEWORDER_SUPPW_WITHOUT_ITEMID, "New Order Supp_W field entered without a corrisponding Item_Id." },
  { ERR_NEWORDER_QTY_WITHOUT_ITEMID, "New Order Qty entered without a corrisponding Item_Id." },
  { ERR_NEWORDER_NOITEMS_ENTERED, "New Order Blank Items between items, items must be continuous." },
  { ERR_PAYMENT_MISSING_DID_KEY, "Payment missing District Key \"DID*\"." },
  { ERR_PAYMENT_DISTRICT_RANGE, "Payment District Out of range, range = 1 - 10." },
  { ERR_PAYMENT_MISSING_CID_KEY, "Payment missing Customer Key \"CID*\"." },
  { ERR_PAYMENT_CUSTOMER_INVALID, "Payment Customer data type invalid, must be numeric." },
  { ERR_PAYMENT_MISSING_CLT, "Payment missing Customer Last Name Key \"CLT*\"." },
  { ERR_PAYMENT_LAST_NAME_TO_LONG, "Payment Customer last name longer than 16 characters." },
  { ERR_PAYMENT_CUSTOMER_RANGE, "Payment Customer ID out of range, must be 1 to 3000." },
  { ERR_PAYMENT_CID_AND_CLT, "Payment Customer ID and Last Name entered must be one or other." },
  { ERR_PAYMENT_MISSING_CDI_KEY, "Payment missing Customer district key \"CDI*\"." },
  { ERR_PAYMENT_CDI_INVALID, "Payment Customer district invalid must be numeric." },
  { ERR_PAYMENT_CDI_RANGE, "Payment Customer district out of range must be 1 - 10." },
  { ERR_PAYMENT_MISSING_CWI_KEY, "Payment missing Customer Warehouse key \"CWI*\"." },
  { ERR_PAYMENT_CWI_INVALID, "Payment Customer Warehouse invalid must be numeric." },
  { ERR_PAYMENT_CWI_RANGE, "Payment Customer Warehouse out of range, 1 to Max Warehouses." },
  { ERR_PAYMENT_MISSING_HAM_KEY, "Payment missing Amount key \"HAM*\"." },
  { ERR_PAYMENT_HAM_INVALID, "Payment Amount invalid data type must be numeric." },
  { ERR_PAYMENT_HAM_RANGE, "Payment Amount out of range, 0 - 9999.99." },
  { ERR_ORDERSTATUS_MISSING_DID_KEY, "Order Status missing District key \"DID*\"." },
  { ERR_ORDERSTATUS_DID_INVALID, "Order Status District invalid, value must be numeric 1 - 10." },
  { ERR_ORDERSTATUS_DID_RANGE, "Order Status District out of range must be 1 - 10." },
  { ERR_ORDERSTATUS_MISSING_CID_KEY, "Order Status missing Customer key \"CID*\"." },
  { ERR_ORDERSTATUS_MISSING_CLT_KEY, "Order Status missing Customer Last Name key \"CLT*\"." },
  { ERR_ORDERSTATUS_CLT_RANGE, "Order Status Customer last name longer than 16 characters." },
  { ERR_ORDERSTATUS_CID_INVALID, "Order Status Customer ID invalid, range must be numeric 1 - 3000." },
  { ERR_ORDERSTATUS_CID_RANGE, "Order Status Customer ID out of range must be 1 - 3000." },
  { ERR_ORDERSTATUS_CID_AND_CLT, "Order Status Customer ID and LastName entered must be only one." },
  { ERR_DELIVERY_MISSING_OCD_KEY, "Delivery missing Carrier ID key \"OCD*\"." },
  { ERR_DELIVERY_CARRIER_INVALID, "Delivery Carrier ID invalid must be numeric 1 - 10." },
  { ERR_DELIVERY_CARRIER_ID_RANGE, "Delivery Carrier ID out of range must be 1 - 10." },
  { ERR_PAYMENT_MISSING_CLT_KEY, "Payment missing Customer Last Name key \"CLT*\"." },
  { ERR_DB_ERROR, "A Database error has occurred." },
  { ERR_DELIVERY_NOT_PROCESSED, "Delivery not processed." },
  { ERR_DB_DELIVERY_NOT_QUEUED, "Delivery not queued." },
  { ERR_CANT_FIND_TPCC_KEY, "TPCC key not found in registry." },
  { ERR_CANT_FIND_INETINFO_KEY, "inetinfo key not found in registry." },
  { ERR_CANT_FIND_POOLTHREADLIMIT, "PoolThreadLimit value not set in inetinfo\\Parameters key." },
  { ERR_TERM_ALLOCATE_FAILED, "Failed to allocate terminal data structure." },
  { ERR_DELIVERY_PIPE_SECURITY, "Failed to initialize delivery pipe security." },
  { ERR_DELIVERY_PIPE_CREATE, "Failed to create delivery pipe." },
  { ERR_DELIVERY_PIPE_OPEN, "Failed to open delivery pipe." },
  { ERR_DELIVERY_PIPE_READ, "Failed to read delivery pipe." },
  { ERR_DELIVERY_PIPE_DISCONNECT, "Failed to start delivery pipe disconnect thread."},
  { ERR_PENDING, "Transaction pending."},
  { ERR_CANT_START_FRCDINIT_THREAD, "Can't start Forced Initialization thread." },
  { ERR_CANT_START_DELIVERY_THREAD, "Can't start delivery thread." },
  { ERR_GOVERNOR_VALUE_NOT_FOUND, "Governor value not found in Registry." },
  { ERR_SERVER_MISMATCH, "Server does not match registry value." },
  { ERR_DATABASE_MISMATCH, "Database name does not match registry value." },
  { ERR_USER_MISMATCH, "User name does not match registry value." },
  { ERR_PASSWORD_MISMATCH, "Password does not match registry value." },
  { ERR_CANT_CREATE_ALL_THREADS_EVENT, "Can't create All Threads Event." },
  { ERR_CANT_CREATE_FORCE_THRED_STRT_EVENT, "Can't create Force Thread Start Event." },
  { ERR_CANT_ALLOCATE_THREAD_LOCAL_STORAGE, "Can't allocate thread local storage" },
  { ERR_CANT_SET_THREAD_LOCAL_STORAGE, "Can't set thread local storage." },
  { ERR_FORCE_CONNECT_THREAD_FAILED, "At least one database connect call failed, check log files for specific error." },
  { ERR_CANT_FIND_SERVER_VALUE, "Server value not set in TPCC key." },
  { ERR_CANT_FIND_PATH_VALUE, "PATH value not set in TPCC key." },
  { ERR_CANNOT_CREATE_RESULTS_FILE, "Cannot create results file." },
  { ERR_CANT_FIND_DATABASE_VALUE, "Database value not set in TPCC key." },
  { ERR_CANT_FIND_USER_VALUE, "User value not set in TPCC key." },
  { ERR_CANT_FIND_PASSWORD_VALUE, "Password value not set in TPCC key." },
  { ERR_DELIVERY_OUTPUT_PIPE_WRITE, "Failed to write output delivery pipe." },
  { ERR_DELIVERY_OUTPUT_PIPE_READ, "Failed to read output delivery pipe." },
```

```
  { ERR_DELIVERY_MISSING_QUEUETIME_KEY, "Delivery queue time
missing from query." },
  { ERR_DELIVERY_QUEUETIME_INVALID, "Delivery queue time is
invalid." },
  { ERR_ALREADY_LOGGED_IN, "TPCCConnectDB has already been
called." },
  { ERR_DB_NOT_LOGGED_IN, "TPCCConnectDB has not yet been called." },
  { ERR_INVALID_FORM, "The FORM field is missing or invalid." },
  { ERR_DELIVERY_MUST_CONNECTDB, "Synchronous transport requires
delivery server connect to database." },
  { ERR_INVALID_FORM_AND_CMD_NOT_BEGIN, "The FORM field is
missing and CMD is not Begin." },
  { ERR_MAX_CONNECTIONS_EXCEEDED, "The maximum number of
connections has been exceeded." },
  { ERR_CANNOT_FIND_CONNECTION, "Transport layer unable to find a
DBContext coresponding to the CallersContext." },
  { ERR_CKPT_NOT_INITIALIZED, "The checkpoint subsystem has not been
started." },
  {             0, "" }
};
#else
extern SERRORMSG errorMsgs[];
#endif /* TPCC_C */

#endif /* TPCCERR_H */
```

## tpccstruct.h

```
#ifndef TPCCSTRUCT_H
#define TPCCSTRUCT_H

/*****************************************************************
**************
*******************************  tpccstruct.h
*********************************
*****************************************************************
**************/
/*
**  tpccstruct.h:  This header file declares data structures for use in
**           application and server
*/
/* Copyright 1996 Digital Equipment Corporation */
/*
**  Author: Bill Carr
**                  (Majority of content from previous work by Ruth Morgenstein)
**
**
*/

#include <time.h>

#ifdef _WIN32
# ifndef BOOLEAN
#  define BOOLEAN BOOL
# endif
#else
# include <sys/types.h>

# define BOOLEAN int
# define VMS     0
# define LINEMAX 256

# define FALSE   0
# define TRUE    1
#endif

#define MAX_OL  15

#ifdef FFE_DEBUG

# define CALLING_LH  0x0001
# define IN_LH                  0x0002
# define IN_RH                  0x0004
# define IN_DB                  0x0008
# define LEAVING_DB  0x0010
# define LEAVING_RH  0x0020
# define LEAVING_LH  0x0040
# define CALLING_RESP           0x0080
# define UNRESERVING            0x0100

# define ALL_STAGES  0x01ff

  /*                    users * scale * hours * min * txn/no */
# define HISTORY_SIZE ((int)( 5000 *   1.2 *     2 *  60 * 2.22222))

# define TRANSACTION_DEBUG_INFO\
  int iStage;\
  DWORD dwThreadId;\
  DWORD dwXPThreadId;\
  int iSynchronous;\
  int iType;\
  int iReserveHistoryId;\
  int iUnreserveHistoryId;\

# define INIT_TRANSACTION(type,pData)\
  gpTransactionPool->iHistoryId++;\
  gpTransactionPool->History[gpTransactionPool->iHistoryId].iFailure = 0;\
  _ASSERT( gpTransactionPool->iNextFree <= gpTransactionPool->iMaxIndex
);\
  memset( pData, 0x01, gpTransactionPool->iTransactionSize );\
  pData->iStage = 0;\
  pData->dwThreadId = GetCurrentThreadId();\
  pData->dwXPThreadId = 0;\
  pData->iType = type;\
  pData->iReserveHistoryId = gpTransactionPool->iHistoryId;\
  pData->iUnreserveHistoryId = 0;\
  gpTransactionPool->History[gpTransactionPool->iHistoryId].iOpCode = 1;\
  gpTransactionPool->History[gpTransactionPool-
>iHistoryId].iReserveHistoryId = gpTransactionPool->iHistoryId;\
  gpTransactionPool->History[gpTransactionPool-
>iHistoryId].iUnreserveHistoryId = 0;\
  gpTransactionPool->History[gpTransactionPool->iHistoryId].iType = type;\
  gpTransactionPool->History[gpTransactionPool->iHistoryId].dwThreadId =
pData->dwThreadId;\
  gpTransactionPool->History[gpTransactionPool->iHistoryId].dwXPThreadId =
pData->dwXPThreadId;\
  gpTransactionPool->History[gpTransactionPool->iHistoryId].pTrans = pData;

# define CHECK_TRANSACTION(type,pData)\
  gpTransactionPool->iHistoryId++;\
  gpTransactionPool->History[gpTransactionPool->iHistoryId].iFailure++;\
  _ASSERT( gpTransactionPool->iNextFree > 0 );\
  gpTransactionPool->History[gpTransactionPool->iHistoryId].iFailure++;\
  _ASSERT(((pData->iStage) | ALL_STAGES) == ALL_STAGES);\
  gpTransactionPool->History[gpTransactionPool->iHistoryId].iFailure++;\
  if( pData->iSynchronous == 1 )\
    _ASSERT((pData->dwThreadId == GetCurrentThreadId( )));\
  else if( pData->iSynchronous == 0 )\
    _ASSERT((pData->dwXPThreadId == GetCurrentThreadId( )));\
  else\
    _ASSERT(FALSE);\
  gpTransactionPool->History[gpTransactionPool->iHistoryId].iFailure++;\
  _ASSERT((pData->iType==type));\
  gpTransactionPool->History[gpTransactionPool->iHistoryId].iFailure++;\
  _ASSERT((gpTransactionPool->History[pData->iReserveHistoryId].pTrans)
== pData);\
  pData->iUnreserveHistoryId = gpTransactionPool->iHistoryId;\
  gpTransactionPool->History[gpTransactionPool->iHistoryId].iOpCode = 2;\
  gpTransactionPool->History[gpTransactionPool-
>iHistoryId].iReserveHistoryId = pData->iReserveHistoryId;\
```

```
  gpTransactionPool->History[gpTransactionPool-
>iHistoryId].iUnreserveHistoryId = gpTransactionPool->iHistoryId;\
  gpTransactionPool->History[gpTransactionPool->iHistoryId].iType = type;\
  gpTransactionPool->History[gpTransactionPool->iHistoryId].dwThreadId =
pData->dwThreadId;\
  gpTransactionPool->History[gpTransactionPool->iHistoryId].dwXPThreadId =
pData->dwXPThreadId;\
  gpTransactionPool->History[gpTransactionPool->iHistoryId].pTrans = pData;

#else /* FFE_DEBUG */

# define TRANSACTION_DEBUG_INFO

# define INIT_TRANSACTION(type,pData)

# define CHECK_TRANSACTION(type,pData)

#endif /* FFE_DEBUG */

# define NUMBER_POOL_TRANS_TYPES 5
# define DELIVERY_TRANS 0
# define NEW_ORDER_TRANS 1
# define ORDER_STATUS_TRANS 2
# define PAYMENT_TRANS 3
# define STOCK_LEVEL_TRANS 4

#define RESERVE_TRANSACTION_STRUCT(type,pData)\
  EnterCriticalSection( &gpTransactionPool->critSec );\
  pData = gpTransactionPool->index[gpTransactionPool->iNextFree];\
  INIT_TRANSACTION(type,pData);\
  gpTransactionPool->iNextFree++;\
  LeaveCriticalSection( &gpTransactionPool->critSec );

#define UNRESERVE_TRANSACTION_STRUCT(type,pData)\
  EnterCriticalSection( &gpTransactionPool->critSec );\
  CHECK_TRANSACTION(type,pData);\
  gpTransactionPool->index[--gpTransactionPool->iNextFree] = pData;\
  LeaveCriticalSection( &gpTransactionPool->critSec );

typedef struct
{
  CRITICAL_SECTION critSec;
  int           iNextFree;
#ifdef FFE_DEBUG
  int           iMaxIndex;
  int           iTransactionSize;
  int           iHistoryId;
  struct
  {
    int                 iOpCode;
    int                 iFailure;
    int                 iReserveHistoryId;
    int                 iUnreserveHistoryId;
    int                 iType;
    DWORD  dwThreadId;
    DWORD  dwXPThreadId;
    void        *pTrans;
  }                     History[HISTORY_SIZE];
#endif
  void          *index[1];
  char          data[1];
} TransactionPoolStruct, *pTransactionPoolStruct;



/*
**  Data structures descriptions for IO data for each transaction type
**
*/

typedef void CallersContext;
typedef void *pCallersContext;

typedef void *DBContext;

#define INVALID_DB_CONTEXT NULL

typedef struct _DBDate {
                int year;       /* 1900 - 2100 */
                int month;      /* 1 - 12 */
                int day;        /* 1 - 31 */
                int hour;       /* 0 - 23 */
                int minute;     /* 0 - 59 */
                int second;     /* 0 - 59 */
} DBDateData, *pDBDateData;

/* Data common to all transactions that represents the connection to the UI */
/* and the database are built as a macro to reduce duplication. */
#define CONN_DATA \
   TRANSACTION_DEBUG_INFO\
   int    w_id;\
   int    ld_id;\
   CallersContext *pCC;\
   int    status;\
   int    dbstatus;


typedef struct _ConnData
{
   CONN_DATA
} ConnData, *pConnData;

/* DELIVERY is built as a macro so that i_delivery struct is consistant with */
/* the io_delivery struct.  Note also that the input portion of the delivery */
/* data can be simply memcpyed from the input to the input/output struct. */
#define I_DELIVERY \
   CONN_DATA\
   time_t  queue_time;\
   unsigned delta_time;   /* in milliseconds */\
   int    o_carrier_id;

typedef struct _DeliveryDataInput {
   I_DELIVERY
} DeliveryDataInput, *pDeliveryDataInput;

typedef struct _DeliveryData {
   I_DELIVERY                                   /* see comment above */
   int    o_id[10];
} DeliveryData, *pDeliveryData;

struct io_order_line {
   int    ol_i_id;
   int    ol_supply_w_id;
   int    ol_quantity;
   char   i_name[25];
   int    s_quantity;
   char   b_g[2];
   double  i_price;
   double  ol_amount;
};

typedef struct _NewOrderData {
   CONN_DATA
   int    d_id;
   int    c_id;
   int    o_ol_cnt;
   int    o_all_local;
   struct io_order_line o_ol[MAX_OL];
   DBDateData o_entry_d;
   char   c_last[17];
   char   c_credit[3];
   double  c_discount;
   double  w_tax;
   double  d_tax;
   int    o_id;
```

```
    double  tax_n_discount;
    double  total_amount;
} NewOrderData, *pNewOrderData;

struct status_order_line {
    int     ol_supply_w_id;
    int     ol_i_id;
    int     ol_quantity;
    double  ol_amount;
    DBDateData    ol_delivery_d;
};

typedef struct _OrderStatusData {
    CONN_DATA
    BOOLEAN byname;
    int     d_id;
    int     c_id;
    char    c_last[17];
    char    c_first[17];
    char    c_middle[3];
    double  c_balance;
    int     o_id;
    DBDateData    o_entry_d;
    int     o_carrier_id;
    int     o_ol_cnt;
    struct status_order_line    s_ol[MAX_OL];
} OrderStatusData, *pOrderStatusData;

typedef struct _PaymentData {
    CONN_DATA
    BOOLEAN byname;
    int     d_id;
    int     c_id;
    char    c_last[17];
    int     c_w_id;
    int     c_d_id;
    double  h_amount;
    DBDateData h_date;
    char    w_street_1[21];
    char    w_street_2[21];
    char    w_city[21];
    char    w_state[3];
    char    w_zip[10];
    char    d_street_1[21];
    char    d_street_2[21];
    char    d_city[21];
    char    d_state[3];
    char    d_zip[10];
    char    c_first[17];
    char    c_middle[3];
    char    c_street_1[21];
    char    c_street_2[21];
    char    c_city[21];
    char    c_state[3];
    char    c_zip[10];
    char    c_phone[17];
    DBDateData    c_since;
    char    c_credit[3];
    double  c_credit_lim;
    double  c_discount;
    double  c_balance;
    char    c_data[201];
} PaymentData, *pPaymentData;

typedef struct _StockLevelData {
    CONN_DATA
    int     threshold;
    int     low_stock;
} StockLevelData, *pStockLevelData;

typedef struct _CheckpointData {
    CONN_DATA
    int     how_many;
    int     interval;
} CheckpointData, *pCheckpointData;

/*
**  Data structure for input & output data
*/

typedef struct _TransactionData {
    int type;
    union {
                DeliveryData delivery;
                NewOrderData newOrder;
                OrderStatusData orderStatus;
                PaymentData payment;
                StockLevelData stockLevel;
        CheckpointData checkpoint;
    }  info;
} TransactionData, *pTransactionData;


typedef struct _TransportData {
    BOOL                asynchronous;
    BOOL                generic;
    int                 num_gc;
    int                 num_dy;
    int                 num_no;
    int                 num_os;
    int                 num_pt;
    int                 num_sl;
    BOOL                dy_use_transport;
    int                 num_dy_servers;
    int                 num_queued_deliveries;
    int                 num_queued_responses;
} TransportData, *pTransportData;

/* Data structure for passing connection information */
typedef struct _LoginData {
    CONN_DATA
    char                        szServer[32];
    char                        szDatabase[32];
    char                        szUser[32];
    char                        szPassword[32];
    char                        szApplication[32];
} LoginData, *pLoginData;

#endif /* TPCCSTRUCT_H */
```

## web_ui.c

```
/*+**********************************************************************
*************
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```

```
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 *                                                                *
 *                                                                *

******************************************************************
***********/

/*+
 * Abstract: This file contains the Digital created front end functions
 *                                for the tpcc benchmark.
 *
 * Author: A Bradley & W Carr
 * Creation Date: May 1997
 *
 * Modified history:
 *
 *
*/
#include <windows.h>
#include <stdio.h>
#include <stdarg.h>
#include <malloc.h>
#include <stdlib.h>
#include <string.h>
#include <time.h>
#include <sys\timeb.h>
#include <io.h>
#include <crtdbg.h>
#include <process.h>

#define WEB_UI_C
#include <tpccerr.h>
#include <tpccstruct.h>
#include <tpccapi.h>
#include <httpext.h>

#include <tpcc.h>
#include <web_ui.h>
#include <ckpt.h>

#ifdef FFE_DEBUG
# include <crtdbg.h>
static int tmpDbgFlag;
static _HFILE hMemFile;
#endif


#define MAX(a,b) ((a)>(b)?(a):(b))

#define PUT_STRING(szString, iLen, pStart, pStruct) \
pStruct.szStr=szString; pStruct.iIndex=pStart; pStruct.iFieldSize=iLen;

#define CONVERT_SPECIAL(pout,pin,iwid)\
{\
  char *out = pout;\
  char *in = pin;\
  int wid = iwid;\
  while( wid && '\0' != *in )\
  {\
    if( '>' == *in )\
    {*out++='&'; *out++='g'; *out++='t'; *out++=';';}\
    else if( '<' == *in )\
    {*out++='&'; *out++='l'; *out++='t'; *out++=';';}\
    else if( '&' == *in )\
    {*out++='&'; *out++='a'; *out++='m'; *out++='p'; *out++=';';}\
    else if( '\"' == *in )\
    {*out++='&'; *out++='q'; *out++='u'; *out++='o'; *out++='t'; *out++=';';}\
    else\
    {*out++=*in;}\
    in++;\
    wid--;\
  }\
  while( wid-- ) *out++ = ' ';\
}

/* define indexes for the building of the forms */
/* defines for new order */
#define NO_WDID 0
#define NO_WID NO_WDID + 1
#define NO_DID NO_WID + 1
#define NO_DATE NO_DID + 1
#define NO_CID NO_DATE + 1
#define NO_LAST NO_CID + 1
#define NO_CREDIT NO_LAST + 1
#define NO_DISC NO_CREDIT + 1
#define NO_OID NO_DISC + 1
#define NO_LINES NO_OID + 1
#define NO_W_TAX NO_LINES + 1
#define NO_D_TAX NO_W_TAX + 1
#define NO_S_WID NO_D_TAX + 1
#define NO_IID NO_S_WID + 1
#define NO_INAME NO_IID + 1
#define NO_QTY NO_INAME + 1
#define NO_STOCK NO_QTY + 1
#define NO_BG NO_STOCK + 1
#define NO_PRICE NO_BG + 1
#define NO_AMT NO_PRICE + 1
#define NO_STAT NO_AMT + (14*8) + 1
#define NO_TOTAL NO_STAT + 1

/* defines for payment input form */
#define PT_WDID_INPUT 0
#define PT_WID_INPUT PT_WDID_INPUT + 1

/* defines for payment output form */
#define PT_WDID 0
#define PT_LONG_DATE PT_WDID + 1
#define PT_WID PT_LONG_DATE + 1
#define PT_DID PT_WID + 1
#define PT_W_ST_1 PT_DID + 1
#define PT_D_ST_1 PT_W_ST_1 + 1
#define PT_W_ST_2 PT_D_ST_1 + 1
#define PT_D_ST_2 PT_W_ST_2 + 1
#define PT_W_CITY PT_D_ST_2 + 1
#define PT_W_ST PT_W_CITY + 1
#define PT_W_ZIP PT_W_ST + 1
#define PT_D_CITY PT_W_ZIP + 1
#define PT_D_ST PT_D_CITY + 1
#define PT_D_ZIP PT_D_ST + 1
#define PT_CID PT_D_ZIP + 1
#define PT_C_WID PT_CID + 1
#define PT_C_DID PT_C_WID + 1
#define PT_FIRST PT_C_DID + 1
#define PT_MIDDLE PT_FIRST + 1
#define PT_LAST PT_MIDDLE + 1
#define PT_SM_DATE PT_LAST + 1
#define PT_C_STR_1 PT_SM_DATE + 1
#define PT_CREDIT PT_C_STR_1 + 1
#define PT_D_STR_2 PT_CREDIT + 1
#define PT_DISC PT_D_STR_2 + 1
#define PT_C_CITY PT_DISC + 1
#define PT_C_ST PT_C_CITY + 1
#define PT_C_ZIP PT_C_ST + 1
#define PT_C_PHONE PT_C_ZIP + 1
```

```
#define PT_AMT PT_C_PHONE + 1
#define PT_BAL PT_AMT + 1
#define PT_LIM PT_BAL + 1
#define PT_CUST_DATA PT_LIM + 1

/* defines for order status */
#define OS_WDID 0
#define OS_WID OS_WDID + 1
#define OS_DID OS_WID + 1
#define OS_CID OS_DID + 1
#define OS_FIRST OS_CID + 1
#define OS_MIDDLE OS_FIRST + 1
#define OS_LAST OS_MIDDLE + 1
#define OS_BAL OS_LAST + 1
#define OS_OID OS_BAL + 1
#define OS_DATE OS_OID + 1
#define OS_CAR_ID OS_DATE + 1
#define OS_S_WID OS_CAR_ID + 1
#define OS_IID OS_S_WID + 1
#define OS_QTY OS_IID + 1
#define OS_AMT OS_QTY + 1
#define OS_SM_DATE OS_AMT + 1
/* defines for delivery form */
#define D_WDID 0
#define D_WID D_WDID + 1
#define D_CAR D_WID + 1
#define D_QUEUE1 D_CAR + 1
#define D_DELTA1 D_QUEUE1 + 1
#define D_WID1 D_DELTA1 + 1
#define D_CAR1 D_WID1 + 1
#define D_OID10 D_CAR1 + 1
#define D_OID11 D_OID10 + 1
#define D_OID12 D_OID11 + 1
#define D_OID13 D_OID12 + 1
#define D_OID14 D_OID13 + 1
#define D_OID15 D_OID14 + 1
#define D_OID16 D_OID15 + 1
#define D_OID17 D_OID16 + 1
#define D_OID18 D_OID17 + 1
#define D_OID19 D_OID18 + 1
#define D_QUEUE2 D_OID19 + 1
#define D_DELTA2 D_QUEUE2 + 1
#define D_WID2 D_DELTA2 + 1
#define D_CAR2 D_WID2 + 1
#define D_OID20 D_CAR2 + 1
#define D_OID21 D_OID20 + 1
#define D_OID22 D_OID21 + 1
#define D_OID23 D_OID22 + 1
#define D_OID24 D_OID23 + 1
#define D_OID25 D_OID24 + 1
#define D_OID26 D_OID25 + 1
#define D_OID27 D_OID26 + 1
#define D_OID28 D_OID27 + 1
#define D_OID29 D_OID28 + 1

/* defines for stock level form */
#define SL_WDID 0
#define SL_WID SL_WDID + 1
#define SL_DID SL_WID + 1
#define SL_TH SL_DID + 1
#define SL_LOW SL_TH + 1

#define WDID(w_id,d_id) (w_id*10+(d_id-1))

#define PANIC_FORM_SIZE 4096

#define NUMBER_POOL_FORM_TYPES 5
#define DELIVERY_FORM 0
#define NEW_ORDER_FORM 1
#define ORDER_STATUS_FORM 2
#define PAYMENT_FORM 3
#define STOCK_LEVEL_FORM 4

#define NUMBER_POOL_RESPONSE_TYPES 5
#define DELIVERY_RESPONSE 0
#define NEW_ORDER_RESPONSE 1
#define ORDER_STATUS_RESPONSE 2
#define PAYMENT_RESPONSE 3
#define STOCK_LEVEL_RESPONSE 4

#ifdef FFE_DEBUG
# define FFE_ASSERT(arg) _ASSERT(arg)
#else
# define FFE_ASSERT(arg)
#endif

#define RESERVE_FORM(type,szForm)\
 {\
  EnterCriticalSection( &gpForms->critSec[type] );\
  FFE_ASSERT( gpForms->iNextFreeForm[type] <= gpForms-
>iMaxIndex[type] );\
  szForm = gpForms->index[gpForms->iFirstFormIndex[type] +\
                                          gpForms->iNextFreeForm[type]++];\
  LeaveCriticalSection( &gpForms->critSec[type] );\
 }
#define UNRESERVE_FORM(type,szForm)\
 {\
  EnterCriticalSection( &gpForms->critSec[type] );\
  FFE_ASSERT( gpForms->iNextFreeForm[type] > 0 );\
  gpForms->index[gpForms->iFirstFormIndex[type] +\
                          --gpForms->iNextFreeForm[type]] = szForm;\
  LeaveCriticalSection( &gpForms->critSec[type] );\
 }

#define RESERVE_RESPONSE(type,szResponse)\
 {\
  EnterCriticalSection( &gpResponses->critSec[type] );\
  FFE_ASSERT(gpResponses->iNextFreeResponse[type]<=gpResponses-
>iMaxIndex[type]);\
  szResponse = gpResponses->index[gpResponses->iFirstResponseIndex[type]
+\
                                          gpResponses-
>iNextFreeResponse[type]++];\
  LeaveCriticalSection( &gpResponses->critSec[type] );\
 }
#define UNRESERVE_RESPONSE(type,szResponse)\
 {\
  EnterCriticalSection( &gpResponses->critSec[type] );\
  FFE_ASSERT(gpResponses->iNextFreeResponse[type] > 0 );\
  gpResponses->index[gpResponses->iFirstResponseIndex[type] +\
                          --gpResponses->iNextFreeResponse[type]] =
szResponse;\
  LeaveCriticalSection( &gpResponses->critSec[type] );\
 }

#define RESERVE_PANIC_FORM(szForm)\
 {\
  EnterCriticalSection( &gpPanicForms->critSec );\
  FFE_ASSERT( gpPanicForms->iNextFree <= gpPanicForms->iMaxIndex );\
  szForm = gpPanicForms->index[gpPanicForms->iNextFree++];\
  LeaveCriticalSection( &gpPanicForms->critSec );\
 }

#define UNRESERVE_PANIC_FORM(szForm)\
 {\
  EnterCriticalSection( &gpPanicForms->critSec );\
  FFE_ASSERT( gpPanicForms->iNextFree > 0 );\
  gpPanicForms->index[--gpPanicForms->iNextFree] = szForm;\
  LeaveCriticalSection( &gpPanicForms->critSec );\
 }

#if 0
CMD                     0
FORM ID                 3
```

```
LOGIN WAREHOUSE  4
LOGIN DISTRICT   5
DELI QUEUE TIME  6
CARRIER ID       7
DISTRICT  8
CUSTOMER         9
NEWORDER FIELDS A-X,a-u
CUST LAST NAME   Y
CUST WAREHOUSE   Z
CUST DISTRICT    v
AMOUNT PAID      w
THRESHOLD        x
#endif

#define MENU_BAR \
"<HR>"\
"<INPUT TYPE=submit NAME=0 VALUE=NewOrder>"\
"<INPUT TYPE=submit NAME=0 VALUE=Payment>"\
"<INPUT TYPE=submit NAME=0 VALUE=Delivery>"\
"<INPUT TYPE=submit NAME=0 VALUE=OrderStatus>"\
"<INPUT TYPE=submit NAME=0 VALUE=StockLevel>"\
"<INPUT TYPE=submit NAME=0 VALUE=Exit>"

static char    szFormTemplate[] =
"<BODY><FORM ACTION=%s METHOD=GET>";

static char    szWelcomeFormTemplate[] =
"<BODY><FORM ACTION=%s METHOD=GET>"
"<INPUT TYPE=hidden NAME=3 VALUE=W00>"
"Please Identify your Warehouse and District for this session.<BR>"
"Warehouse ID <INPUT NAME=4 SIZE=5><BR>"
"District ID <INPUT NAME=5 SIZE=2><BR>"
"<HR>"
"<INPUT TYPE=submit NAME=0 VALUE=Submit>"
"</FORM></BODY>";

static char
szWelcomeForm[sizeof(szWelcomeFormTemplate)+FILENAMESIZE];
static int  iWelcomeFormLen;

static char    szMainMenuFormTemplate[] =
"<BODY><FORM ACTION=%s METHOD=GET>"
"<INPUT TYPE=hidden NAME=3 VALUE=M%06d>"
"%55.55s<BR>"
"Select Desired Transaction.<BR>"
MENU_BAR
"</FORM></BODY>";

static char szDeliveryFormTemp2i[] =
"<INPUT TYPE=hidden NAME=3 VALUE=D######>"
"<INPUT TYPE=hidden NAME=6 VALUE=0>"
"<PRE>                          Delivery<BR>"
"Warehouse: #####<BR><BR>"
"Carrier Number: <INPUT NAME=7 SIZE=1><BR><BR>"
"Execution Status:<BR></PRE>"
"<HR><INPUT TYPE=submit NAME=0 VALUE=Process>"
"<INPUT TYPE=submit NAME=0 VALUE=Menu>"
"</FORM></BODY>";

static char szDeliveryFormTemp2p[] =
"<INPUT TYPE=hidden NAME=3 VALUE=d######>"
"<PRE>                          Delivery<BR>"
"Warehouse: #####<BR><BR>"
"Carrier Number: ##<BR><BR>"
"Execution Status: Delivery has been queued.<BR>"
"Previous Deliveries:<BR>"
"########## ######## ##### ## #### #### #### #### #### #### #### #### ####
#### ####"
"<BR>"
"########## ######## ##### ## #### #### #### #### #### #### #### #### ####
#### ####"
"<BR>"
"</PRE>"
MENU_BAR
"</FORM></BODY>";

static char szNewOrderFormTemp2i[] =
"<INPUT TYPE=hidden NAME=3 VALUE=N######>"
"<PRE>                          New Order<BR>"
"Warehouse: #####"
"  District: <INPUT NAME=8 SIZE=2>                    Date:<BR>"
"Customer:  <INPUT NAME=9 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=A SIZE=4>  <INPUT NAME=B SIZE=6>"
"                        <INPUT NAME=C SIZE=1><BR>"
" <INPUT NAME=D SIZE=4>  <INPUT NAME=E SIZE=6>"
"                        <INPUT NAME=F SIZE=1><BR>"
" <INPUT NAME=G SIZE=4>  <INPUT NAME=H SIZE=6>"
"                        <INPUT NAME=I SIZE=1><BR>"
" <INPUT NAME=J SIZE=4>  <INPUT NAME=K SIZE=6>"
"                        <INPUT NAME=L SIZE=1><BR>"
" <INPUT NAME=M SIZE=4>  <INPUT NAME=N SIZE=6>"
"                        <INPUT NAME=O SIZE=1><BR>"
" <INPUT NAME=P SIZE=4>  <INPUT NAME=Q SIZE=6>"
"                        <INPUT NAME=R SIZE=1><BR>"
" <INPUT NAME=S SIZE=4>  <INPUT NAME=T SIZE=6>"
"                        <INPUT NAME=U SIZE=1><BR>"
" <INPUT NAME=V SIZE=4>  <INPUT NAME=W SIZE=6>"
"                        <INPUT NAME=X SIZE=1><BR>"
" <INPUT NAME=a SIZE=4>  <INPUT NAME=b SIZE=6>"
"                        <INPUT NAME=c SIZE=1><BR>"
" <INPUT NAME=d SIZE=4>  <INPUT NAME=e SIZE=6>"
"                        <INPUT NAME=f SIZE=1><BR>"
" <INPUT NAME=g SIZE=4>  <INPUT NAME=h SIZE=6>"
"                        <INPUT NAME=i SIZE=1><BR>"
" <INPUT NAME=j SIZE=4>  <INPUT NAME=k SIZE=6>"
"                        <INPUT NAME=l SIZE=1><BR>"
" <INPUT NAME=m SIZE=4>  <INPUT NAME=n SIZE=6>"
"                        <INPUT NAME=o SIZE=1><BR>"
" <INPUT NAME=p SIZE=4>  <INPUT NAME=q SIZE=6>"
"                        <INPUT NAME=r SIZE=1><BR>"
" <INPUT NAME=s SIZE=4>  <INPUT NAME=t SIZE=6>"
"                        <INPUT NAME=u SIZE=1><BR>"
"Execution Status:                          Total:<BR><HR>"
"<INPUT TYPE=submit NAME=0 VALUE=Process>"
"<INPUT TYPE=submit NAME=0 VALUE=Menu>"
"</FORM></BODY>";

static char szNewOrderFormTemp2p[] =
"<INPUT TYPE=hidden NAME=3 VALUE=n######>"
"<PRE>                          New Order<BR>"
"Warehouse: #####"
"  District: ##                  Date: ################### <BR>"
"Customer:  ####  Name: ################  Credit: ##  "
"%Disc: #####          <BR>"
"Order Number: ########  Number of Lines: ##       "
"W_tax: #####  D_tax: #####  <BR><BR>"
" Supp_W  Item_Id  Item Name              Qty  Stock  B/G  "
"Price    Amount<BR>"
" ####  ######  ######################## ##   ###   #  "
"$######  $#######  <BR>"
" ####  ######  ######################## ##   ###   #  "
"$######  $#######  <BR>"
" ####  ######  ######################## ##   ###   #  "
"$######  $#######  <BR>"
" ####  ######  ######################## ##   ###   #  "
"$######  $#######  <BR>"
" ####  ######  ######################## ##   ###   #  "
"$######  $#######  <BR>"
" ####  ######  ######################## ##   ###   #  "
```

```
"$###### $####### <BR>"
" ####  ######  ######################## ##   ###   #  "
"$###### $####### <BR>"
" ####  ######  ######################## ##   ###   #  "
"$###### $####### <BR>"
" ####  ######  ######################## ##   ###   #  "
"$###### $####### <BR>"
" ####  ######  ######################## ##   ###   #  "
"$###### $####### <BR>"
" ####  ######  ######################## ##   ###   #  "
"$###### $####### <BR>"
" ####  ######  ######################## ##   ###   #  "
"$###### $####### <BR>"
" ####  ######  ######################## ##   ###   #  "
"$###### $####### <BR>"
" ####  ######  ######################## ##   ###   #  "
"$###### $####### <BR>"
"Execution Status: ########################              "
"Total:  $########  <BR>"
"</PRE>"
MENU_BAR
"</FORM></BODY>";

static char szOrderStatusFormTemp2i[] =
"<INPUT TYPE=hidden NAME=3 VALUE=O######>"
"<PRE>                          Order-Status<BR>"
"Warehouse: #####  District: <INPUT NAME=8 SIZE=1><BR>"
"Customer: <INPUT NAME=9 SIZE=4>   Name:                  "
"<INPUT NAME=Y 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=0 VALUE=Process>"
"<INPUT TYPE=submit NAME=0 VALUE=Menu>"
"</FORM></BODY>";

static char szOrderStatusFormTemp2p[] =
"<INPUT TYPE=hidden NAME=3 VALUE=o######>"
"<PRE>                          Order-Status<BR>"
"Warehouse: #####  District: ##<BR>"
"Customer: ####   Name: ################ ## ################<BR>"
"Cust-Balance: $##########<BR><BR>"
"Order-Number: ########   Entry-Date: ###################   Carrier-
Number: ##"
"<BR>"
"Supply-W    Item-Id    Qty    Amount      Delivery-Date<BR>"
" ####      ######     ##     $########     ##########<BR>"
" ####      ######     ##     $########     ##########<BR>"
" ####      ######     ##     $########     ##########<BR>"
" ####      ######     ##     $########     ##########<BR>"
" ####      ######     ##     $########     ##########<BR>"
" ####      ######     ##     $########     ##########<BR>"
" ####      ######     ##     $########     ##########<BR>"
" ####      ######     ##     $########     ##########<BR>"
" ####      ######     ##     $########     ##########<BR>"
" ####      ######     ##     $########     ##########<BR>"
" ####      ######     ##     $########     ##########<BR>"
" ####      ######     ##     $########     ##########<BR>"
" ####      ######     ##     $########     ##########<BR>"
" ####      ######     ##     $########     ##########<BR>"
"</PRE>"
MENU_BAR
"</FORM></BODY>";

static char szPaymentFormTemp2i[] =
"<INPUT TYPE=hidden NAME=3 VALUE=P######>"
"<PRE>                          Payment<BR>"
"Date:  <BR><BR>"
"Warehouse: #####                  District: <INPUT NAME=8 SIZE=2><BR>"
"<BR><BR><BR><BR>"
"Customer: <INPUT NAME=9 SIZE=4>"
"Cust-Warehouse: <INPUT NAME=Z SIZE=5>  "
"Cust-District: <INPUT NAME=v SIZE=1><BR>"
"Name:                  <INPUT NAME=Y SIZE=16>                  "
"Since:<BR>"
"                                  Credit:<BR>"
"                                  Disc:<BR>"
"                                  Phone:<BR><BR>"
"Amount Paid:        $<INPUT NAME=w SIZE=7>      New Cust Balance:<BR>"
"Credit Limit:<BR><BR>Cust-Data: <BR><BR><BR><BR></PRE><HR>"
"<INPUT TYPE=submit NAME=0 VALUE=Process>"
"<INPUT TYPE=submit NAME=0 VALUE=Menu>"
"</FORM></BODY>";

static char szPaymentFormTemp2p[] =
"<INPUT TYPE=hidden NAME=3 VALUE=p######>"
"<PRE>                          Payment<BR>"
"Date: ################### <BR><BR>"
"Warehouse: #####                  District: ##<BR>"
"####################                ####################<BR>"
"####################                ####################<BR>"
"################### ## ##########      ################### ##
##########"
"<BR><BR>"
"Customer: ####  Cust-Warehouse: ##### Cust-District: ##<BR>"
"Name:   ################ ## ################     Since:
##########<BR>"
"       ####################                Credit: ##<BR>"
"       ####################                %Disc:  #####<BR>"
"       ################### ## ##########       Phone:
###################"
"<BR><BR>"
"Amount Paid:        $#######      New Cust Balance: $###############<BR>"
"Credit Limit:   $#############<BR><BR>"
"Cust-Data:
##################################################<BR>"
"         ##################################################<BR>"
"         ##################################################<BR>"
"         ##################################################<BR>"
"</PRE>"
MENU_BAR
"</FORM></BODY>";

static char szStockLevelFormTemp2i[] =
"<INPUT TYPE=hidden NAME=3 VALUE=S######>"
"<PRE>                          Stock-Level<BR>"
"Warehouse: #####  District: ##<BR><BR>"
"Stock Level Threshold: <INPUT NAME=x SIZE=2><BR><BR>"
"low stock:    <BR><HR>"
"<INPUT TYPE=submit NAME=0 VALUE=Process>"
"<INPUT TYPE=submit NAME=0 VALUE=Menu>"
"</FORM></BODY>";

static char szStockLevelFormTemp2p[] =
"<INPUT TYPE=hidden NAME=3 VALUE=s######>"
"<PRE>                          Stock-Level<BR>"
"Warehouse: #####  District: ##<BR><BR>"
"Stock Level Threshold: ##<BR><BR>"
"low stock: ###"
"</PRE>"
MENU_BAR
"</FORM></BODY>";

static char szErrorFormTemplate[] =
"<BODY><FORM ACTION=%s METHOD=GET>"
"<INPUT TYPE=hidden NAME=3 VALUE=e%06d>"
"Error: %d (%s): %s"
MENU_BAR
"</FORM></BODY>";

static char szResponseHeaderTemplate[] =
```

```
"Connection: keep-alive\r\n"
"Content-type: text/html\r\n"
"Content-length: ####\r\n"
"\r\n";
static char  szResponseHeader[sizeof(szResponseHeaderTemplate)];
FORM_INDEXES responseHeaderIndexes[1] = { 0 };
int                 responseHeaderLen = 0;


#define MATCHES_BEGIN(p) ('B'==p[0])
#define MATCHES_CHECKPOINT(p) \
(0==strncmp(p,"Checkpoint",strlen("Checkpoint")))
#define MATCHES_CHECKPOINT_STARTUP(p) \
(0==strncmp(p,"CheckpointStartup",strlen("CheckpointStartup")))
#define MATCHES_CLEAR(p) ('C'==p[0]&&'l'==p[1])
#define MATCHES_DELIVERY(p) ('D'==p[0])
#define MATCHES_EXIT(p) ('E'==p[0])
#define MATCHES_MENU(p) ('M'==p[0])
#define MATCHES_NEWORDER(p) ('N'==p[0])
#define MATCHES_ORDERSTATUS(p) ('O'==p[0])
#define MATCHES_PAYMENT(p) ('P'==p[0]&&'a'==p[1])
#define MATCHES_PROCESS(p) ('P'==p[0]&&'r'==p[1])
#define MATCHES_STOCKLEVEL(p) ('S'==p[0]&&'t'==p[1])
#define MATCHES_SUBMIT(p) ('S'==p[0]&&'u'==p[1])
#ifdef FFE_DEBUG
# define MATCHES_MEMORYCHECK(p) ('!'==p[0]&&'M'==p[1])
#endif

/* function prototypes */
void BeginCmd( EXTENSION_CONTROL_BLOCK *pECB );
void CheckpointCmd( EXTENSION_CONTROL_BLOCK *pECB, int w_id, int
ld_id );
void CheckpointStartupCmd( EXTENSION_CONTROL_BLOCK *pECB, int
w_id, int ld_id );
void ClearCmd( EXTENSION_CONTROL_BLOCK *pECB );
void ExitCmd( EXTENSION_CONTROL_BLOCK *pECB );
void MenuCmd( EXTENSION_CONTROL_BLOCK *pECB, int w_id, int ld_id
);
void SubmitCmd( EXTENSION_CONTROL_BLOCK *pECB, int *w_id, int
*ld_id );
void MemoryCheckCmd( EXTENSION_CONTROL_BLOCK *pECB, int w_id,
int ld_id );

BOOL GetKeyValuePtr( char *szIPtr, char *szKey, char **pszOPtr );
BOOL GetCharKeyValuePtr( char *szIPtr, char cKey, char **pszOPtr );
BOOL GetKeyValueString( char *szIPtr, char *szKey,
                                        char *szValue, int iSize );
BOOL GetWDID(char *ptr, int *lw_id, int *ld_id, char **optr);

void Log( char *szType, char *szStr );
void MakePanicPool( DWORD dwResponseSize );
void MakeTemplatePool( DWORD dwFormSize, DWORD dwResponseSize );
void MakeTransactionPool( DWORD dwTransactionPoolSize );
void DeletePanicPool( void );
void DeleteTemplatePool( void );
void DeleteTransactionPool( void );

int ProcessDeliveryQuery( EXTENSION_CONTROL_BLOCK *pECB,
                                      char *lpszQueryString,
                                      int w_id, int ld_id );
int ProcessNewOrderQuery( EXTENSION_CONTROL_BLOCK *pECB,
                                      char *lpszQueryString,
                                      int w_id, int ld_id );
int ProcessOrderStatusQuery( EXTENSION_CONTROL_BLOCK *pECB,
                                        char *lpszQueryString,
                                        int w_id, int ld_id );
int ProcessPaymentQuery( EXTENSION_CONTROL_BLOCK *pECB,
                                      char *lpszQueryString,
                                      int w_id, int ld_id );
int ProcessStockLevelQuery( EXTENSION_CONTROL_BLOCK *pECB,
                                        char *lpszQueryString,
                                        int w_id, int ld_id );

DWORD ProcessQueryString(EXTENSION_CONTROL_BLOCK *pECB);

void PutNumeric( int iInt, int iFieldSize, char *pChar );
void SendErrorResponse( EXTENSION_CONTROL_BLOCK *pECB, int
iError,
                                        int iErrorType, char *szMsg, int w_id, int
ld_id,
                                        pConnData pConn );
void SendMainMenuForm( EXTENSION_CONTROL_BLOCK *pECB,
                                  int w_id, int ld_id, char *szStatus );
void SendResponse(EXTENSION_CONTROL_BLOCK *pECB, char *szStr, int
iStrLen);
void SendWelcomeForm(EXTENSION_CONTROL_BLOCK *pECB);
#ifdef FFE_DEBUG
unsigned __stdcall CheckMemory(void *param);
#endif

/* typedefs */
typedef struct
{
  char *szStr;
  int iIndex;
  int iFieldSize;
  int iNewIndex;
  int iNewFieldSize;
} PutStrStruct, *pPutStrStruct;

typedef struct
{
  CRITICAL_SECTION critSec;
#ifdef FFE_DEBUG
  int           iMaxIndex;
#endif
  int           iNextFree;
  char          *index[1];
  char          forms[PANIC_FORM_SIZE];
} PanicStruct, *pPanicStruct;

typedef struct
{
  CRITICAL_SECTION critSec[NUMBER_POOL_FORM_TYPES];
#ifdef FFE_DEBUG
  int           iMaxIndex[NUMBER_POOL_FORM_TYPES];
#endif
  int           iNextFreeForm[NUMBER_POOL_FORM_TYPES];
  int           iFirstFormIndex[NUMBER_POOL_FORM_TYPES];
  char          *index[1];
  char          forms[1];
} FormStruct, *pFormStruct;

typedef struct
{
  CRITICAL_SECTION critSec[NUMBER_POOL_RESPONSE_TYPES];
#ifdef FFE_DEBUG
  int           iMaxIndex[NUMBER_POOL_RESPONSE_TYPES];
#endif
  int           iNextFreeResponse[NUMBER_POOL_RESPONSE_TYPES];
  int           iFirstResponseIndex[NUMBER_POOL_RESPONSE_TYPES];
  char          *index[1];
  char          responses[1];
} ResponseStruct, *pResponseStruct;

/* global variables */
static int                  iInitStatus    = ERR_SUCCESS;

static CRITICAL_SECTION startupCriticalSection;
static BOOL           startupFlag    = FALSE;

static pPanicStruct gpPanicForms      = NULL;
static int giPanic                                  = 0;
static pFormStruct gpForms                          = 0;
```

```
static int giFormLen[NUMBER_POOL_FORM_TYPES] = { 0 };
static pResponseStruct gpResponses    = 0;
static int giResponseLen[NUMBER_POOL_RESPONSE_TYPES] = { 0 };

/* FUNCTION: BOOL APIENTRY DllMain(HANDLE hModule, DWORD
ul_reason_for_call,
 *                                                  LPVOID lpReserved)
 *
 * PURPOSE:              This is the main entry point to an ISAPI dll.  All dll
 *                       global initializations should be done in this routine.
 *
 * ARGUMENTS:            HANDLE    hModule                                 dll
module handle
 *                       DWORD     ul_reason_for_call      reason for call
 *                       LPVOID    lpReserved              reserved for
future use
 *
 * RETURNS:              BOOL      Always TRUE
                Errors in intiialization
 *                                                                        are
presented at the first
 *
                screen to the user.
 * COMMENTS:             None
 *
 */

BOOL APIENTRY
DllMain(HANDLE hModule, DWORD ul_reason_for_call, LPVOID lpRes)
{
  char                  szTmpFileName[FILENAMESIZE];
  DWORD                 dwFileNameLen;
  char                  *pChr;

  switch( ul_reason_for_call )
  {
  case DLL_PROCESS_ATTACH:
#ifdef FFE_DEBUG
    tmpDbgFlag = _CrtSetDbgFlag(_CRTDBG_REPORT_FLAG);
    tmpDbgFlag |= _CRTDBG_CHECK_CRT_DF;
    tmpDbgFlag |= _CRTDBG_LEAK_CHECK_DF;
    tmpDbgFlag |= _CRTDBG_ALLOC_MEM_DF;
    tmpDbgFlag |= _CRTDBG_CHECK_ALWAYS_DF;
    _CrtSetDbgFlag(tmpDbgFlag);

    hMemFile = CreateFile( "MemErrors", GENERIC_WRITE,
FILE_SHARE_READ, NULL,
                                        OPEN_ALWAYS,
FILE_ATTRIBUTE_NORMAL, NULL );

   _CrtSetReportMode( _CRT_WARN, _CRTDBG_MODE_FILE );
   _CrtSetReportFile( _CRT_WARN, hMemFile );
   _CrtSetReportMode( _CRT_ERROR, _CRTDBG_MODE_FILE );
   _CrtSetReportFile( _CRT_ERROR, hMemFile );
   _CrtSetReportMode( _CRT_ASSERT, _CRTDBG_MODE_FILE );
   _CrtSetReportFile( _CRT_ASSERT, hMemFile );
#endif
#ifdef DEBUG_ENTRY
    DebugBreak( );
#endif
    InitializeCriticalSection( &startupCriticalSection );

    dwFileNameLen = GetModuleFileName( hModule, szTmpFileName,
FILENAMESIZE-1);
    if( 0 == dwFileNameLen )
      return FALSE;

    pChr = strrchr( szTmpFileName, '\\' );
    if( NULL == pChr )
      return FALSE;

    pChr++;
    dwFileNameLen = strlen( pChr );
    if( 0 >= dwFileNameLen )
      return FALSE;

    CopyMemory( szModName, pChr, dwFileNameLen+1 );

    iWelcomeFormLen = sprintf(szWelcomeForm, szWelcomeFormTemplate,
szModName);

    if( ERR_SUCCESS != iInitStatus )
      return TRUE;

    break;
  case DLL_THREAD_ATTACH:
    break;
  case DLL_THREAD_DETACH:
    dwFileNameLen = 0;
    break;
  case DLL_PROCESS_DETACH:

    TPCCShutdown( );

    DeleteTransactionPool( );
    DeleteTemplatePool( );
    DeletePanicPool( );

    DeleteCriticalSection( &startupCriticalSection );

    TPCCCloseLog( );

    break;
  }
  return TRUE;
}

/* FUNCTION: BOOL WINAPI GetExtensionVersion(HSE_VERSION_INFO
*pVersion)
 *
 * PURPOSE:              This function is called by the inet service when the DLL
 *                       is first loaded.
 *
 * ARGUMENTS:            HSE_VERSION_INFO  *pVersion     passed in
structure in
 *
                which to place expected
 *
                version number.
 *
 * RETURNS:              TRUE
                expected return value.
 *
 * COMMENTS:             None
 *
 */

BOOL WINAPI
GetExtensionVersion(HSE_VERSION_INFO *pVersion)
{

  pVersion->dwExtensionVersion =
    MAKELONG(HSE_VERSION_MINOR, HSE_VERSION_MAJOR);
  strncpy(pVersion->lpszExtensionDesc,
                "Digital TPC-C Server.",
                HSE_MAX_EXT_DLL_NAME_LEN-1);
  *(pVersion->lpszExtensionDesc) = '\0';

  return TRUE;
}

/* FUNCTION: DWORD WINAPI
HttpExtensionProc(EXTENSION_CONTROL_BLOCK *pECB)
 *
```

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

DWORD WINAPI
HttpExtensionProc(EXTENSION_CONTROL_BLOCK *pECB)
{
  DWORD                         status;
  int                           dbstatus;
  TransportData                 transport;
  int                           formPoolSize;
  int                           responsePoolSize;
  int                           panicPoolSize;
  int                           transactionPoolSize;
  int                           transportThreadLimit;
  int                           webServerThreadLimit;
#ifdef FFE_DEBUG
  unsigned long                 ulHandle;
  unsigned              uThreadAddr;
#endif

  if ( ! startupFlag ) {
    EnterCriticalSection( &startupCriticalSection );
    if ( ! startupFlag ) {
      if( ERR_SUCCESS == iInitStatus ) {
            if ( ERR_SUCCESS != ( iInitStatus = ReadRegistrySettings( )))
              MakePanicPool( 50 );    /* make room for error messages */
            else {
              TPCCOpenLog( );
              iInitStatus = TPCCGetTransportData( &transport );
              if( ERR_SUCCESS != iInitStatus ) {
                MakePanicPool( 50 );  /* make room for error messages */
              }
              else {
                webServerThreadLimit = gdwPoolThreadLimit;
                if( transport.generic ) {
                  transportThreadLimit = transport.num_gc;
                }
                else {
                  transportThreadLimit = transport.num_dy +
                        transport.num_no + transport.num_os +
                        transport.num_pt + transport.num_sl;
                }

                /* The size of the transaction pool represents the maximum
number */
                /* of transactions that can be carried by any part of the system. */
                /* First sum the transactions that can be carried by the delivery */
                /* subsystem. */
                transactionPoolSize = transport.num_dy_servers +
                  transport.num_queued_deliveries +
transport.num_queued_responses;

                /* Menu transactions are only carried by the web server */
                /* and hence are limited by the count of web server threads. */
                formPoolSize = webServerThreadLimit;

                if( transport.asynchronous ) {
                  /* Delivery transactions and their interactive response */
                  /* are carried by the web server threads since they are */
                  /* synchronous.  Database transactions and their responses */
                  /* are limited by transport threads.  Therefore the maximum */
                  /* number of concurrent responses is the greater of the */
                  /* web server and transport thread counts. */
                  responsePoolSize =
MAX(webServerThreadLimit,transportThreadLimit);

                  /* Panic forms are used either to report errors or to */
                  /* handle the case where a response required the quoting */
                  /* of a character that is an HTML special character. */
                  /* The maximum number of these forms is also the greater of the
*/
                  /* web server and transport thread counts. */
                  panicPoolSize = MAX( webServerThreadLimit,
transportThreadLimit );

                  /* Since the transport is asynchronous, all web server and */
                  /* transport threads can carry a transaction. */
                  transactionPoolSize +=
                        webServerThreadLimit + transportThreadLimit;
                }
                else {
                  /* If the transport runs synchronously, only web server */
                  /* threads can generate any form of response. */
                  responsePoolSize = webServerThreadLimit;
                  panicPoolSize = webServerThreadLimit;

                  /* Since the transport is synchronous, a single transaction is */
                  /* shared by the web thread and the transport thread. */
                  transactionPoolSize +=
                        MAX( webServerThreadLimit, transportThreadLimit );
                }

                MakeTemplatePool( formPoolSize, responsePoolSize );
                MakePanicPool( panicPoolSize );
                MakeTransactionPool( transactionPoolSize );
                dbstatus = TPCCStartup( iMaxConnections, &transport );
                if( ERR_DB_SUCCESS != dbstatus ) {
                  iInitStatus = dbstatus;
                }

#ifdef FFE_DEBUG
                        ulHandle = _beginthreadex(
                                NULL,                           /*
Security        */
                                0,
                /* Stack size*/
                                CheckMemory,            /* Start
Address*/
                                NULL,                           /*
Arglist         */
                                0,
                /* Init flag    */
                                &uThreadAddr);  /* Thread address */

                        _ASSERT (ulHandle != 0);
#endif
              }
            }
      }
      startupFlag = TRUE;
    }
    LeaveCriticalSection( &startupCriticalSection );
  }
```

```
 if( ERR_SUCCESS != iInitStatus )
 {
  SendErrorResponse(pECB, iInitStatus, ERR_TYPE_WEBDLL, NULL, -1, -1,
NULL);
  return HSE_STATUS_SUCCESS;
 }

 /* if registry setting is for html logging then show http string passed in.*/
 if ( bLog )
 {
  TPCCLog( "%s %s\r\n", "* QUERY    *", pECB->lpszQueryString );
 }

 /* process http query */
 status = ProcessQueryString(pECB);

 /* finish up with status returned by Processing functions */
 return status;
}

/* FUNCTION: void SendErrorResponse( EXTENSION_CONTROL_BLOCK
*pECB, int iError,
 *                                                  int iErrorType, char
*szMsg,
 *                                                  int w_id, int ld_id )
 *
 * PURPOSE:              This function displays an error form in the client
browser.
 *
 * ARGUMENTS:          EXTENSION_CONTROL_BLOCK   *pECB       IIS
context structure pointer
 *
             unique to this connection.
 *                      int          iError                              id of
error message
 *                      int          iErrorType                error type,
ERR_TYPE_SQL,
 *
             ERR_TYPE_DBLIB, ERR_TYPE_WEBDLL
 *                      int          w_id
             Login warehouse ID.
 *                      int          ld_id
             Login district ID.
 *                      char         *szMsg
             optional error message string
 *                                                                          used
with ERR_TYPE_SQL and
 *
             ERR_TYPE_DBLIB
 *
 * RETURNS:              None
 *
 * COMMENTS:          If the error type is ERR_TYPE_WEBDLL the szMsg
parameter
 *                      may be NULL because it is ignored. If the error type is
 *                      ERR_TYPE_SQL or ERR_TYPE_DBLIB then the
szMsg parameter
 *                      contains the text of the error message, so the szMsg
 *                      parameter cannot be NULL.
 *
 */

void
SendErrorResponse( EXTENSION_CONTROL_BLOCK *pECB, int iError, int
iErrorType,
                   char *szMsg, int w_id, int ld_id, pConnData pConn )
{
 int          ii;

 static char szNoMsg[] = "";
 char                 *szErrorTypeMsg;
 char                 *szErrorMsg;
 char                 *szForm;
 int                  iStrLen;

 if ( !szMsg  )
  szMsg = szNoMsg;

 RESERVE_PANIC_FORM( szForm );

 if( ERR_TYPE_WEBDLL == iErrorType )
 {
  ii = 0;
  while( '\0' != errorMsgs[ii].szMsg[0] && iError != errorMsgs[ii].iError )
   ii++;
  if ( '\0' == errorMsgs[ii].szMsg[0] )
   ii = 1;  /* ERR_NO_MESSAGE */
  szErrorTypeMsg = "TPCCWEB";
  szErrorMsg = errorMsgs[ii].szMsg;
 }
 else if( ERR_TYPE_SQL == iErrorType )
 {
  szErrorTypeMsg = "SQLSVR";
  szErrorMsg = szMsg;
 }
 else if( ERR_TYPE_DBLIB == iErrorType )
 {
  szErrorTypeMsg = "DBLIB";
  szErrorMsg = szMsg;
 }

 if( NULL != pConn )
  TPCCTransactionErr( pConn, "%s(%d): %s\r\n",
                                    szErrorTypeMsg, iError, szErrorMsg );
 else
  TPCCErr( "%s(%d): %s\r\n", szErrorTypeMsg, iError, szErrorMsg );

 iStrLen = sprintf( szForm, szErrorFormTemplate, szModName,
                           WDID(w_id,ld_id), iError, szErrorTypeMsg,
szErrorMsg );

 SendResponse(pECB, szForm, iStrLen);

 UNRESERVE_PANIC_FORM( szForm );
}

/* FUNCTION: void HandlePanic(pPutStrStruct pStruct,
 *                                                  char *szInput, int iInputSize,
 *                                                  char **szOutput, int
*iOutputSize )
 *
 * PURPOSE:  This routine handles the case where the output string contains
 * at least one of the special characters double quote ("), ampersand (&),
 * less than (<), or greater than (>).  What it does is scan the strings
 * to be output checking for all special characters.  It then moves the
 * input string template sections further along in the output string
 * making enough room for the strings including their special quoted
 * charaters, then fills the new template with the output strings.
 *
 * ARGUMENTS:
 *
 * RETURNS:              void
 *
 * COMMENTS:
 */

void
HandlePanic( pPutStrStruct pStruct,
             char *szInput, int iInputSize,
             char **szOutput, int *iOutputSize )
{
 pPutStrStruct pStructTmp1;
 pPutStrStruct pStructTmp2;
 char *pIChar;
```

```
 int iExtra;
 int iTotalExtra;
 char *szTmp;

 RESERVE_PANIC_FORM( szTmp );

 /* first, save what we've done so far */
 *szOutput = szTmp;
 memcpy( szTmp, szInput, pStruct->iIndex );

 /* save the original values for string moving */
 pStructTmp1 = pStruct;
 while( NULL != pStructTmp1->szStr ) {
  pStructTmp1->iNewIndex = pStructTmp1->iIndex;
  pStructTmp1->iNewFieldSize = pStructTmp1->iFieldSize;
  pStructTmp1++;
 }

 /* parse all remaining strings for special characters and fix indicies */
 pStructTmp1 = pStruct;
 iTotalExtra = 0;
 while( NULL != pStructTmp1->szStr ) {
  pIChar = pStructTmp1->szStr;
  iExtra = 0;
  while( 0 != *pIChar )
  {
   if( '"' == *pIChar )
                iExtra += 5;
   else if( '&' == *pIChar )
                iExtra += 4;
   else if( '<' == *pIChar )
                iExtra += 3;
   else if( '>' == *pIChar )
                iExtra += 3;
   pIChar++;
  }

  /* reset field width for this string */
  pStructTmp1->iNewFieldSize += iExtra;

  /* move all following indicies */
  for( pStructTmp2 = pStructTmp1+1;
                NULL != pStructTmp2->szStr;
                pStructTmp2++ )
   pStructTmp2->iNewIndex += iExtra;

  pStructTmp1++;
  iTotalExtra += iExtra;
 }

 /* update new string length */
 *iOutputSize = iInputSize + iTotalExtra;

 /* move end of string to new output string */
 --pStructTmp1;
 memcpy( &szTmp[pStructTmp1->iNewIndex + pStructTmp1-
>iNewFieldSize],
                &szInput[pStructTmp1->iIndex + pStructTmp1->iFieldSize],
                iInputSize - pStructTmp1->iIndex + pStructTmp1->iFieldSize);

 /* move input string pieces to new locations in output string */
 pStructTmp2 = pStructTmp1--;
 while( pStruct != pStructTmp2 )
 {
  memcpy( &szTmp[pStructTmp1->iNewIndex + pStructTmp1-
>iNewFieldSize],
                &szInput[pStructTmp1->iIndex + pStructTmp1->iFieldSize],
                pStructTmp2->iIndex -
                ( pStructTmp1->iIndex + pStructTmp1->iFieldSize ));
  pStructTmp2 = pStructTmp1--;
 }

 /* Now put in the strings */
 pStructTmp1 = pStruct;
 while( NULL != pStructTmp1->szStr ) {
  CONVERT_SPECIAL( &szTmp[pStructTmp1->iNewIndex], pStructTmp1-
>szStr,
                        pStructTmp1->iNewFieldSize );
  pStructTmp1++;
 }
}

/* FUNCTION: void SendResponse(EXTENSION_CONTROL_BLOCK
*pECB, char *szForm,
 *                                              int iStrLen)
 *
 * PURPOSE:
 *   This function takes the forms generated by each transaction routine
 *   and calls the server callback function to pass it on to the browser.
 *
 * ARGUMENTS:
 *   EXTENSION_CONTROL_BLOCK        *pECB
            Server context structure.
 *   char                           *szForm                 form to pass to
browser.
 *   int                            iStrLen                 length of form
excluding null.
 *
 * RETURNS:
 *   None
 *
 * COMMENTS:
 */

void
SendResponse(EXTENSION_CONTROL_BLOCK *pECB, char *szForm, int
iStrLen)
{
 char                   szHeader1[sizeof(szResponseHeader)];
 static char  szHeader[] = "200 Ok";
 static int     iSize = sizeof(szHeader)-1;
 int                    lpbSize;

 lpbSize = iStrLen + 1;

 if ( bLog )
  TPCCLog( "%s %s\r\n", "* RESPONSE *", szForm );

 CopyMemory( szHeader1, szResponseHeader, sizeof(szResponseHeader) );
 PutNumeric(lpbSize, responseHeaderIndexes[0].iLen,
            &szHeader1[responseHeaderIndexes[0].iStartIndex]);

 (*pECB->ServerSupportFunction)(pECB->ConnID,
HSE_REQ_SEND_RESPONSE_HEADER,
                                        szHeader, &iSize,
(LPDWORD)szHeader1);
 (*pECB->WriteClient)(pECB->ConnID, szForm, &lpbSize, 0);
}

/* FUNCTION: ParseTemplateString(char *szForm, int *pcurLen,
 *                                              char *formTemplate,
FORM_INDEXES *indexes)
 *
 * PURPOSE:            This function parses the query string to find the ##
signs
 *                     that mark the positions for the values to be put, and
 *                     stores these locations and lengths in the indexes
structure.
 *
 * ARGUMENTS: char   *szForm       the resultant form
 *            int    *pcurLen the current length of szForm
 *            char   *formTemplate        the form's template
 *            FORM_INDEXES *indexes       ptr to the array of indexes for
the
```

```
 *                                                          tag values of the
form
 *
 * RETURNS:              void
 *
 * COMMENTS:
 */

void
ParseTemplateString(char *szForm, int *pcurLen,
                                char *formTemplate, FORM_INDEXES *indexes)
{
  int   curIndex = 0;
  int           ii = 0;
  int           jj;
  int           curLen;

  curLen = *pcurLen;
  while ('\0' != formTemplate[ii])
  {
    if('#' != formTemplate[ii])
    {
      szForm[curLen] = formTemplate[ii];
      ii++;
      curLen++;
    }
    else
    {
      jj = 0;
      indexes[curIndex].iStartIndex = curLen;
      while('#' == formTemplate[ii])
      {
                jj++;
                szForm[curLen] = formTemplate[ii];
                curLen++;
                ii++;
      }
      indexes[curIndex].iLen = jj;
      curIndex++;
    }
  }
  szForm[curLen] = '\0';
  *pcurLen = curLen;
}

/* FUNCTION: void PutNumeric(int iInt, int iFieldSize, char *pChar )
 *
 * PURPOSE:              This function converts an integer to a char string.
 *
 * ARGUMENTS:    int             iInt                    the integer to
convert to string
 *                       int             iFieldSize      max size of char string to
return.
 *                       char            *pChar                  the string to put
the int into.
 *
 * RETURNS:              None
 *
 * COMMENTS:             If the Integer value exceeds the max field size, then
 *                       the string will be filled with iFieldSize "*" to signal
 *                       an error.
 */

void
PutNumeric( int iInt, int iFieldSize, char *pChar )
{
  int iSaveSize = iFieldSize;
  char *pSaveStart = pChar;
  char pAsterisk[] = "**********";
  BOOL bSignFlag = TRUE;

  pChar += (iFieldSize - 1);

  if(0 > iInt)
  {
    bSignFlag = FALSE;
    iInt = abs(iInt);
  }

  do
  {
    *pChar = ( iInt % 10 ) + '0';
    iInt /= 10;
    iFieldSize--;
    if( iFieldSize )
      pChar--;
  } while( iFieldSize );

  if( !bSignFlag )
  {
    if('0' == *pChar)
      *pChar = '-';
    else
    {
      memcpy( pSaveStart, pAsterisk, iSaveSize );
      return;
    }
  }

  if( 0 != iInt )
  {
    /* put in string of ** to signal error */
    memcpy( pSaveStart, pAsterisk, iSaveSize );
  }
}

/* FUNCTION: void SendDeliveryForm( EXTENSION_CONTROL_BLOCK
*pECB,
 *                                                      int w_id, int ld_id )
 *
 * PURPOSE:              This function puts the data into the input form and then
 *                       returns the form to the browser.
 *
 * ARGUMENTS:    EXTENSION_CONTROL_BLOCK   *pECB
        structure pointer to passed in
 *
        internet service information.
 *                       int             w_id
        Login warehouse ID.
 *                       int             ld_id
        Login district ID.
 &
 * RETURNS:                      None
 *
 * COMMENTS:             None
 *
 */

void
SendDeliveryForm( EXTENSION_CONTROL_BLOCK *pECB, int w_id, int
ld_id )
{
  char          *deliveryForm;

  RESERVE_FORM( DELIVERY_FORM, deliveryForm );

  PutNumeric(WDID(w_id,ld_id),
                deliveryFormIndexesI[D_WDID].iLen,
                &deliveryForm[deliveryFormIndexesI[D_WDID].iStartIndex]);
  PutNumeric(w_id,
                deliveryFormIndexesI[D_WID].iLen,
                &deliveryForm[deliveryFormIndexesI[D_WID].iStartIndex]);

  SendResponse(pECB, deliveryForm, giFormLen[DELIVERY_FORM]);
```

```
 UNRESERVE_FORM( DELIVERY_FORM, deliveryForm );
}

/* FUNCTION: void SendNewOrderForm( EXTENSION_CONTROL_BLOCK
*pECB,
 *                                                  int w_id, int ld_id )
 *
 * PURPOSE:              This function puts the data into the input form and then
 *                       returns the form to the browser.
 *
 * ARGUMENTS:            EXTENSION_CONTROL_BLOCK   *pECB
                pointer to the structure that
 *                                                                        is
passed in the internet
 *                       int                       w_id          warehouse id
 *                       int                       ld_id         login district id
 *
 * RETURNS:              None
 *
 * COMMENTS:             None
 *
 */

void
SendNewOrderForm( EXTENSION_CONTROL_BLOCK *pECB, int w_id, int
ld_id )
{
 char         *newOrderForm;

 RESERVE_FORM( NEW_ORDER_FORM, newOrderForm );

 PutNumeric(WDID(w_id,ld_id),
                   newOrderFormIndexes[NO_WDID].iLen,

&newOrderForm[newOrderFormIndexes[NO_WDID].iStartIndex]);
 PutNumeric(w_id,
                   newOrderFormIndexes[NO_WID].iLen,

&newOrderForm[newOrderFormIndexes[NO_WID].iStartIndex]);

 SendResponse(pECB, newOrderForm, giFormLen[NEW_ORDER_FORM]);

 UNRESERVE_FORM( NEW_ORDER_FORM, newOrderForm );
}

/* FUNCTION: void SendPaymentForm(EXTENSION_CONTROL_BLOCK
*pECB,
 *                                                  int w_id, int ld_id,
DBContext *pdb)
 *
 * PURPOSE:              This function puts the data into the input form and then
 *                       returns the form to the browser.
 *
 * ARGUMENTS:
 *                       EXTENSION_CONTROL_BLOCK   *pECB
                pointer to structure passed in
 *                                                                        the
internet
 *                       int                                   w_id
               warehouse id
 *                       int                                   ld_id
               login district id
 *
 * RETURNS:              None
 *
 * COMMENTS:             None
 *
 */

void
SendPaymentForm( EXTENSION_CONTROL_BLOCK *pECB, int w_id, int
ld_id )
{
 char         *paymentForm;

 RESERVE_FORM( PAYMENT_FORM, paymentForm );

 PutNumeric(WDID(w_id,ld_id),
                   paymentFormIndexes[PT_WDID_INPUT].iLen,

&paymentForm[paymentFormIndexes[PT_WDID_INPUT].iStartIndex]);
 /* the date field is before wid for the response so use 2 here */
 PutNumeric(w_id,
                   paymentFormIndexes[PT_WID_INPUT].iLen,

&paymentForm[paymentFormIndexes[PT_WID_INPUT].iStartIndex]);

 SendResponse(pECB, paymentForm, giFormLen[PAYMENT_FORM]);

 UNRESERVE_FORM( PAYMENT_FORM, paymentForm );
}

/* FUNCTION: void SendOrderStatusForm(EXTENSION_CONTROL_BLOCK
*pECB,
 *                                                  int w_id, int
ld_id, DBContext *pdb)
 *
 * PURPOSE:              This function fills in data and then sends the order
status
 *                       input form back to the browser.
 *
 * ARGUMENTS:            EXTENSION_CONTROL_BLOCK *pECB         ptr
to structure passed in the
 *
               internet.
 *                       int                       w_id          warehouse id
 *                       int                       ld_id         login district id
 *
 * RETURNS:              None
 *
 * COMMENTS:             None
 *
 */

void
SendOrderStatusForm( EXTENSION_CONTROL_BLOCK *pECB, int w_id, int
ld_id )
{
 char         *orderStatusForm;

 RESERVE_FORM( ORDER_STATUS_FORM, orderStatusForm );

 PutNumeric(WDID(w_id,ld_id),
                   orderStatusFormIndexes[OS_WDID].iLen,

&orderStatusForm[orderStatusFormIndexes[OS_WDID].iStartIndex]);
 PutNumeric(w_id,
                   orderStatusFormIndexes[OS_WID].iLen,

&orderStatusForm[orderStatusFormIndexes[OS_WID].iStartIndex]);
 SendResponse(pECB, orderStatusForm,
giFormLen[ORDER_STATUS_FORM]);

 UNRESERVE_FORM( ORDER_STATUS_FORM, orderStatusForm );
}

/* FUNCTION: void SendStockLevelForm(EXTENSION_CONTROL_BLOCK
*pECB,
 *                                                  int w_id, int d_id,
DBContext *pdb)
 *
 * PURPOSE:              This function puts the data into the input form and then
 *                       returns the form to the browser.
 *
```

```
 * ARGUMENTS:        EXTENSION_CONTROL_BLOCK   *pECB
                structure pointer to passed
 *                                                                    in
internet service information
 *                        int                     w_id
                warehouse id
 *                        int                     d_id
                district id
 *                        DBContext  *pdb                 pointer to
database context.
 *
 * RETURNS:               None
 *
 * COMMENTS:              None
 *
 */

void
SendStockLevelForm( EXTENSION_CONTROL_BLOCK *pECB, int w_id, int
d_id )
{
  char          *stockLevelForm;

  RESERVE_FORM( STOCK_LEVEL_FORM, stockLevelForm );

  PutNumeric(WDID(w_id,d_id),
                    stockLevelFormIndexes[SL_WDID].iLen,

&stockLevelForm[stockLevelFormIndexes[SL_WDID].iStartIndex]);
  PutNumeric(w_id,
                    stockLevelFormIndexes[SL_WID].iLen,

&stockLevelForm[stockLevelFormIndexes[SL_WID].iStartIndex]);
  PutNumeric(d_id,
                    stockLevelFormIndexes[SL_DID].iLen,

&stockLevelForm[stockLevelFormIndexes[SL_DID].iStartIndex]);

  SendResponse(pECB, stockLevelForm, giFormLen[STOCK_LEVEL_FORM]);

  UNRESERVE_FORM( STOCK_LEVEL_FORM, stockLevelForm );
}


/* FUNCTION: void SendMainMenuForm(EXTENSION_CONTROL_BLOCK
*pECB,
 *                                                  int w_id, int ld_id, char
*szStatus)
 *
 * PURPOSE:               This function sends the main menu form to the browser.
 *
 * ARGUMENTS:             EXTENSION_CONTROL_BLOCK   *pECB        IIS
context structure pointer
 *
                unique to this connection.
 *
 *                        int             w_id
                warehouse id
 *                        int             ld_id
                login district id
 *                        char            *szStatus               String to report
previous
 *
                operation status.
 *
 * RETURNS:               None
 *
 * COMMENTS:
 */

void
SendMainMenuForm( EXTENSION_CONTROL_BLOCK *pECB,
                                int w_id, int ld_id, char *szStatus )
{
  char          *szForm;
  int           iStrLen;
  static char   *szNoStatus = "";
  char          *pszStatus;

  pszStatus = ( NULL == szStatus ) ? szNoStatus : szStatus;

  RESERVE_PANIC_FORM( szForm );

  iStrLen = sprintf( szForm, szMainMenuFormTemplate,
                                szModName, WDID(w_id,ld_id), pszStatus );

  SendResponse(pECB, szForm, iStrLen);

  UNRESERVE_PANIC_FORM( szForm );
}

/* FUNCTION: void SendWelcomeForm(EXTENSION_CONTROL_BLOCK
*pECB)
 *
 * PURPOSE:               This function sends the welcome form to the browser.
 *
 * ARGUMENTS:   None
 *
 * RETURNS:               None
 *
 * COMMENTS:              The welcome form is generated on initialization.
 */

void
SendWelcomeForm(EXTENSION_CONTROL_BLOCK *pECB)
{
  SendResponse( pECB, szWelcomeForm, iWelcomeFormLen );
}

/* FUNCTION: DWORD
ProcessQueryString(EXTENSION_CONTROL_BLOCK *pECB)
 *
 * PURPOSE:               This function extracts the relevent information out
 *                        of the http command passed in from the browser.
 *
 * ARGUMENTS:             EXTENSION_CONTROL_BLOCK   *pECB        IIS
context structure pointer
 *
                unique to this connection.
 *
 * RETURNS:               DWORD
                server connection status code
 *
 * COMMENTS:              If this is the initial connection i.e. client is at
 *                        welcome screen then there will not be a terminal id or
 *                        current form id if this is the case then the pTermid and
 *                        pFormid return values are undefined.
 */

DWORD
ProcessQueryString(EXTENSION_CONTROL_BLOCK *pECB)
{
  static char *beginptr = "Begin";
  char *ptr;
  char *cmdptr;
  int cFormID;
  int w_id;
  int ld_id;
  DWORD status;
  int retcode;

  w_id = 0;
  ld_id = 0;
```

```
 if ( GetCharKeyValuePtr( pECB->lpszQueryString, '3', &ptr ))
 {
  cFormID = *ptr++;
  if( !GetWDID( ptr, &w_id, &ld_id, &ptr )) {
   SendErrorResponse( pECB, ERR_W_ID_INVALID, ERR_TYPE_WEBDLL,
NULL,
                                        w_id, ld_id, NULL );
   return HSE_STATUS_SUCCESS_AND_KEEP_CONN;
  }
 }
 else
  cFormID = '\0';

 /* now figure out what command we have and execute it */
 if ( !GetCharKeyValuePtr( ptr, '0', &cmdptr ))
 {
  if( 0 == strlen( pECB->lpszQueryString )) {
   cmdptr = beginptr;
  }
  else {
   SendErrorResponse( pECB, ERR_COMMAND_UNDEFINED,
ERR_TYPE_WEBDLL,
                                        NULL, w_id, ld_id, NULL );
   return HSE_STATUS_SUCCESS_AND_KEEP_CONN;
  }
 }

 if( '\0' == cFormID && !MATCHES_BEGIN( cmdptr )) {
  SendErrorResponse( pECB,
ERR_INVALID_FORM_AND_CMD_NOT_BEGIN,
                                ERR_TYPE_WEBDLL, NULL, w_id, ld_id,
NULL );
  return HSE_STATUS_SUCCESS_AND_KEEP_CONN;
 }

 status = HSE_STATUS_SUCCESS_AND_KEEP_CONN;
 if( MATCHES_PROCESS( cmdptr ))
 {
  if( 'N' == cFormID )
   retcode = ProcessNewOrderQuery( pECB, ptr, w_id, ld_id );
  else if( 'P' == cFormID )
   retcode = ProcessPaymentQuery( pECB, ptr, w_id, ld_id );
  else if( 'D' == cFormID )
   retcode = ProcessDeliveryQuery( pECB, ptr, w_id, ld_id );
  else if( 'O' == cFormID )
   retcode = ProcessOrderStatusQuery( pECB, ptr, w_id, ld_id );
  else if( 'S' == cFormID )
   retcode = ProcessStockLevelQuery( pECB, ptr, w_id, ld_id );
  else {
   SendErrorResponse( pECB, ERR_INVALID_FORM,
ERR_TYPE_WEBDLL, NULL,
                                        w_id, ld_id, NULL );
   return HSE_STATUS_SUCCESS_AND_KEEP_CONN;
  }

  if( ERR_DB_PENDING == retcode )
   status = HSE_STATUS_PENDING;
  else if( ERR_DB_SUCCESS != retcode ) {
   SendErrorResponse( pECB, retcode, ERR_TYPE_WEBDLL,
                                        NULL, w_id, ld_id, NULL );
   return HSE_STATUS_SUCCESS_AND_KEEP_CONN;
  }
 }
 else if( MATCHES_PAYMENT( cmdptr ))
  SendPaymentForm( pECB, w_id, ld_id );
 else if( MATCHES_NEWORDER( cmdptr ))
  SendNewOrderForm( pECB, w_id, ld_id );
 else if( MATCHES_DELIVERY( cmdptr ))
  SendDeliveryForm( pECB, w_id, ld_id );
 else if( MATCHES_ORDERSTATUS( cmdptr ))
  SendOrderStatusForm( pECB, w_id, ld_id );
 else if( MATCHES_STOCKLEVEL( cmdptr ))
  SendStockLevelForm( pECB, w_id, ld_id );
 else if( MATCHES_EXIT( cmdptr ))
  ExitCmd( pECB );
 else if( MATCHES_SUBMIT( cmdptr ))
  SubmitCmd( pECB, &w_id, &ld_id );
 else if( MATCHES_BEGIN( cmdptr ))
  BeginCmd( pECB );
 else if( MATCHES_MENU( cmdptr ))
  MenuCmd( pECB, w_id, ld_id );
 else if( MATCHES_CLEAR( cmdptr ))
  ClearCmd( pECB );
 else if( MATCHES_CHECKPOINT_STARTUP( cmdptr ))
  CheckpointStartupCmd( pECB, w_id, ld_id );
 else if( MATCHES_CHECKPOINT( cmdptr ))
  CheckpointCmd( pECB, w_id, ld_id );
#ifdef FFE_DEBUG
 else if( MATCHES_MEMORYCHECK( cmdptr ))
  MemoryCheckCmd( pECB, w_id, ld_id );
#endif
 else
  SendErrorResponse( pECB, ERR_COMMAND_UNDEFINED,
ERR_TYPE_WEBDLL,
                                NULL, w_id, ld_id, NULL );

 return status;
}

/* FUNCTION: PutFloat2(double dVal, int iFieldSize, char *pChar )
 *
 * PURPOSE:          This function converts a double into a char string
 *                   in the format of xx.xx
 *
 * ARGUMENTS: double          dVal                    the value to
convert to char
 *            int     iFieldSize   max size of char string
 *            char    pChar                string where to put value
 *
 * RETURNS:          void
 *
 * COMMENTS:         If the double exceeds the max field size entered,
 *                   the char string will be filled with iFieldSize *'s
 *                   to signal an error
 */

void
PutFloat2( double dVal, int iFieldSize, char *pChar )
{
 int iInt;
 int iDecimal;
 BOOL bSignFlag = TRUE;
 int iSaveSize = iFieldSize;
 char *pSaveStart = pChar;
 char pAsterisk[] = "**********";

 pChar += (iFieldSize - 1);

 if(0 > dVal)
 {
  bSignFlag = FALSE;
  iInt = abs((int)( dVal * 100. ));
 }
 else
 {
  iInt = (int)( dVal * 100. );
 }
 iDecimal = 2;
 do
 {
  *pChar-- = ( iInt % 10 ) + '0';
  iInt /= 10;
  iFieldSize--;
 } while( --iDecimal );
```

```
 *pChar-- = '.';
 iFieldSize--;

 do
 {
  *pChar-- = ( iInt % 10 ) + '0';
  iInt /= 10;
  iFieldSize--;
 } while( iFieldSize && iInt != 0 );

 if( !iFieldSize && iInt != 0 )
 {
  /* put in string of ** to signal error */
  memcpy(pSaveStart, pAsterisk, iSaveSize);
  return;
 }
 if(!bSignFlag)
 {
  iFieldSize--;
  if( 0 >= iFieldSize )
  {
   /* put in string of  ** to signal error */
   memcpy(pSaveStart, pAsterisk, iSaveSize);
   return;
  }
  *pChar-- = '-';
 }

 /* Fill in the remaining spaces in the field with blanks. */
 while( iFieldSize-- )
  *pChar-- = ' ';
}
/* FUNCTION: void PutHTMLStrings( pPutStrStruct pStruct,
 *                                                    char *szInput, int
iInputSize,
 *                                                    char **szOutput,
int *iOutputSize )
 *
 * PURPOSE:  This routine takes a template output string and a data structure
 *           containing strings, positions, and field widths of strings to be
 *           compied into the template.  The routine scans all input strings to
 *           determine if any contain special charaters that need to be quoted
 *           in the output string.  If none exist, the template is filled with
 *           the desired strings.  If at least one special character exists in
 *           the output strings, a more expensive routine is called to build a
 *           new output string template containing the quoted strings.
 *
 * ARGUMENTS: pPutStrStruct    pStruct       pointer to structure containing
the
 *                                                    strings, positions
and field lengths.
 *            char             *szInput      pointer to input form
 *            int              iInputSize    length of the input form
 *            char             **szOutput    pointer to the new input form
 *                                                    it
may or may not be different
 *                                                    than
the input form.
 *            int              iOutputSize   length of the new input form.
 *
 * RETURNS:   none
 *
 * COMMENTS:        none
 */

void
PutHTMLStrings( pPutStrStruct pStruct,
                char *szInput, int iInputSize,
                char **szOutput, int *iOutputSize )
{
 char *pIChar;
 char *pOChar;
 int          iFieldSize;

 while( NULL != pStruct->szStr )
 {
  pIChar = pStruct->szStr;
  pOChar = szInput + pStruct->iIndex;
  iFieldSize = pStruct->iFieldSize;
  while( 0 != *pIChar && iFieldSize )
  {
   /* '>' is the highest ACSII value of the special characters. */
   /* If '>' is greater than the character is question, check further. */
   if( '>' > *pIChar )
   {
            if( '"' == *pIChar || '&' == *pIChar ||
                '<' == *pIChar || '>' == *pIChar )
            {
             /* We have found at least one special character in the desired */
             /* output string, go the the more expensive routine to build */
             /* the desired output string. */
             InterlockedIncrement( &giPanic );
             HandlePanic( pStruct, szInput, iInputSize, szOutput, iOutputSize );
             return;
            }
            else
             *pOChar = *pIChar;
   }
   else
            *pOChar = *pIChar;

   pIChar++;
   pOChar++;
   iFieldSize--;
  }

  /* Fill in the remaining spaces in the field with blanks. */
  while( iFieldSize-- )
   *pOChar++ = ' ';

  pStruct++;
 }

 /* The output string is the template and the length is unchanged */
 *szOutput = szInput;
 *iOutputSize = iInputSize;

 return;
}

/* FUNCTION: void TPCCDeliveryResponse(
EXTENSION_CONTROL_BLOCK *pECB,
 *                                                    int retcode,
 *                                                    DeliveryData
*deliveryData )
 *
 * PURPOSE:          This function fills in the values and returns the
 *                   response form to the browser.
 *
 * ARGUMENTS:        EXTENSION_CONTROL_BLOCK *pECB
 *                   int                             retcode  return
code from db
 *                   DeliveryData                    *deliveryData
pointer to the delivery
 *                                                                    data
structure.
 *
 * RETURNS:          none
 *
 * COMMENTS:         none
 */

void
```

```
TPCCDeliveryResponse( int retcode, pDeliveryData pDelivery,
                      pDeliveryData
CompletedDeliveries[DELIVERY_RESPONSE_COUNT] )
{
  int ssCnt = 0;
  char *szOutput;
  int iOutputLen;
  PutStrStruct StrStruct[2];
  char *deliveryForm;
  int ii, jj, index;
  pDeliveryData pCompletedDelivery;
  static DeliveryData blankDelivery = { 0 };
  EXTENSION_CONTROL_BLOCK *pECB;

  pECB = pDelivery->pCC;

  if ( ERR_DB_PENDING == retcode )
  {
    return;
  }
  else if ( ERR_DB_DEADLOCK_LIMIT == retcode )
  {
    for( jj = 0; jj < DELIVERY_RESPONSE_COUNT; jj++ )
      if( NULL != CompletedDeliveries[jj] ) {
#ifdef FFE_DEBUG
                CompletedDeliveries[jj]->iStage |= UNRESERVING;
#endif
                UNRESERVE_TRANSACTION_STRUCT( DELIVERY_TRANS,
CompletedDeliveries[jj] );
      }

    SendErrorResponse( pECB, ERR_DELIVERY_NOT_PROCESSED,
                                ERR_TYPE_WEBDLL, NULL,
                                pDelivery->w_id, pDelivery->ld_id,
                                (pConnData)pDelivery );

    return;
  }
  else          if ( ERR_DB_SUCCESS != retcode )
  {
    for( jj = 0; jj < DELIVERY_RESPONSE_COUNT; jj++ )
      if( NULL != CompletedDeliveries[jj] ) {
#ifdef FFE_DEBUG
                CompletedDeliveries[jj]->iStage |= UNRESERVING;
#endif
                UNRESERVE_TRANSACTION_STRUCT( DELIVERY_TRANS,
CompletedDeliveries[jj] );
      }

    SendErrorResponse( pECB, ERR_DB_DELIVERY_NOT_QUEUED,
                                ERR_TYPE_WEBDLL, NULL,
                                pDelivery->w_id, pDelivery->ld_id,
                                (pConnData)pDelivery );

    return;
  }

  RESERVE_RESPONSE( DELIVERY_RESPONSE, deliveryForm );

  PutNumeric(WDID(pDelivery->w_id,pDelivery->ld_id),
                deliveryFormIndexesP[D_WDID].iLen,
                &deliveryForm[deliveryFormIndexesP[D_WDID].iStartIndex]);
  PutNumeric(pDelivery->w_id,
                deliveryFormIndexesP[D_WID].iLen,
                &deliveryForm[deliveryFormIndexesP[D_WID].iStartIndex]);
  PutNumeric(pDelivery->o_carrier_id,
                deliveryFormIndexesP[D_CAR].iLen,
                &deliveryForm[deliveryFormIndexesP[D_CAR].iStartIndex]);

  index = D_QUEUE1;
  for( jj = 0; jj < DELIVERY_RESPONSE_COUNT; jj++ ) {
    if( NULL == CompletedDeliveries[jj] )
      pCompletedDelivery = &blankDelivery;
    else
      pCompletedDelivery = CompletedDeliveries[jj];
    PutNumeric(pCompletedDelivery->queue_time,
                deliveryFormIndexesP[index].iLen,
                &deliveryForm[deliveryFormIndexesP[index].iStartIndex]);
    index++;
    PutNumeric(pCompletedDelivery->delta_time,
                deliveryFormIndexesP[index].iLen,
                &deliveryForm[deliveryFormIndexesP[index].iStartIndex]);
    index++;
    PutNumeric(pCompletedDelivery->w_id,
                deliveryFormIndexesP[index].iLen,
                &deliveryForm[deliveryFormIndexesP[index].iStartIndex]);
    index++;
    PutNumeric(pCompletedDelivery->o_carrier_id,
                deliveryFormIndexesP[index].iLen,
                &deliveryForm[deliveryFormIndexesP[index].iStartIndex]);
    index++;
    for( ii = 0; ii < 10; ii++ ) {
      PutNumeric(pCompletedDelivery->o_id[ii],
                        deliveryFormIndexesP[index].iLen,

&deliveryForm[deliveryFormIndexesP[index].iStartIndex]);
      index++;
    }
    if( NULL != CompletedDeliveries[jj] ) {
#ifdef FFE_DEBUG
      CompletedDeliveries[jj]->iStage |= UNRESERVING;
#endif
      UNRESERVE_TRANSACTION_STRUCT( DELIVERY_TRANS,
CompletedDeliveries[jj] );
    }
  }

  PUT_STRING(NULL, 0, 0, StrStruct[ssCnt]);
  PutHTMLStrings(StrStruct, deliveryForm,
giResponseLen[DELIVERY_RESPONSE],
                        &szOutput, &iOutputLen);

  SendResponse(pECB, szOutput, iOutputLen);

  UNRESERVE_RESPONSE( DELIVERY_RESPONSE, deliveryForm );

  if( szOutput != deliveryForm )
    UNRESERVE_PANIC_FORM( szOutput );
}

/* FUNCTION: void
TPCCNewOrderResponse(EXTENSION_CONTROL_BLOCK *pECB,
 *                                                      int retcode,
 *                                                      NewOrderData
*newOrderData )
 *
 * PURPOSE:             This function fills in the values and returns the
 *                      response form to the browser.
 *
 * ARGUMENTS:           EXTENSION_CONTROL_BLOCK  *pECB
                pointer to the structure
 *                                                                      that
contains the internet
 *
                service information.
 *                      int                     retcode         return status from
the db.
 *                      NewOrderData            *newOrderData
                pointer to structure containing
 *                                                                      data
about the current txn.
 *
 * RETURNS:             none
 *
```

```
 * COMMENTS:            none
 */

void
TPCCNewOrderResponse( int retcode, pNewOrderData pNewOrder )
{
  int             i;
  char  szDate[]   = "xx-xx-xxxx xx:xx:xx";
  char  szBlanks[] = "                    ";
  char  szDollar[] = "$";
  PutStrStruct StrStruct[133];
  int ssCnt = 0;
  int jj;
  int kk;
  int mm;
  char *newOrderForm;
  char *szOutput;
  int iOutputLen;
  BOOL bValid;
  char *execution_status;
  char szStatus[80];
  EXTENSION_CONTROL_BLOCK *pECB;

  pECB = pNewOrder->pCC;

  if ( ERR_DB_PENDING == retcode )
  {
   return;
  }
  else if ( ERR_DB_DEADLOCK_LIMIT == retcode )
  {
   SendErrorResponse( pECB, ERR_NEW_ORDER_NOT_PROCESSED,
                            ERR_TYPE_WEBDLL, NULL,
                            pNewOrder->w_id, pNewOrder->ld_id,
                            (pConnData)pNewOrder );
   return;
  }
  else if( ERR_DB_SUCCESS != retcode && ERR_DB_NOT_COMMITED !=
retcode )
  {
   sprintf( szStatus,
            "Item number is not valid, or DB error = %d",
            pNewOrder->dbstatus );
   SendErrorResponse( pECB, ERR_DB_ERROR,
                            ERR_TYPE_WEBDLL, NULL,
                            pNewOrder->w_id, pNewOrder->ld_id,
                            (pConnData)pNewOrder );
   return;
  }
  else if ( ERR_DB_SUCCESS == retcode )
  {
   bValid = TRUE;
   execution_status = "Transaction commited.";
  }
  else if ( ERR_DB_NOT_COMMITED == retcode )
  {
   bValid = FALSE;
   execution_status = "Item number is not valid.";
  }

  RESERVE_RESPONSE( NEW_ORDER_RESPONSE, newOrderForm );

  if(bValid)
  {
   PutNumeric(WDID(pNewOrder->w_id,pNewOrder->ld_id),
              newOrderResponseIndexes[NO_WDID].iLen,

&newOrderForm[newOrderResponseIndexes[NO_WDID].iStartIndex]);
   PutNumeric(pNewOrder->w_id,
              newOrderResponseIndexes[NO_WID].iLen,

&newOrderForm[newOrderResponseIndexes[NO_WID].iStartIndex]);
   PutNumeric(pNewOrder->d_id,
              newOrderResponseIndexes[NO_DID].iLen,

&newOrderForm[newOrderResponseIndexes[NO_DID].iStartIndex]);

   /* put the date in if valid */
   PutNumeric(pNewOrder->o_entry_d.day, 2, &szDate[0]);
   PutNumeric(pNewOrder->o_entry_d.month, 2, &szDate[3]);
   PutNumeric(pNewOrder->o_entry_d.year, 4, &szDate[6]);
   PutNumeric(pNewOrder->o_entry_d.hour, 2, &szDate[11]);
   PutNumeric(pNewOrder->o_entry_d.minute, 2, &szDate[14]);
   PutNumeric(pNewOrder->o_entry_d.second, 2, &szDate[17]);

memcpy(&newOrderForm[newOrderResponseIndexes[NO_DATE].iStartIndex],
          szDate, newOrderResponseIndexes[NO_DATE].iLen);
  }
  else
  {
   /* put in blanks for the date if not valid */

memcpy(&newOrderForm[newOrderResponseIndexes[NO_DATE].iStartIndex],
          szBlanks, newOrderResponseIndexes[NO_DATE].iLen);
  }
  /* put in value for the customer id. */
  PutNumeric(pNewOrder->c_id,
             newOrderResponseIndexes[NO_CID].iLen,

&newOrderForm[newOrderResponseIndexes[NO_CID].iStartIndex]);

  /* put in the values for the last name and  credit rating */
  PUT_STRING(pNewOrder->c_last,
             newOrderResponseIndexes[NO_LAST].iLen,
             newOrderResponseIndexes[NO_LAST].iStartIndex,
             StrStruct[ssCnt]);
  ssCnt++;
  PUT_STRING(pNewOrder->c_credit,
             newOrderResponseIndexes[NO_CREDIT].iLen,
             newOrderResponseIndexes[NO_CREDIT].iStartIndex,
             StrStruct[ssCnt]);
  ssCnt++;

  if(bValid)
  {
   /* put in the values */
   PutFloat2(pNewOrder->c_discount,
             newOrderResponseIndexes[NO_DISC].iLen,

&newOrderForm[newOrderResponseIndexes[NO_DISC].iStartIndex]);
   PutNumeric(pNewOrder->o_id,
              newOrderResponseIndexes[NO_OID].iLen,

&newOrderForm[newOrderResponseIndexes[NO_OID].iStartIndex]);
   PutNumeric(pNewOrder->o_ol_cnt,
              newOrderResponseIndexes[NO_LINES].iLen,

&newOrderForm[newOrderResponseIndexes[NO_LINES].iStartIndex]);
   PutFloat2(pNewOrder->w_tax,
             newOrderResponseIndexes[NO_W_TAX].iLen,

&newOrderForm[newOrderResponseIndexes[NO_W_TAX].iStartIndex]);
   PutFloat2(pNewOrder->d_tax,
             newOrderResponseIndexes[NO_D_TAX].iLen,

&newOrderForm[newOrderResponseIndexes[NO_D_TAX].iStartIndex]);


   for(i=0; i<pNewOrder->o_ol_cnt; i++)
   {
    PutNumeric(pNewOrder->o_ol[i].ol_supply_w_id,
                        newOrderResponseIndexes[NO_S_WID+(i*8)].iLen,

&newOrderForm[newOrderResponseIndexes[NO_S_WID+(i*8)].iStartIndex]);
```

```
    PutNumeric(pNewOrder->o_ol[i].ol_i_id,
                            newOrderResponseIndexes[NO_IID+(i*8)].iLen,

&newOrderForm[newOrderResponseIndexes[NO_IID+(i*8)].iStartIndex]);
    PUT_STRING(pNewOrder->o_ol[i].i_name,
                            newOrderResponseIndexes[NO_INAME+(i*8)].iLen,

newOrderResponseIndexes[NO_INAME+(i*8)].iStartIndex,
                            StrStruct[ssCnt]);
    ssCnt++;
    PutNumeric(pNewOrder->o_ol[i].ol_quantity,
                            newOrderResponseIndexes[NO_QTY+(i*8)].iLen,

&newOrderForm[newOrderResponseIndexes[NO_QTY+(i*8)].iStartIndex]);

    PutNumeric(pNewOrder->o_ol[i].s_quantity,
                            newOrderResponseIndexes[NO_STOCK+(i*8)].iLen,

&newOrderForm[newOrderResponseIndexes[NO_STOCK+(i*8)].iStartIndex]);
    PUT_STRING(pNewOrder->o_ol[i].b_g,
                            newOrderResponseIndexes[NO_BG+(i*8)].iLen,

newOrderResponseIndexes[NO_BG+(i*8)].iStartIndex,
                            StrStruct[ssCnt]);
    ssCnt++;

memcpy(&newOrderForm[newOrderResponseIndexes[NO_PRICE+(i*8)].iStart
Index-1],
                    szDollar, 1);
    PutFloat2(pNewOrder->o_ol[i].i_price,
                            newOrderResponseIndexes[NO_PRICE+(i*8)].iLen,

                &newOrderForm[newOrderResponseIndexes[NO_PRICE+(i*8)].iSt
artIndex]);

memcpy(&newOrderForm[newOrderResponseIndexes[NO_AMT+(i*8)].iStartIn
dex-1],
                    szDollar, 1);
    PutFloat2(pNewOrder->o_ol[i].ol_amount,
                            newOrderResponseIndexes[NO_AMT+(i*8)].iLen,

                &newOrderForm[newOrderResponseIndexes[NO_AMT+(i*8)].iSta
rtIndex]);

   }
   /* need to blank out the rest of the unused item rows */
   jj = NO_AMT + ((i-1)*8) + 1;
   for(kk=i; kk<15; kk++)
   {
    /* there are 8 items per row - 6 plain and 2 with $*/
    for(mm=0; mm<6; mm++)
    {
                memcpy(&newOrderForm[newOrderResponseIndexes[jj].iStartInde
x],
                    szBlanks, newOrderResponseIndexes[jj].iLen);
                jj++;
    }
    /* blank out the '$' for the blank $values */
    for(mm=0; mm<2; mm++)
    {
                memcpy(&newOrderForm[newOrderResponseIndexes[jj].iStartInde
x-1],
                    szBlanks, newOrderResponseIndexes[jj].iLen+1);
                jj++;
    }
   }
  }
  else
  {
   /* will need to blank out any fields not entered when not valid */
   /* space for discount */
memcpy(&newOrderForm[newOrderResponseIndexes[NO_DISC].iStartIndex],
                szBlanks, newOrderResponseIndexes[NO_DISC].iLen);
   /*the actual order number */
   PutNumeric(pNewOrder->o_id,
                    newOrderResponseIndexes[NO_OID].iLen,

&newOrderForm[newOrderResponseIndexes[NO_OID].iStartIndex]);
   /* space for number of lines, w_tax, and d_tax */
   for(kk=0; kk<3; kk++)
   {

memcpy(&newOrderForm[newOrderResponseIndexes[NO_LINES+kk].iStartIn
dex],
                szBlanks, newOrderResponseIndexes[NO_LINES+kk].iLen);
   }
   /* spaces for each of the fields in the row items */
   jj = NO_S_WID;
   for(kk=0; kk<15; kk++)
   {
    /* there are 8 items per row - 6 plain and 2 with $*/
    for(mm=0; mm<6; mm++)
    {
                memcpy(&newOrderForm[newOrderResponseIndexes[jj].iStartInde
x],
                    szBlanks, newOrderResponseIndexes[jj].iLen);
                jj++;
    }
    /* blank out the '$' for the blank $values */
    for(mm=0; mm<2; mm++)
    {
                memcpy(&newOrderForm[newOrderResponseIndexes[jj].iStartInde
x-1],
                    szBlanks, newOrderResponseIndexes[jj].iLen+1);
                jj++;
    }

   }
  }

  /* output the execution status */
  PUT_STRING(execution_status, newOrderResponseIndexes[NO_STAT].iLen,
                newOrderResponseIndexes[NO_STAT].iStartIndex,
                StrStruct[ssCnt]);
  ssCnt++;

  if(bValid)
  {
   /* total */
   PutFloat2(pNewOrder->total_amount,
                    newOrderResponseIndexes[NO_TOTAL].iLen,

&newOrderForm[newOrderResponseIndexes[NO_TOTAL].iStartIndex]);
  }
  else
  {
   /* put blanks for total */

memcpy(&newOrderForm[newOrderResponseIndexes[NO_TOTAL].iStartIndex
],
                szBlanks, newOrderResponseIndexes[NO_TOTAL].iLen);
  }
  PUT_STRING(NULL, 0, 0, StrStruct[ssCnt]);
  PutHTMLStrings(StrStruct, newOrderForm,
giResponseLen[NEW_ORDER_RESPONSE],
                            &szOutput, &iOutputLen);

#ifdef FFE_DEBUG
  pNewOrder->iStage |= UNRESERVING;
#endif
```

```
 UNRESERVE_TRANSACTION_STRUCT( NEW_ORDER_TRANS,
pNewOrder );

 SendResponse(pECB, szOutput, iOutputLen);

 UNRESERVE_RESPONSE( NEW_ORDER_RESPONSE, newOrderForm );

 if( szOutput != newOrderForm )
  UNRESERVE_PANIC_FORM( szOutput );
}

/* FUNCTION: void
TPCCPaymentResponse(EXTENSION_CONTROL_BLOCK *pECB,
 *                                                    int retcode,
 *                                                    PaymentData
*paymentData)
 *
 * PURPOSE:          This function fills in the values and returns the
 *                   response form to the browser.
 *
 * ARGUMENTS:        EXTENSION_CONTROL_BLOCK  *pECB
          pointer to structure that
 *
          contains internet service
 *
          information.
 *                   int                 retcode       return status from
the db call
 *                   PaymentData         *paymentData
          pointer to structure containing
 *                                                                  the
data for this transaction.
 *
 * RETURNS:          none
 *
 * COMMENTS:         none
 */

void
TPCCPaymentResponse( int retcode, pPaymentData pPayment )
{
 char        *ptr;
 char        szTmp[64];
 char        szW_Zip[26];
 char        szD_Zip[26];
 char        szC_Zip[26];
 char        szC_Phone[26];
 int         i;
 int         l;
 char        *szZipPic = "XXXXX-XXXX";
 char  szLongDate[] = "XX-XX-XXXX XX:XX:XX";
 char  szDate[]   = "xx-xx-xxxx";
 char  szBlanks[] = "                                   ";
 PutStrStruct StrStruct[34];
 int ssCnt = 0;
 char *paymentForm;
 char *szOutput;
 int iOutputLen;
 EXTENSION_CONTROL_BLOCK *pECB;

 pECB = pPayment->pCC;

 if ( ERR_DB_PENDING == retcode )
 {
  return;
 }
 else if ( ERR_DB_DEADLOCK_LIMIT == retcode )
 {
  SendErrorResponse( pECB, ERR_PAYMENT_NOT_PROCESSED,
                     ERR_TYPE_WEBDLL, NULL,
                     pPayment->w_id, pPayment->ld_id,
                     (pConnData)pPayment );
  return;
 }
 else if ( ERR_DB_NOT_COMMITED == retcode )
 {
  SendErrorResponse( pECB, ERR_PAYMENT_INVALID_CUSTOMER,
                     ERR_TYPE_WEBDLL, NULL,
                     pPayment->w_id, pPayment->ld_id,
                     (pConnData)pPayment );
  return;
 }
 else if ( ERR_DB_SUCCESS != retcode )
 {
  SendErrorResponse( pECB, ERR_DB_ERROR,
                     ERR_TYPE_WEBDLL, NULL,
                     pPayment->w_id, pPayment->ld_id,
                     (pConnData)pPayment );
  return;
 }

 RESERVE_RESPONSE( PAYMENT_RESPONSE,  paymentForm );

 PutNumeric(WDID(pPayment->w_id,pPayment->ld_id),
          paymentResponseIndexes[PT_WDID].iLen,

&paymentForm[paymentResponseIndexes[PT_WDID].iStartIndex]);
 PutNumeric(pPayment->h_date.day, 2,
          &szLongDate[0]);
 PutNumeric(pPayment->h_date.month, 2,
          &szLongDate[3]);
 PutNumeric(pPayment->h_date.year, 4,
          &szLongDate[6]);
 PutNumeric(pPayment->h_date.hour, 2,
          &szLongDate[11]);
 PutNumeric(pPayment->h_date.minute, 2,
          &szLongDate[14]);
 PutNumeric(pPayment->h_date.second, 2,
          &szLongDate[17]);

memcpy(&paymentForm[paymentResponseIndexes[PT_LONG_DATE].iStartIn
dex],
        szLongDate, paymentResponseIndexes[PT_LONG_DATE].iLen);

 PutNumeric(pPayment->w_id,
          paymentResponseIndexes[PT_WID].iLen,

&paymentForm[paymentResponseIndexes[PT_WID].iStartIndex]);
 PutNumeric(pPayment->d_id,
          paymentResponseIndexes[PT_DID].iLen,

&paymentForm[paymentResponseIndexes[PT_DID].iStartIndex]);

 PUT_STRING(pPayment->w_street_1,
          paymentResponseIndexes[PT_W_ST_1].iLen,
          paymentResponseIndexes[PT_W_ST_1].iStartIndex,
          StrStruct[ssCnt]);
 ssCnt++;
 PUT_STRING(pPayment->d_street_1,
          paymentResponseIndexes[PT_D_ST_1].iLen,
          paymentResponseIndexes[PT_D_ST_1].iStartIndex,
          StrStruct[ssCnt]);
 ssCnt++;
 PUT_STRING(pPayment->w_street_2,
          paymentResponseIndexes[PT_W_ST_2].iLen,
          paymentResponseIndexes[PT_W_ST_2].iStartIndex,
          StrStruct[ssCnt]);
 ssCnt++;
 PUT_STRING(pPayment->d_street_2,
          paymentResponseIndexes[PT_D_ST_2].iLen,
          paymentResponseIndexes[PT_D_ST_2].iStartIndex,
          StrStruct[ssCnt]);
 ssCnt++;
 PUT_STRING(pPayment->w_city,
```

```
                paymentResponseIndexes[PT_W_CITY].iLen,
                paymentResponseIndexes[PT_W_CITY].iStartIndex,
                StrStruct[ssCnt]);
 ssCnt++;
 PUT_STRING(pPayment->w_state,
                paymentResponseIndexes[PT_W_ST].iLen,
                paymentResponseIndexes[PT_W_ST].iStartIndex,
                StrStruct[ssCnt]);
 ssCnt++;
 FormatString(szW_Zip, szZipPic, pPayment->w_zip);
 memcpy(&paymentForm[paymentResponseIndexes[PT_W_ZIP].iStartIndex],
            szW_Zip, paymentResponseIndexes[PT_W_ZIP].iLen);
 PUT_STRING(pPayment->d_city,
                paymentResponseIndexes[PT_D_CITY].iLen,
                paymentResponseIndexes[PT_D_CITY].iStartIndex,
                StrStruct[ssCnt]);
 ssCnt++;
 PUT_STRING(pPayment->d_state,
                paymentResponseIndexes[PT_D_ST].iLen,
                paymentResponseIndexes[PT_D_ST].iStartIndex,
                StrStruct[ssCnt]);
 ssCnt++;
 FormatString(szD_Zip, szZipPic, pPayment->d_zip);
 memcpy(&paymentForm[paymentResponseIndexes[PT_D_ZIP].iStartIndex],
            szD_Zip, paymentResponseIndexes[PT_D_ZIP].iLen);
 PutNumeric(pPayment->c_id,
                paymentResponseIndexes[PT_CID].iLen,

&paymentForm[paymentResponseIndexes[PT_CID].iStartIndex]);
 PutNumeric(pPayment->c_w_id,
                paymentResponseIndexes[PT_C_WID].iLen,

&paymentForm[paymentResponseIndexes[PT_C_WID].iStartIndex]);
 PutNumeric(pPayment->c_d_id,
                paymentResponseIndexes[PT_C_DID].iLen,

&paymentForm[paymentResponseIndexes[PT_C_DID].iStartIndex]);

 PUT_STRING(pPayment->c_first,
                paymentResponseIndexes[PT_FIRST].iLen,
                paymentResponseIndexes[PT_FIRST].iStartIndex,
                StrStruct[ssCnt]);
 ssCnt++;
 PUT_STRING(pPayment->c_middle,
                paymentResponseIndexes[PT_MIDDLE].iLen,
                paymentResponseIndexes[PT_MIDDLE].iStartIndex,
                StrStruct[ssCnt]);
 ssCnt++;
 PUT_STRING(pPayment->c_last,
                paymentResponseIndexes[PT_LAST].iLen,
                paymentResponseIndexes[PT_LAST].iStartIndex,
                StrStruct[ssCnt]);
 ssCnt++;

 PutNumeric(pPayment->c_since.day, 2, &szDate[0]);
 PutNumeric(pPayment->c_since.month, 2, &szDate[3]);
 PutNumeric(pPayment->c_since.year, 4, &szDate[6]);

memcpy(&paymentForm[paymentResponseIndexes[PT_SM_DATE].iStartIndex
], szDate,
            paymentResponseIndexes[PT_SM_DATE].iLen);

 PUT_STRING(pPayment->c_street_1,
                paymentResponseIndexes[PT_C_STR_1].iLen,
                paymentResponseIndexes[PT_C_STR_1].iStartIndex,
                StrStruct[ssCnt]);
 ssCnt++;
 PUT_STRING(pPayment->c_credit,
                paymentResponseIndexes[PT_CREDIT].iLen,
                paymentResponseIndexes[PT_CREDIT].iStartIndex,
                StrStruct[ssCnt]);
 ssCnt++;

 PUT_STRING(pPayment->d_street_2,
                paymentResponseIndexes[PT_D_STR_2].iLen,
                paymentResponseIndexes[PT_D_STR_2].iStartIndex,
                StrStruct[ssCnt]);
 ssCnt++;

 PutFloat2(pPayment->c_discount,
                paymentResponseIndexes[PT_DISC].iLen,

&paymentForm[paymentResponseIndexes[PT_DISC].iStartIndex]);

 PUT_STRING(pPayment->c_city,
                paymentResponseIndexes[PT_C_CITY].iLen,
                paymentResponseIndexes[PT_C_CITY].iStartIndex,
                StrStruct[ssCnt]);
 ssCnt++;

 PUT_STRING(pPayment->c_state,
                paymentResponseIndexes[PT_C_ST].iLen,
                paymentResponseIndexes[PT_C_ST].iStartIndex,
                StrStruct[ssCnt]);
 ssCnt++;

 FormatString(szC_Zip, szZipPic, pPayment->c_zip);
 memcpy(&paymentForm[paymentResponseIndexes[PT_C_ZIP].iStartIndex],
szC_Zip,
            paymentResponseIndexes[PT_C_ZIP].iLen);
 FormatString(szC_Phone, "XXXXXX-XXX-XXX-XXXX",
              pPayment->c_phone);

memcpy(&paymentForm[paymentResponseIndexes[PT_C_PHONE].iStartIndex
],
            szC_Phone, paymentResponseIndexes[PT_C_PHONE].iLen);

 PutFloat2(pPayment->h_amount,
                paymentResponseIndexes[PT_AMT].iLen,

&paymentForm[paymentResponseIndexes[PT_AMT].iStartIndex]);
 PutFloat2(pPayment->c_balance,
                paymentResponseIndexes[PT_BAL].iLen,

&paymentForm[paymentResponseIndexes[PT_BAL].iStartIndex]);

 PutFloat2(pPayment->c_credit_lim,
                paymentResponseIndexes[PT_LIM].iLen,

&paymentForm[paymentResponseIndexes[PT_LIM].iStartIndex]);

 ptr = pPayment->c_credit;
 if ( *ptr == 'B' && *(ptr+1) == 'C' )
 {
  ptr = pPayment->c_data;
  l = strlen( ptr ) / 50;
  for(i=0; i<4; i++, ptr += 50)
  {
   if ( i <= l )
   {
            strncpy(szTmp, ptr, 50);
            szTmp[50] = '\0';
   }
   else
            szTmp[0] = 0;

   PUT_STRING(szTmp,
                        paymentResponseIndexes[PT_CUST_DATA+i].iLen,

paymentResponseIndexes[PT_CUST_DATA+i].iStartIndex,
                        StrStruct[ssCnt]);
   ssCnt++;
  }
 }
```

```
  else
  {
    for(i=0; i<4; i++)
    {

memcpy(&paymentForm[paymentResponseIndexes[PT_CUST_DATA+i].iStartI
ndex],
                    szBlanks, paymentResponseIndexes[PT_CUST_DATA+i].iLen);
    }
  }

  PUT_STRING(NULL, 0, 0, StrStruct[ssCnt]);

  PutHTMLStrings(StrStruct, paymentForm,
giResponseLen[PAYMENT_RESPONSE],
                                &szOutput, &iOutputLen);

#ifdef FFE_DEBUG
  pPayment->iStage |= UNRESERVING;
#endif

  UNRESERVE_TRANSACTION_STRUCT( PAYMENT_TRANS, pPayment );

  SendResponse(pECB, szOutput, iOutputLen);

  UNRESERVE_RESPONSE( PAYMENT_RESPONSE, paymentForm );

  if( szOutput != paymentForm )
    UNRESERVE_PANIC_FORM( szOutput );
}

/* FUNCTION: void TPCCOrderStatusResponse( int retcode,
 *
OrderStatusData *orderStatusData)
 *
 * PURPOSE:              This function fills in the values and returns the
 *                       response form to the browser.
 *
 * ARGUMENTS:            EXTENSION_CONTROL_BLOCK   *pECB
              pointer to structure containing
 *
              internet service information.
 *                       int                       retcode return status from db
call
 *                       OrderStatusData *orderStatusData      pointer to
structure
 *
              of data for this txn.
 *
 * RETURNS:              none
 *
 * COMMENTS:             none
 */

void
TPCCOrderStatusResponse( int retcode, pOrderStatusData pOrderStatus )
{
  int           i;
  int           jj;
  int           kk;
  int           mm;
  char  szLongDate[] = "XX-XX-XXXX XX:XX:XX";
  char  szDate[]   = "XX-XX-XXXX";
  char  szBlanks[] = "                    ";
  char  szDollar[] = "$";
  PutStrStruct StrStruct[4];
  int   ssCnt = 0;
  char          *orderStatusForm;
  char          *szOutput;
  int           iOutputLen;
  EXTENSION_CONTROL_BLOCK *pECB;

  pECB = pOrderStatus->pCC;

  if ( ERR_DB_PENDING == retcode )
  {
   return;
  }
  else if ( ERR_DB_DEADLOCK_LIMIT == retcode )
  {
   SendErrorResponse( pECB, ERR_ORDER_STATUS_NOT_PROCESSED,
                                ERR_TYPE_WEBDLL, NULL,
                                pOrderStatus->w_id, pOrderStatus->ld_id,
                                (pConnData)pOrderStatus );
   return;
  }
  else if ( ERR_DB_NOT_COMMITED == retcode )
  {
   SendErrorResponse( pECB, ERR_NOSUCH_CUSTOMER,
                                ERR_TYPE_WEBDLL, NULL,
                                pOrderStatus->w_id, pOrderStatus->ld_id,
                                (pConnData)pOrderStatus );
   return;
  }
  else          if ( ERR_DB_SUCCESS != retcode )
  {
   SendErrorResponse( pECB, ERR_DB_ERROR,
                                ERR_TYPE_WEBDLL, NULL,
                                pOrderStatus->w_id, pOrderStatus->ld_id,
                                (pConnData)pOrderStatus );
  return;
  }

  RESERVE_RESPONSE( ORDER_STATUS_RESPONSE, orderStatusForm );

  PutNumeric(WDID(pOrderStatus->w_id,pOrderStatus->ld_id),
                orderStatusResponseIndexes[OS_WDID].iLen,

&orderStatusForm[orderStatusResponseIndexes[OS_WDID].iStartIndex]);
  PutNumeric(pOrderStatus->w_id,
                orderStatusResponseIndexes[OS_WID].iLen,

&orderStatusForm[orderStatusResponseIndexes[OS_WID].iStartIndex]);
  PutNumeric(pOrderStatus->d_id,
                orderStatusResponseIndexes[OS_DID].iLen,

&orderStatusForm[orderStatusResponseIndexes[OS_DID].iStartIndex]);
  PutNumeric(pOrderStatus->c_id,
                orderStatusResponseIndexes[OS_CID].iLen,

&orderStatusForm[orderStatusResponseIndexes[OS_CID].iStartIndex]);
  PUT_STRING(pOrderStatus->c_first,
                orderStatusResponseIndexes[OS_FIRST].iLen,
                orderStatusResponseIndexes[OS_FIRST].iStartIndex,
StrStruct[ssCnt]);
  ssCnt++;
  PUT_STRING(pOrderStatus->c_middle,
                orderStatusResponseIndexes[OS_MIDDLE].iLen,
                orderStatusResponseIndexes[OS_MIDDLE].iStartIndex,
                StrStruct[ssCnt]);
  ssCnt++;
  PUT_STRING(pOrderStatus->c_last,
                orderStatusResponseIndexes[OS_LAST].iLen,
                orderStatusResponseIndexes[OS_LAST].iStartIndex,
StrStruct[ssCnt]);
  ssCnt++;
  PutFloat2(pOrderStatus->c_balance,
                orderStatusResponseIndexes[OS_BAL].iLen,

&orderStatusForm[orderStatusResponseIndexes[OS_BAL].iStartIndex]);
  PutNumeric(pOrderStatus->o_id,
                orderStatusResponseIndexes[OS_OID].iLen,

&orderStatusForm[orderStatusResponseIndexes[OS_OID].iStartIndex]);
```

```
 PutNumeric(pOrderStatus->o_entry_d.day, 2, &szLongDate[0]);
 PutNumeric(pOrderStatus->o_entry_d.month, 2, &szLongDate[3]);
 PutNumeric(pOrderStatus->o_entry_d.year, 4, &szLongDate[6]);
 PutNumeric(pOrderStatus->o_entry_d.hour, 2, &szLongDate[11]);
 PutNumeric(pOrderStatus->o_entry_d.minute, 2, &szLongDate[14]);
 PutNumeric(pOrderStatus->o_entry_d.second, 2, &szLongDate[17]);

memcpy(&orderStatusForm[orderStatusResponseIndexes[OS_DATE].iStartInde
x],
                szLongDate, orderStatusResponseIndexes[OS_DATE].iLen);
 PutNumeric(pOrderStatus->o_carrier_id,
                  orderStatusResponseIndexes[OS_CAR_ID].iLen,

&orderStatusForm[orderStatusResponseIndexes[OS_CAR_ID].iStartIndex]);

 for(i=0; i<pOrderStatus->o_ol_cnt; i++)
 {
  PutNumeric(pOrderStatus->s_ol[i].ol_supply_w_id,
                  orderStatusResponseIndexes[OS_S_WID+(i*5)].iLen,

&orderStatusForm[orderStatusResponseIndexes[OS_S_WID+(i*5)].iStartIndex]
);
  PutNumeric(pOrderStatus->s_ol[i].ol_i_id,
                  orderStatusResponseIndexes[OS_IID+(i*5)].iLen,

&orderStatusForm[orderStatusResponseIndexes[OS_IID+(i*5)].iStartIndex]);
  PutNumeric(pOrderStatus->s_ol[i].ol_quantity,
                  orderStatusResponseIndexes[OS_QTY+(i*5)].iLen,

&orderStatusForm[orderStatusResponseIndexes[OS_QTY+(i*5)].iStartIndex]);

memcpy(&orderStatusForm[orderStatusResponseIndexes[OS_AMT+(i*5)].iStar
tIndex-1],
                szDollar, 1);
  PutFloat2(pOrderStatus->s_ol[i].ol_amount,
                  orderStatusResponseIndexes[OS_AMT+(i*5)].iLen,

&orderStatusForm[orderStatusResponseIndexes[OS_AMT+(i*5)].iStartIndex]);
  PutNumeric(pOrderStatus->s_ol[i].ol_delivery_d.day,
                  2, &szDate[0]);
  PutNumeric(pOrderStatus->s_ol[i].ol_delivery_d.month,
                  2, &szDate[3]);
  PutNumeric(pOrderStatus->s_ol[i].ol_delivery_d.year,
                  4, &szDate[6]);

memcpy(&orderStatusForm[orderStatusResponseIndexes[OS_SM_DATE+(i*5)
].iStartIndex],
                szDate,
orderStatusResponseIndexes[OS_SM_DATE+(i*5)].iLen);
 }
 /* need to blank out the rest of the unused item rows */
 jj = OS_SM_DATE + ((i-1)*5) + 1;
 for(kk=i; kk<15; kk++)
 {
  /* there are 5 items per row - 4 plain and 1 with $*/
  for(mm=0; mm<3; mm++)
  {
   memcpy(&orderStatusForm[orderStatusResponseIndexes[jj].iStartIndex],
                szBlanks, orderStatusResponseIndexes[jj].iLen);
   jj++;
  }
  /* blank out the '$' for the blank $values */
  memcpy(&orderStatusForm[orderStatusResponseIndexes[jj].iStartIndex-1],
                szBlanks, orderStatusResponseIndexes[jj].iLen+1);
  jj++;
  memcpy(&orderStatusForm[orderStatusResponseIndexes[jj].iStartIndex],
                szBlanks, orderStatusResponseIndexes[jj].iLen);
  jj++;
 }

 PUT_STRING(NULL, 0, 0, StrStruct[ssCnt]);
 PutHTMLStrings(StrStruct, orderStatusForm,
                          giResponseLen[ORDER_STATUS_RESPONSE],
                          &szOutput, &iOutputLen);

#ifdef FFE_DEBUG
 pOrderStatus->iStage |= UNRESERVING;
#endif

 UNRESERVE_TRANSACTION_STRUCT( ORDER_STATUS_TRANS,
pOrderStatus );

 SendResponse(pECB, szOutput, iOutputLen);

 UNRESERVE_RESPONSE( ORDER_STATUS_RESPONSE, orderStatusForm
);

 if( szOutput != orderStatusForm )
  UNRESERVE_PANIC_FORM( szOutput );
}

/* FUNCTION: void TPCCStockLevelResponse(int retcode,
 *                                                  StockLevelData
*stockLevelData)
 *
 * PURPOSE:          This function puts the response data for the transaction
 *                   into the form and sends the form back to the browser.
 *
 * ARGUMENTS:        EXTENSION_CONTROL_BLOCK  *pECB
          pointer to structure containing
 *
          internet service information.
 *                   int                  retcode return status from db
call
 *                   StockLevelData       *stockLevelData
          pointer to structure containing
 *                                                                  data
for this transaction.
 *
 * RETURNS:          none
 *
 * COMMENTS:         none
 */

void
TPCCStockLevelResponse( int retcode, StockLevelData *pStockLevel )
{
 char *stockLevelForm;
 EXTENSION_CONTROL_BLOCK *pECB;

 pECB = pStockLevel->pCC;

 if ( ERR_DB_PENDING == retcode )
 {
  return;
 }
 else if ( ERR_DB_DEADLOCK_LIMIT == retcode )
 {
  SendErrorResponse( pECB, ERR_STOCKLEVEL_NOT_PROCESSED,
                           ERR_TYPE_WEBDLL, NULL,
                           pStockLevel->w_id, pStockLevel->ld_id,
                           (pConnData)pStockLevel );
  return;
 }
 else if ( ERR_DB_SUCCESS != retcode )
 {
  SendErrorResponse( pECB, ERR_DB_ERROR,
                           ERR_TYPE_WEBDLL, NULL,
                           pStockLevel->w_id, pStockLevel->ld_id,
                           (pConnData)pStockLevel );
  return;
 }
```

```
 RESERVE_RESPONSE( STOCK_LEVEL_RESPONSE, stockLevelForm );

 PutNumeric(WDID(pStockLevel->w_id,pStockLevel->ld_id),
                stockLevelResponseIndexes[SL_WDID].iLen,
&stockLevelForm[stockLevelResponseIndexes[SL_WDID].iStartIndex]);
 PutNumeric(pStockLevel->w_id,
                stockLevelResponseIndexes[SL_WID].iLen,
&stockLevelForm[stockLevelResponseIndexes[SL_WID].iStartIndex]);
 PutNumeric(pStockLevel->ld_id,
                stockLevelResponseIndexes[SL_DID].iLen,
&stockLevelForm[stockLevelResponseIndexes[SL_DID].iStartIndex]);
 PutNumeric(pStockLevel->threshold,
                stockLevelResponseIndexes[SL_TH].iLen,
&stockLevelForm[stockLevelResponseIndexes[SL_TH].iStartIndex]);
 PutNumeric(pStockLevel->low_stock,
                stockLevelResponseIndexes[SL_LOW].iLen,
&stockLevelForm[stockLevelResponseIndexes[SL_LOW].iStartIndex]);

#ifdef FFE_DEBUG
 pStockLevel->iStage |= UNRESERVING;
#endif

 UNRESERVE_TRANSACTION_STRUCT( STOCK_LEVEL_TRANS,
pStockLevel );

 SendResponse(pECB, stockLevelForm,
                giResponseLen[STOCK_LEVEL_RESPONSE]);

 UNRESERVE_RESPONSE( STOCK_LEVEL_RESPONSE, stockLevelForm );
}


/* FUNCTION: void TPCCResponseComplete(
EXTENSION_CONTROL_BLOCK *pECB )
 *
 * PURPOSE:
 *    This function completes the asynchronous web transaction.
 *
 * ARGUMENTS:
 *    EXTENSION_CONTROL_BLOCK          *pECB
 *          Server context structure.
 *
 * RETURNS:
 *    None
 *
 * COMMENTS:
 */

void
TPCCResponseComplete( EXTENSION_CONTROL_BLOCK *pECB )
{
 DWORD    status;

 status = HSE_STATUS_SUCCESS_AND_KEEP_CONN;
 (pECB->ServerSupportFunction)(pECB->ConnID,
HSE_REQ_DONE_WITH_SESSION,
                                        &status, NULL, NULL);
}

/* FUNCTION: int ProcessDeliveryQuery( EXTENSION_CONTROL_BLOCK
*pECB,
 *
 * PURPOSE:          This function parses the query string, validates the data,
 *                   and sends the request to the db/transport and returns
 *                   a response to the browser.
 *
 * ARGUMENTS:        EXTENSION_CONTROL_BLOCK  *pECB      ptr
to the structure
 *
 *          containing the internet server
 *
 *          information.
 *
 * RETURNS:          int                      status
 *
 * COMMENTS:         None
 *
 */

int
ProcessDeliveryQuery( EXTENSION_CONTROL_BLOCK *pECB, char
*lpszQueryString,
                      int w_id, int ld_id )
{
 int                      retcode;
 char                     *ptr;
 char                     *deliveryVals[MAXDELIVERYVALS];
 pDeliveryData            pDelivery;
 pDeliveryData
          CompletedDeliveries[DELIVERY_RESPONSE_COUNT];

 RESERVE_TRANSACTION_STRUCT( DELIVERY_TRANS, pDelivery );

 pDelivery->w_id = w_id;
 pDelivery->ld_id = ld_id;
 pDelivery->pCC = pECB;

 PARSE_QUERY_STRING(lpszQueryString, MAXDELIVERYVALS,
                    deliveryStrs, deliveryVals);

 if ( !GetValuePtr(deliveryVals, QUEUETIME, &ptr) )
  return ERR_DELIVERY_MISSING_QUEUETIME_KEY;

 if ( !GetNumeric(ptr, &pDelivery->queue_time) )
  return ERR_DELIVERY_QUEUETIME_INVALID;

 if ( !GetValuePtr(deliveryVals, OCD, &ptr) )
  return ERR_DELIVERY_MISSING_OCD_KEY;

 if ( !GetNumeric(ptr, &pDelivery->o_carrier_id) )
  return ERR_DELIVERY_CARRIER_INVALID;

 if ( pDelivery->o_carrier_id > 10 || pDelivery->o_carrier_id < 1 )
  return ERR_DELIVERY_CARRIER_ID_RANGE;

#ifdef FFE_DEBUG
 pDelivery->iStage |= CALLING_LH;
#endif
 retcode = TPCCDelivery( pDelivery, CompletedDeliveries );

#ifdef FFE_DEBUG
 _ASSERT(VALID_DB_ERR(retcode));
 pDelivery->iStage |= CALLING_RESP;
#endif
 TPCCDeliveryResponse( retcode, pDelivery, CompletedDeliveries );

 return retcode;
}

/* FUNCTION: int ProcessNewOrderQuery(
EXTENSION_CONTROL_BLOCK *pECB,
 *
 * PURPOSE:          This function parses the query string, validates the data,
 *                   and sends the request to the db/transport and returns
 *                   a response to the browser.
 *
 * ARGUMENTS:        EXTENSION_CONTROL_BLOCK  *pECB      ptr
to structure containing
```

```
 *
                internet server info
 *
 * RETURNS:              int                             status
 *
 * COMMENTS:             None
 *
 */

int
ProcessNewOrderQuery( EXTENSION_CONTROL_BLOCK *pECB, char
*lpszQueryString,
                                int w_id, int ld_id )
{
  int                                   retcode;
  NewOrderData                          *pNewOrder;

  RESERVE_TRANSACTION_STRUCT( NEW_ORDER_TRANS, pNewOrder
);

  pNewOrder->w_id = w_id;
  pNewOrder->ld_id = ld_id;
  pNewOrder->pCC = pECB;

  if ( ERR_SUCCESS != ( retcode = ParseNewOrderQuery( lpszQueryString,

pNewOrder )))
    return retcode;

#ifdef FFE_DEBUG
  pNewOrder->iStage |= CALLING_LH;
#endif
  retcode = TPCCNewOrder( pNewOrder );

#ifdef FFE_DEBUG
  _ASSERT(VALID_DB_ERR(retcode));
  pNewOrder->iStage |= CALLING_RESP;
#endif
  TPCCNewOrderResponse( retcode, pNewOrder );

  return retcode;
}

/* FUNCTION: int ProcessOrderStatusQuery(
EXTENSION_CONTROL_BLOCK *pECB,
 *
 * PURPOSE:              This function parses the query string, validates the data,
 *                       and sends the request to the db/transport and returns
 *                       a response to the browser.
 *
 * ARGUMENTS:            EXTENSION_CONTROL_BLOCK   *pECB       ptr
to structure that contains
 *                                                                      the
internet server info.
 *
 * RETURNS:              int                             status
 *
 * COMMENTS:             None
 *
 */

int
ProcessOrderStatusQuery( EXTENSION_CONTROL_BLOCK *pECB, char
*lpszQueryString,
                                 int w_id, int ld_id )
{
  int                                   retcode;
  OrderStatusData           *pOrderStatus;

  RESERVE_TRANSACTION_STRUCT( ORDER_STATUS_TRANS,
pOrderStatus );

  pOrderStatus->w_id = w_id;
  pOrderStatus->ld_id = ld_id;
  pOrderStatus->pCC = pECB;

  if( ERR_SUCCESS != ( retcode = ParseOrderStatusQuery( lpszQueryString,

                pOrderStatus )))
    return retcode;

#ifdef FFE_DEBUG
  pOrderStatus->iStage |= CALLING_LH;
#endif
  retcode = TPCCOrderStatus( pOrderStatus );

#ifdef FFE_DEBUG
  _ASSERT(VALID_DB_ERR(retcode));
  pOrderStatus->iStage |= CALLING_RESP;
#endif
  TPCCOrderStatusResponse( retcode, pOrderStatus );

  return retcode;
}

/* FUNCTION: int ProcessPaymentQuery( EXTENSION_CONTROL_BLOCK
*pECB,
 *
 * PURPOSE:              This function gets and validates the input data from the
 *                       payment form filling in the required input variables.
 *                       It then calls the SQLPayment transaction, constructs the
 *                       output form and writes it back to client browser.
 *
 * ARGUMENTS:            EXTENSION_CONTROL_BLOCK   *pECB       ptr
to structure that contains
 *                                                                      the
internet server info.
 *
 * RETURNS:              int                             status
 *
 * COMMENTS:             None
 *
 */

int
ProcessPaymentQuery( EXTENSION_CONTROL_BLOCK *pECB, char
*lpszQueryString,
                                int w_id, int ld_id )
{
  int                                   retcode;
  PaymentData                           *pPayment;

  RESERVE_TRANSACTION_STRUCT( PAYMENT_TRANS, pPayment );

  pPayment->w_id = w_id;
  pPayment->ld_id = ld_id;
  pPayment->pCC = pECB;

  if( ERR_SUCCESS != ( retcode = ParsePaymentQuery( lpszQueryString,

pPayment )))
    return retcode;

#ifdef FFE_DEBUG
  pPayment->iStage |= CALLING_LH;
#endif
  retcode = TPCCPayment( pPayment );

#ifdef FFE_DEBUG
  _ASSERT(VALID_DB_ERR(retcode));
  pPayment->iStage |= CALLING_RESP;
#endif
  TPCCPaymentResponse( retcode, pPayment );
```

```
 return retcode;
}

/* FUNCTION: int ProcessStockLevelQuery(
EXTENSION_CONTROL_BLOCK *pECB,
 *
 * PURPOSE:              This function gets and validates the input data from the
 *                       Stock Level form filling in the required input variables.
 *                       It then calls the SQLStockLevel transaction, constructs
 *                       the output form and writes it back to client browser.
 *
 * ARGUMENTS:            EXTENSION_CONTROL_BLOCK   *pECB       ptr
to structure that contains
 *                                                                    the
internet server info.
 *                       int                       iSyncId
            client browser sync id
 *
 * RETURNS:              int                       status
 *
 * COMMENTS:             None
 *
 */

int
ProcessStockLevelQuery( EXTENSION_CONTROL_BLOCK *pECB, char
*lpszQueryString,
                                    int w_id, int ld_id )
{
 char       *ptr;
 int                    retcode;
 char                   *stockLevelVals[MAXSTOCKLEVELVALS];
 StockLevelData         *pStockLevel;

 RESERVE_TRANSACTION_STRUCT( STOCK_LEVEL_TRANS,
pStockLevel );

 pStockLevel->w_id = w_id;
 pStockLevel->ld_id = ld_id;
 pStockLevel->pCC = pECB;

 PARSE_QUERY_STRING(lpszQueryString, MAXSTOCKLEVELVALS,
                        stockLevelStrs, stockLevelVals);

 if ( !GetValuePtr(stockLevelVals, TT, &ptr))
  return ERR_STOCKLEVEL_MISSING_THRESHOLD_KEY;

 if ( !GetNumeric(ptr, &pStockLevel->threshold) )
  return ERR_STOCKLEVEL_THRESHOLD_INVALID;

 if ( pStockLevel->threshold >= 100 || pStockLevel->threshold < 0 )
  return ERR_STOCKLEVEL_THRESHOLD_RANGE;

#ifdef FFE_DEBUG
 pStockLevel->iStage |= CALLING_LH;
#endif
 retcode = TPCCStockLevel( pStockLevel );

#ifdef FFE_DEBUG
 _ASSERT(VALID_DB_ERR(retcode));
 pStockLevel->iStage |= CALLING_RESP;
#endif
 TPCCStockLevelResponse( retcode, pStockLevel );

 return retcode;
}

/* FUNCTION: BOOL GetValuePtr(char *pProcessedQuery[], int iIndex,
 *                                                    char **pValue)
 *
 * PURPOSE:              This function passes back a pointer to the char ptr to the
 *                       value requested.
 *
 * ARGUMENTS:            char  *pProcessedQuery[]   char* array of query string
values
 *           int   iIndex    index into the ProcessedQuery array
 *                 char *pValue          character ptr into to the key's value
 *
 * RETURNS:              BOOL        FALSE       there is no valid ptr for this
value
 *                                   TRUE  the ptr returned is valid
 *
 *
 * COMMENTS:             none.
 */

BOOL
GetValuePtr(char *pProcessedQuery[], int iIndex, char **pValue)
{
 *pValue = pProcessedQuery[iIndex];

 if(NULL == *pValue)return FALSE;

 return TRUE;
}

/* FUNCTION: void MakeDeliveryTemplates( char *deliveryForm,
 *                                                                    char
*deliveryResponse )
 *
 * PURPOSE:              This function constructs the templates for the
 *                       Delivery input and response HTML forms.
 *
 * ARGUMENTS:            char *deliveryForm        pointer to the HTML input
form.
 *                       char *deliveryResponse   pointer to the HTML response
form.
 *
 * RETURNS:              None
 *
 * COMMENTS:             None
 */

void
MakeDeliveryTemplates( char *deliveryForm, char *deliveryResponse )
{
 int            curLen;

 /* first make the input form template */
 curLen = sprintf(deliveryForm, szFormTemplate, szModName);
 ParseTemplateString(deliveryForm, &curLen, szDeliveryFormTemp2i,
                              deliveryFormIndexesI);
 giFormLen[DELIVERY_FORM] = curLen;

 /* now make the process form template */
 curLen = sprintf(deliveryResponse, szFormTemplate, szModName);
 ParseTemplateString(deliveryResponse, &curLen, szDeliveryFormTemp2p,
                              deliveryFormIndexesP);
 giResponseLen[DELIVERY_RESPONSE] = curLen;
}

/* FUNCTION: void MakeNewOrderTemplates(char *newOrderForm,
                                                                    char
*newOrderResponse )
 *
 * PURPOSE:              This function constructs the templates for both the input
 *                       and the response HTML forms for NewOrder function.
 *
 * ARGUMENTS:            char          *newOrderForm           pointer to the
input HTML form.
 *                       char          *newOrderResponse pointer to the
response HTML form.
 *
 * RETURNS:              none
```

```
 *
 * COMMENTS:            none.
 */

void
MakeNewOrderTemplates( char *newOrderForm, char *newOrderResponse )
{
  int             curLen;

  /* first make the input template */
  curLen = sprintf(newOrderForm, szFormTemplate, szModName);
  ParseTemplateString(newOrderForm, &curLen, szNewOrderFormTemp2i,
                                newOrderFormIndexes);
  giFormLen[NEW_ORDER_FORM] = curLen;

  /* now make the process template */
  curLen = sprintf(newOrderResponse, szFormTemplate, szModName);
  ParseTemplateString(newOrderResponse, &curLen, szNewOrderFormTemp2p,
                                newOrderResponseIndexes);
  giResponseLen[NEW_ORDER_RESPONSE] = curLen;
}

/* FUNCTION: void MakeOrderStatusTemplates(char *orderStatusForm,
 *                                                      char *orderStatusResponse)
 *
 * PURPOSE:             This function constructs the template HTML forms
 *                      for Order Status.
 *
 * ARGUMENTS:           char *orderStatusForm       pointer to the input HTML
form
 *                      char *orderStatusResponse   pointer to the response
HTML form
 *
 * RETURNS:             none
 *
 * COMMENTS:    none
 */

void
MakeOrderStatusTemplates(char *orderStatusForm, char *orderStatusResponse)
{
  int             curLen;

  /* first make the input form template */
  curLen = sprintf(orderStatusForm, szFormTemplate, szModName);
  ParseTemplateString(orderStatusForm, &curLen, szOrderStatusFormTemp2i,
                                orderStatusFormIndexes);
  giFormLen[ORDER_STATUS_FORM] = curLen;

  /* now make the process template */
  curLen = sprintf(orderStatusResponse, szFormTemplate, szModName);
  ParseTemplateString(orderStatusResponse, &curLen,
szOrderStatusFormTemp2p,
                                orderStatusResponseIndexes);
  giResponseLen[ORDER_STATUS_RESPONSE] = curLen;
}

/* FUNCTION: void MakePaymentTemplates(char *paymentForm,
 *                                                              char
*paymentResponse)
 *
 * PURPOSE:             This function constructs the templates for the
 *                      Payment input and response HTML forms.
 *
 * ARGUMENTS:           char            *paymentForm            pointer to the
input HTML form.
 *                      char            *paymentResponse pointer to the response
HTML form.
 *
 * RETURNS:             none
 *
 * COMMENTS:            none
 */

void
MakePaymentTemplates(char *paymentForm, char *paymentResponse)
{
  int             curLen;

  /* first make the input form template */
  curLen = sprintf(paymentForm, szFormTemplate, szModName);
  ParseTemplateString(paymentForm, &curLen, szPaymentFormTemp2i,
                                paymentFormIndexes);
  giFormLen[PAYMENT_FORM] = curLen;

  /* now make the process form template */
  curLen = sprintf(paymentResponse, szFormTemplate, szModName);
  ParseTemplateString(paymentResponse, &curLen, szPaymentFormTemp2p,
                                paymentResponseIndexes);
  giResponseLen[PAYMENT_RESPONSE] = curLen;
}

/* FUNCTION: void MakeStockLevelTemplates(char *stockLevelForm,
 *                                                      char *stockLevelResponse)
 *
 * PURPOSE:             This function constructs the templates for the
 *                      input and response Stock Level HTML pages.
 *
 * ARGUMENTS:           char            *stockLevelForm             pointer to the
input HTML form
 *                      char            *stockLevelResponse   pointer to the
response HTML form
 *
 * RETURNS:             none
 *
 * COMMENTS:            none
 */
void
MakeStockLevelTemplates(char *stockLevelForm, char *stockLevelResponse)
{
  int             curLen;

  /* first make the input template */
  curLen = sprintf(stockLevelForm, szFormTemplate, szModName);
  ParseTemplateString(stockLevelForm, &curLen, szStockLevelFormTemp2i,
                                stockLevelFormIndexes);
  giFormLen[STOCK_LEVEL_FORM] = curLen;

  /* now make the process template */
  curLen = sprintf(stockLevelResponse, szFormTemplate, szModName);
  ParseTemplateString(stockLevelResponse, &curLen,
szStockLevelFormTemp2p,
                                stockLevelResponseIndexes);
  giResponseLen[STOCK_LEVEL_RESPONSE] = curLen;
}

/* FUNCTION: void MakeResponseHeader(void)
 *
 * PURPOSE:             This function constructs the HTML response header.
 *
 * ARGUMENTS:           char            *responseString             pointer to the
header string
 *
 * RETURNS:             none
 *
 * COMMENTS:            none
 */
void
MakeResponseHeader(void)
{
  ParseTemplateString(szResponseHeader, &responseHeaderLen,
                                szResponseHeaderTemplate,
responseHeaderIndexes);
}
```

```
/* FUNCTION: void MakePanicPool( DWORD dwResponseSize )
 *
 * PURPOSE:              This function builds the array of panic forms to be used
 *                       by the threads as they need an oversize form, or to
report
 *                       an error.
 *
 * ARGUMENTS:            none
 *
 * RETURNS:              none
 *
 * COMMENTS:             none
 */

void
MakePanicPool( DWORD dwResponseSize )
{
  int iMallocSize;
  char *pForm;
  DWORD ii;

  /* set up area for forms (including errors) that are built on the fly. */
  iMallocSize = (((char *)&gpPanicForms->index - (char *)gpPanicForms) +
                                 (((char *)gpPanicForms->forms - (char
*)gpPanicForms->index)
                                  * dwResponseSize) +
                                 (((char *)&gpPanicForms-
>forms[PANIC_FORM_SIZE] -
                                   (char *)&gpPanicForms->forms[0]) *
dwResponseSize));
  gpPanicForms = malloc( iMallocSize );
  InitializeCriticalSection( &gpPanicForms->critSec );
#ifdef FFE_DEBUG
  gpPanicForms->iMaxIndex = dwResponseSize - 1;
#endif
  gpPanicForms->iNextFree = 0;
  pForm =
    ((char *)&gpPanicForms->index[0] +
     (((char *)&gpPanicForms->forms[0] - (char *)&gpPanicForms->index[0]) *
      dwResponseSize));

  for( ii = 0; ii < dwResponseSize; ii++ )
  {
    gpPanicForms->index[ii] = pForm;
    pForm += PANIC_FORM_SIZE;
  }
}

/* FUNCTION: void DeletePanicPool( void )
 *
 * PURPOSE:              This function destroys the array of panic forms to be
used
 *                       by the threads as they need an oversize or error form.
 *
 * ARGUMENTS:            none
 *
 * RETURNS:              none
 *
 * COMMENTS:             none
 */
void
DeletePanicPool( void )
{
  DeleteCriticalSection( &gpPanicForms->critSec );
  free( gpPanicForms );
}

/* FUNCTION: void MakeTemplatePool( DWORD dwFormSize, DWORD
dwResponseSize )
 *
 * PURPOSE:              This function builds the array of forms to be used
 *                       by the threads as they need a form.  The forms are
 *                       reserved and released by each thread as needed.
 *
 * ARGUMENTS:            none
 *
 * RETURNS:              none
 *
 * COMMENTS:             none
 */

void
MakeTemplatePool( DWORD dwFormSize, DWORD dwResponseSize )
{
  char szDeliveryForm[sizeof(szFormTemplate)+FILENAMESIZE+
                                  sizeof(szDeliveryFormTemp2i)];
  char szNewOrderForm[sizeof(szFormTemplate)+FILENAMESIZE+
                                  sizeof(szNewOrderFormTemp2i)];
  char szOrderStatusForm[sizeof(szFormTemplate)+FILENAMESIZE+
                                     sizeof(szOrderStatusFormTemp2i)];
  char szPaymentForm[sizeof(szFormTemplate)+FILENAMESIZE+
                                   sizeof(szPaymentFormTemp2i)];
  char szStockLevelForm[sizeof(szFormTemplate)+FILENAMESIZE+
                                    sizeof(szStockLevelFormTemp2i)];
  char szDeliveryResponse[sizeof(szFormTemplate)+FILENAMESIZE+
                                     sizeof(szDeliveryFormTemp2p)];
  char szNewOrderResponse[sizeof(szFormTemplate)+FILENAMESIZE+
                                     sizeof(szNewOrderFormTemp2p)];
  char szOrderStatusResponse[sizeof(szFormTemplate)+FILENAMESIZE+
                                      sizeof(szOrderStatusFormTemp2p)];
  char szPaymentResponse[sizeof(szFormTemplate)+FILENAMESIZE+
                                     sizeof(szPaymentFormTemp2p)];
  char szStockLevelResponse[sizeof(szFormTemplate)+FILENAMESIZE+
                                      sizeof(szStockLevelFormTemp2p)];
  int           iFormLen[NUMBER_POOL_FORM_TYPES];
  int           iResponseLen[NUMBER_POOL_RESPONSE_TYPES];
  int iMallocSize;
  int iRowSize;
  DWORD ii;
  int jj;
  char *pForm;
  char *pResponse;

  /* now build the forms that are static */
  MakeDeliveryTemplates( szDeliveryForm, szDeliveryResponse );
  MakeNewOrderTemplates( szNewOrderForm, szNewOrderResponse );
  MakeOrderStatusTemplates( szOrderStatusForm, szOrderStatusResponse );
  MakePaymentTemplates( szPaymentForm, szPaymentResponse );
  MakeStockLevelTemplates( szStockLevelForm, szStockLevelResponse );
  MakeResponseHeader( );

  /* calculate the size of one row of forms */
  iRowSize = 0;
  for( jj = 0; jj < NUMBER_POOL_FORM_TYPES; jj++ )
  {
    iFormLen[jj] = ( giFormLen[jj] + 8 ) & ( ~(int)7 );
    iRowSize += iFormLen[jj];
  }

  iMallocSize = (((char *)&gpForms->index - (char *)gpForms) +
                                 (((char *)gpForms->forms - (char *)gpForms->index)
                                  * dwFormSize * NUMBER_POOL_FORM_TYPES )
+
                                 (((char *)&gpForms->forms[iRowSize * dwFormSize]
-
                                   (char *)&gpForms->forms[0])));
  gpForms = malloc( iMallocSize );

  for( jj = 0; jj < NUMBER_POOL_FORM_TYPES; jj++ )
  {
    InitializeCriticalSection( &gpForms->critSec[jj] );
    gpForms->iNextFreeForm[jj] = 0;
    gpForms->iFirstFormIndex[jj] = jj * dwFormSize;
```

```
#ifdef FFE_DEBUG
   gpForms->iMaxIndex[jj] = dwFormSize - 1;
#endif
  }

  pForm = ((char *)&gpForms->index[0] +
                  (((char *)&gpForms->forms[0] - (char *)&gpForms->index[0]) *
                   NUMBER_POOL_FORM_TYPES * dwFormSize));
  for( ii = 0; ii < dwFormSize; ii++ )
  {
   for( jj = 0; jj < NUMBER_POOL_FORM_TYPES; jj++ )
   {
    gpForms->index[jj*dwFormSize+ii] = pForm;
    pForm += iFormLen[jj];
   }
  }

  /* load the first row with the templates */
  pForm = gpForms->index[0];

  memcpy( pForm, szDeliveryForm, iFormLen[DELIVERY_FORM] );
  pForm += iFormLen[DELIVERY_FORM];

  memcpy( pForm, szNewOrderForm, iFormLen[NEW_ORDER_FORM] );
  pForm += iFormLen[NEW_ORDER_FORM];

  memcpy( pForm, szOrderStatusForm, iFormLen[ORDER_STATUS_FORM] );
  pForm += iFormLen[ORDER_STATUS_FORM];

  memcpy( pForm, szPaymentForm, iFormLen[PAYMENT_FORM] );
  pForm += iFormLen[PAYMENT_FORM];

  memcpy( pForm, szStockLevelForm, iFormLen[STOCK_LEVEL_FORM] );
  pForm += iFormLen[STOCK_LEVEL_FORM];

  /* copy the first row to all the other rows */
  pForm = gpForms->index[0];
  for( ii = 1; ii < dwFormSize; ii++ )
  {
   memcpy( gpForms->index[ii], pForm, iRowSize );
  }

  /* calculate the size of one row of responses */
  iRowSize = 0;
  for( jj = 0; jj < NUMBER_POOL_RESPONSE_TYPES; jj++ )
  {
   iResponseLen[jj] = ( giResponseLen[jj] + 8 ) & ( ~(int)7 );
   iRowSize += iResponseLen[jj];
  }

  iMallocSize = (((char *)&gpResponses->index - (char *)gpResponses) +
                          (((char *)gpResponses->responses - (char
*)gpResponses->index)
                           * dwResponseSize *
NUMBER_POOL_RESPONSE_TYPES ) +
                          (((char *)&gpResponses->responses[iRowSize *
dwResponseSize] -
                            (char *)&gpResponses->responses[0])));
  gpResponses = malloc( iMallocSize );

  for( jj = 0; jj < NUMBER_POOL_RESPONSE_TYPES; jj++ )
  {
   InitializeCriticalSection( &gpResponses->critSec[jj] );
#ifdef FFE_DEBUG
   gpResponses->iMaxIndex[jj] = dwResponseSize - 1;
#endif
   gpResponses->iNextFreeResponse[jj] = 0;
   gpResponses->iFirstResponseIndex[jj] = jj * dwResponseSize;
  }

  pResponse = ((char *)&gpResponses->index[0] +
                  (((char *)&gpResponses->responses[0] -
                   (char *)&gpResponses->index[0]) *
                  NUMBER_POOL_RESPONSE_TYPES * dwResponseSize));
  for( ii = 0; ii < dwResponseSize; ii++ )
  {
   for( jj = 0; jj < NUMBER_POOL_RESPONSE_TYPES; jj++ )
   {
    gpResponses->index[jj*dwResponseSize+ii] = pResponse;
    pResponse += iResponseLen[jj];
   }
  }

  /* load the first row with the templates */
  pResponse = gpResponses->index[0];

  memcpy( pResponse, szDeliveryResponse,
iResponseLen[DELIVERY_RESPONSE] );
  pResponse += iResponseLen[DELIVERY_RESPONSE];

  memcpy( pResponse, szNewOrderResponse,
iResponseLen[NEW_ORDER_RESPONSE] );
  pResponse += iResponseLen[NEW_ORDER_RESPONSE];

  memcpy(pResponse, szOrderStatusResponse,
iResponseLen[ORDER_STATUS_RESPONSE]);
  pResponse += iResponseLen[ORDER_STATUS_RESPONSE];

  memcpy( pResponse, szPaymentResponse,
iResponseLen[PAYMENT_RESPONSE] );
  pResponse += iResponseLen[PAYMENT_RESPONSE];

  memcpy( pResponse, szStockLevelResponse,
iResponseLen[STOCK_LEVEL_RESPONSE] );
  pResponse += iResponseLen[STOCK_LEVEL_RESPONSE];

  /* copy the first row to all the other rows */
  pResponse = gpResponses->index[0];
  for( ii = 1; ii < dwResponseSize; ii++ )
  {
   memcpy( gpResponses->index[ii], pResponse, iRowSize );
  }
}

/* FUNCTION: void DeleteTemplatePool( void )
 *
 * PURPOSE:          This function destroys the array of forms to be used
 *                   by the threads as they need a form.
 *
 * ARGUMENTS:        none
 *
 * RETURNS:          none
 *
 * COMMENTS:         none
 */
void
DeleteTemplatePool( void )
{
  int                                   jj;

  for( jj = 0; jj < NUMBER_POOL_RESPONSE_TYPES; jj++ )
  {
   DeleteCriticalSection( &gpResponses->critSec[jj] );
  }
  free( gpResponses );

  for( jj = 0; jj < NUMBER_POOL_FORM_TYPES; jj++ )
  {
   DeleteCriticalSection( &gpForms->critSec[jj] );
  }
  free( gpForms );

  DeleteCriticalSection( &gpPanicForms->critSec );
  free( gpPanicForms );
```

```
}

/* FUNCTION: void MakeTransactionPool( DWORD dwTransactionPoolSize )
 *
 * PURPOSE:              This function builds the array of forms to be used
 *                       by the threads as they need a form.  The forms are
 *                       reserved and released by each thread as needed.
 *
 * ARGUMENTS:            none
 *
 * RETURNS:              none
 *
 * COMMENTS:             none
 */
void
MakeTransactionPool( DWORD dwTransactionPoolSize )
{
  int iMaxSize;
  int iSize;
  char *data;
  DWORD ii;

  /**** set up transaction data pool used during async operation ****/
  iMaxSize = 0;
  iMaxSize = MAX(iMaxSize,sizeof(DeliveryData));
  iMaxSize = MAX(iMaxSize,sizeof(NewOrderData));
  iMaxSize = MAX(iMaxSize,sizeof(OrderStatusData));
  iMaxSize = MAX(iMaxSize,sizeof(PaymentData));
  iMaxSize = MAX(iMaxSize,sizeof(StockLevelData));
  iMaxSize = MAX(iMaxSize,sizeof(LoginData));
  iSize = (((char *)&gpTransactionPool->index - (char *)gpTransactionPool) +
                  (((char *)gpTransactionPool->data - (char *)gpTransactionPool-
>index)
                   * dwTransactionPoolSize ) +
                  (sizeof( char ) * iMaxSize * dwTransactionPoolSize ));
  gpTransactionPool = malloc( iSize );
  InitializeCriticalSection( &gpTransactionPool->critSec );
#ifdef FFE_DEBUG
  gpTransactionPool->iMaxIndex = dwTransactionPoolSize - 1;
  gpTransactionPool->iTransactionSize = iMaxSize;
  gpTransactionPool->iHistoryId = 0;
#endif
  gpTransactionPool->iNextFree = 0;

  /* careful here, the data is not right after index[0] as the structure */
  /* defines.  We have wedged 'NumUsers + total' indexes in between. */
  data = ((char *)&gpTransactionPool->index[0] +
                 (((char *)&gpTransactionPool->data[0] -
                  (char *)&gpTransactionPool->index[0]) *
                  dwTransactionPoolSize ));

  for( ii = 0; ii < dwTransactionPoolSize; ii++ ) {
    gpTransactionPool->index[ii] = data;
    data += iMaxSize;
  }
}

/* FUNCTION: void DeleteTransactionPool( void )
 *
 * PURPOSE:              This function destroys the array of transaction data
 *                       structures used              by the threads as they process
a transaction.
 *
 * ARGUMENTS:            none
 *
 * RETURNS:              none
 *
 * COMMENTS:             none
 */
void
DeleteTransactionPool( void )
{
  DeleteCriticalSection( &gpTransactionPool->critSec );
  free( gpTransactionPool );
}

/* FUNCTION: void BeginCmd( EXTENSION_CONTROL_BLOCK *pECB )
 *
 * PURPOSE:              This routine is executed in response to the browser
query
 *                       'CMD=Begin&Server=??????'.
 *
 * ARGUMENTS:            EXTENSION_CONTROL_BLOCK   *pECB       IIS
context structure pointer
 *
                 unique to this connection.
 *                                                                              at
login.
 * RETURNS:              None
 *
 * COMMENTS:             Specification of a server machine is required.
 */

void
BeginCmd( EXTENSION_CONTROL_BLOCK *pECB )
{
  SendWelcomeForm(pECB);
}

/* FUNCTION: void CheckpointCmd(EXTENSION_CONTROL_BLOCK
*pECB,
 *
 * PURPOSE:              This function causes a checkpoint to occur in the
database
 *
 * ARGUMENTS:            EXTENSION_CONTROL_BLOCK   *pECB       IIS
context structure pointer
 *
                 unique to this connection.
 *
 * RETURNS:              None
 *
 * COMMENTS:             none
 */

void
CheckpointCmd(EXTENSION_CONTROL_BLOCK *pECB, int w_id, int ld_id
)
{
  int                                 retcode;
  CheckpointData            checkpoint;

  checkpoint.w_id = w_id;
  checkpoint.ld_id = ld_id;
  checkpoint.pCC = pECB;

  retcode = TPCCCheckpoint( &checkpoint );
  if ( ERR_SUCCESS == retcode ) {
    SendMainMenuForm(pECB, w_id, ld_id,
                                  "Checkpoint issued (non-blocking), completed
(blocking).");
  }
  else {
    SendErrorResponse( pECB, retcode, ERR_TYPE_WEBDLL,
                                    NULL, w_id, ld_id, NULL );
  }
}

/* FUNCTION: void
CheckpointStartupCmd(EXTENSION_CONTROL_BLOCK *pECB,
 *
 * PURPOSE:              This function causes initialization of the checkpoint
command.
 *
```

```
 * ARGUMENTS:        EXTENSION_CONTROL_BLOCK   *pECB       IIS
context structure pointer
 *
                unique to this connection.
 *
 * RETURNS:              None
 *
 * COMMENTS:           none
 */

void
CheckpointStartupCmd(EXTENSION_CONTROL_BLOCK *pECB, int w_id,
int ld_id )
{
  int                                   retcode;

  retcode = CKPTStartup( );
  if ( ERR_SUCCESS == retcode ) {
    SendMainMenuForm(pECB, w_id, ld_id, "Checkpoint Startup Succeded.");
  }
  else {
    SendErrorResponse( pECB, retcode, ERR_TYPE_WEBDLL,
                                  NULL, w_id, ld_id, NULL );
  }
}

/* FUNCTION: void ClearCmd(EXTENSION_CONTROL_BLOCK *pECB)
 *
 * PURPOSE:              This resets all terminals and resets the log file.
 *
 * ARGUMENTS:        EXTENSION_CONTROL_BLOCK   *pECB       IIS
context structure pointer
 *
                unique to this connection.
 *
 * RETURNS:                      None
 *
 * COMMENTS:           This function resets the connection information for the
 *                               dll.  Any "users" with current connections will be given
 *                               an error message on their next transaction.
 */

void
ClearCmd(EXTENSION_CONTROL_BLOCK *pECB)
{
  if ( bLog )
  {
    TPCCCloseLog( );
    TPCCOpenLog( );
  }

  SendWelcomeForm(pECB);
}

/* FUNCTION: void ExitCmd(EXTENSION_CONTROL_BLOCK *pECB,
 *
 * PURPOSE:              This function deallocates the terminal associated with
 *                               the browser and presents the login screen.
 *
 * ARGUMENTS:        EXTENSION_CONTROL_BLOCK   *pECB       IIS
context structure pointer
 *
                unique to this connection.
 * RETURNS:              None
 *
 * COMMENTS:           None
 *
 */

void
ExitCmd( EXTENSION_CONTROL_BLOCK *pECB )
{
  TPCCDisconnect( pECB );

  SendWelcomeForm( pECB );
}

/* FUNCTION: void MenuCmd( EXTENSION_CONTROL_BLOCK *pECB,
 *
 * PURPOSE:              This function displays the main menu.
 *
 * ARGUMENTS:        EXTENSION_CONTROL_BLOCK   *pECB       IIS
context structure pointer
 *
                unique to this connection.
 * RETURNS:              None
 *
 * COMMENTS:           None
 *
 */

void
MenuCmd( EXTENSION_CONTROL_BLOCK *pECB, int w_id, int ld_id )
{
  SendMainMenuForm(pECB, w_id, ld_id, NULL);
}

/* FUNCTION: void SubmitCmd( EXTENSION_CONTROL_BLOCK *pECB )
 *
 * PURPOSE:              This function assigns a unique terminal id to the calling
 *                               browser.
 *
 * ARGUMENTS:        EXTENSION_CONTROL_BLOCK   *pECB       IIS
context structure pointer
 *
                unique to this connection.
 * RETURNS:              None
 *
 * COMMENTS:           A terminal id can be allocated but still be invalid if the
 *                               requested warehouse number is outside the range
specified
 *                               in the registry. This then will force the client id
 *                               to be invalid and an error message sent to the users
browser.
 */

void
SubmitCmd( EXTENSION_CONTROL_BLOCK *pECB, int *w_id, int *ld_id )
{
  int           iStatus;
  LoginData login;
  char          *ptr;

  if ( !GetCharKeyValuePtr( pECB->lpszQueryString, '4', &ptr ) ||
      ( 0 == ( *w_id = atoi( ptr ))) ||
      ( *w_id < 0 ))
  {
    SendErrorResponse( pECB, ERR_W_ID_INVALID, ERR_TYPE_WEBDLL,
                                  NULL, *w_id, -1, NULL );
    goto SubmitError;
  }

  if ( !GetCharKeyValuePtr( pECB->lpszQueryString, '5', &ptr ) ||
      ( 0 == ( *ld_id = atoi( ptr ))) ||
      ( *ld_id > 10 ) ||
      ( *ld_id < 0 ))
  {
    SendErrorResponse( pECB, ERR_D_ID_INVALID, ERR_TYPE_WEBDLL,
                                  NULL, *w_id, *ld_id, NULL );
    goto SubmitError;
  }

  login.w_id = *w_id;
  login.ld_id = *ld_id;
```

```
 login.pCC = pECB;
 strcpy( login.szServer, gszServer );
 strcpy( login.szDatabase, gszDatabase );
 strcpy( login.szUser, gszUser );
 strcpy( login.szPassword, gszPassword );
 sprintf( login.szApplication, "TPCC" );
 iStatus = TPCCConnect( &login );
 if( ERR_DB_SUCCESS != iStatus )
 {
  SendErrorResponse( pECB, iStatus, ERR_TYPE_WEBDLL,
                     NULL, *w_id, *ld_id, NULL );
  goto SubmitError;
 }

 SendMainMenuForm(pECB, *w_id, *ld_id, NULL);
 return;

SubmitError:
 return;

}

/* FUNCTION: void MemoryCheckCmd( EXTENSION_CONTROL_BLOCK
*pECB,
 *
 * PURPOSE:          This function displays the main menu.
 *
 * ARGUMENTS:        EXTENSION_CONTROL_BLOCK  *pECB      IIS
context structure pointer
 *
                   unique to this connection.
 * RETURNS:          None
 *
 * COMMENTS:         None
 *
 */

void
MemoryCheckCmd( EXTENSION_CONTROL_BLOCK *pECB, int w_id, int
ld_id )
{
 _ASSERTE( _CrtCheckMemory( ));

 SendErrorResponse( pECB, ERR_SUCCESS, ERR_TYPE_WEBDLL, NULL,
                    w_id, ld_id, NULL );
}

/* FUNCTION: BOOL GetKeyValuePtr( char *szIPtr, char *szKey, char
**pszOPtr )
 *
 * PURPOSE:          This function searches the input string for the key
 *                   specified.  If found, it returns a pointer to the value.
 *
 * ARGUMENTS:        char   *szIPtr                    pointer to string
to check.
 *                   char          *szKey              pointer to key to
find.
 *                   char          **pszOPtr   pointer to value.
 *
 * RETURNS:          BOOL       FALSE                  if key is not
found.
 *                              TRUE                   if key is found.
 *
 * COMMENTS:         A side affect of this routine is that the output string
 *                   pointer will either point at the start of the value being
 *                   searched or at the *start* point where ptr originated.
 */
BOOL
GetKeyValuePtr( char *szIPtr, char *szKey, char **pszOPtr )
{
 char *szPtr1, *szPtr2;

 *pszOPtr = szIPtr;
 while (*szIPtr)
 {
  szPtr1 = szIPtr;
  szPtr2 = szKey;

  while ( *szPtr1 && *szPtr2 && 0 == ( *szPtr1 - *szPtr2 ))
   szPtr1++, szPtr2++;

  if ( '=' == *szPtr1 && '\0' == *szPtr2 )
  {
   *pszOPtr = ++szPtr1;
   return TRUE;
  }

  szIPtr++;
 }

 return FALSE;
}

/* FUNCTION: BOOL GetKeyValueCharPtr( char *szIPtr, char cKey, char
**pszOPtr )
 *
 * PURPOSE:          This function searches the input string for the single
char key
 *                   specified.  If found, it returns a pointer to the value.
 *
 * ARGUMENTS:        char   *szIPtr                    pointer to string
to check.
 *                   char          cKey                pointer to key to
find.
 *                   char          **pszOPtr   pointer to value.
 *
 * RETURNS:          BOOL       FALSE                  if key is not
found.
 *                              TRUE                   if key is found.
 *
 * COMMENTS:         A side affect of this routine is that the output string
 *                   pointer will either point at the start of the value being
 *                   searched or at the *start* point where ptr originated.
 */
BOOL
GetCharKeyValuePtr( char *szIPtr, char cKey, char **pszOPtr )
{
 BOOL      bGotStart;

 *pszOPtr = szIPtr;
 bGotStart = FALSE;
 while( *szIPtr )
 {
  if( cKey == *szIPtr && '=' == *++szIPtr )
  {
   *pszOPtr = ++szIPtr;
   return TRUE;
  }
  while( *szIPtr )
  {
   if( '&' == *szIPtr )
   {
            szIPtr++;
            break;
   }
   szIPtr++;
  }
 }

 return FALSE;
}

/* FUNCTION: BOOL GetNumeric(char *ptr, int *iValue)
 *
```

```
 * PURPOSE:            This function converts the string value to integer, and
 *                     determines if the string is terminated properly.  If it
 *                     contains non-numeric characters or if any characters
 *                     other than '&' or '\0' terminate the integer portion
 *                     of the string, this function fails.
 *
 * ARGUMENTS:          char    *ptr   pointer to string to check.
 *
 * RETURNS:            BOOL    FALSE  if string is not all numeric and
properly
 *                                    terminated.
 *                             TRUE   if string contains only
numeric characters
 *                                    i.e. '0' - '9' and is properly
terminated.
 *
 * COMMENTS:           None
 *
 */
BOOL
GetNumeric(char *ptr, int *iValue)
{
  int c;            /* current char */
  int total;        /* current total */
  BOOL bGotSomething = FALSE;

  c = (int)(unsigned char)*ptr++;

  total = 0;

  while ((c >= '0') && (c <= '9'))
  {
    total = 10 * total + (c - '0');     /* accumulate digit */
    c = (int)(unsigned char)*ptr++;    /* get next char */
    bGotSomething = TRUE;
  }
  if(('\0' == c) || ('&' == c) && bGotSomething)
  {
    *iValue = total;
    return (TRUE);   /* return result */
  }
  else
  {
    *iValue = 0;
    return(FALSE);
  }
}

/* FUNCTION: BOOL GetWDID(char *ptr, int *lw_id, int *ld_id, char **optr)
 *
 * PURPOSE:            This function converts the string value to a pair of
integers
 *                     where the ascii numeric field represents an encoded
warehouse
 *                     and district id.  The least significant digit is one less
than
 *                     the actual local district id, and the remaining high order
 *                     digits are 10 times the actual local warehouse id.
 *
 * ARGUMENTS:          char    *ptr   pointer to string to check.
 *
 * RETURNS:            BOOL    FALSE  if string is not all numeric and
properly
 *                                    terminated.
 *                             TRUE   if string contains only
numeric characters
 *                                    i.e. '0' - '9' and is properly
terminated.
 *
 * COMMENTS:           A side affect of this routine is that the output string
 *                     pointer will either point at the end of the values being
 *                     searched or at the *start* point where ptr originated.
 *
 */
BOOL
GetWDID(char *ptr, int *lw_id, int *ld_id, char **optr)
{
  int c;            /* current char */
  int pc;             /* previous character */
  int total;        /* current total */
  BOOL bGotSomething = FALSE;

  *lw_id = 0;
  *ld_id = 0;
  total = 0;

  *optr = ptr;
  pc = (int)(unsigned char)*ptr++;
  if((pc < '0') || (pc > '9'))
    return FALSE;

  c = (int)(unsigned char)*ptr++;

  while ((c >= '0') && (c <= '9'))
  {
    total = 10 * total + (pc - '0');     /* accumulate digit */
    pc = c;
    c = (int)(unsigned char)*ptr++;    /* get next char */
    bGotSomething = TRUE;
  }
  if(('\0' == c) || ('&' == c) && bGotSomething)
  {
    *lw_id = total;
    *ld_id = (pc - '0') + 1;
    *optr = ptr;
    return TRUE;   /* return result */
  }
  else
    return FALSE;
}

/* FUNCTION: BOOL GetKeyValueString(char *szIPtr, char *szKey,
 *                                                  char *szValue, int iSize)
 *
 * PURPOSE:            This function searches for the key specified and returns
 *                     the string value associated with it.
 *
 * ARGUMENTS:          char            *szIPtr
                string to search
 *                     char            *szKey                          key
to search for
 *                     char            *szValue                location to store
value
 *                     int             iSize                           size
of output array.
 *
 * RETURNS:            BOOL    FALSE                                   key
not found
 *                             TRUE                                    key
found, value stored
 *
 *
 * COMMENTS:           http keys are formatted either KEY=value& or
KEY=value\0.
 *                     This DLL formats TPC-C input fields in such a manner
that
 *                     the keys can be extracted in the above manner.
 */

BOOL
GetKeyValueString(char *szIPtr, char *szKey,
                                char *szValue, int iSize)
{
  char *ptr;
```

```
 if( !GetKeyValuePtr( szIPtr, szKey, &ptr ))
   return FALSE;

 /* force zero termination of output string */
 iSize--;

 while( '\0' != *ptr && '&' != *ptr && iSize)
 {
   *szValue++ = *ptr++;
   iSize--;
 }
 *szValue = 0;
 return TRUE;
}

/* FUNCTION: void CheckMemory(void *param)
 *
 * PURPOSE:              This function loops calling _CrtCheckMemory()
 *
 * ARGUMENTS:
 *                       void          *param                                  not
used
 *
 * RETURNS:              nothing
 *
 * COMMENTS:
 */

#ifdef FFE_DEBUG

unsigned __stdcall
CheckMemory(void *param)
{
        while (TRUE)
        {
                _ASSERTE(_CrtCheckMemory());
                Sleep(1000);
        }

        return 0;
}

#endif
```

# Appendix B

## Sybase Device Init and Database Create Code and Segment Creation

```
disk init
  name = 'ordlne01',
  physname = '/tpcc_devs/ordlne01',
  vdevno = 1,
  size = 6400000
go
disk init
  name = 'ordlne02',
  physname = '/tpcc_devs/ordlne02',
  vdevno = 2,
  size = 6400000
go
disk init
  name = 'ordlne03',
  physname = '/tpcc_devs/ordlne03',
  vdevno = 3,
  size = 6400000
go
disk init
  name = 'ordlne04',
  physname = '/tpcc_devs/ordlne04',
  vdevno = 4,
  size = 6400000
go
disk init
  name = 'ordlne05',
  physname = '/tpcc_devs/ordlne05',
  vdevno = 5,
  size = 6400000
go
disk init
  name = 'ordlne06',
  physname = '/tpcc_devs/ordlne06',
  vdevno = 6,
  size = 6400000
go
disk init
  name = 'orders01',
  physname = '/tpcc_devs/orders01',
  vdevno = 7,
  size = 960000
go
disk init
  name = 'orders02',
  physname = '/tpcc_devs/orders02',
  vdevno = 8,
  size = 960000
go
disk init
  name = 'history01',
  physname = '/tpcc_devs/history01',
  vdevno = 9,
  size = 3840000
go
disk init
  name = 'cidx01',
  physname = '/tpcc_devs/cidx01',
  vdevno = 10,
  size = 1152000
go
disk init
  name = 'cidx02',
  physname = '/tpcc_devs/cidx02',
  vdevno = 11,
  size = 1152000
go
disk init
  name = 'stock01',
  physname = '/tpcc_devs/stock01',
  vdevno = 12,
  size = 3543040
go
disk init
  name = 'stock02',
  physname = '/tpcc_devs/stock02',
  vdevno = 13,
  size = 3543040
go
disk init
  name = 'stock03',
  physname = '/tpcc_devs/stock03',
  vdevno = 14,
  size = 3543040
go
disk init
  name = 'stock04',
  physname = '/tpcc_devs/stock04',
  vdevno = 15,
  size = 3543040
go
disk init
  name = 'stock05',
  physname = '/tpcc_devs/stock05',
  vdevno = 16,
  size = 3543040
go
disk init
  name = 'stock06',
  physname = '/tpcc_devs/stock06',
  vdevno = 17,
  size = 3543040
go
disk init
  name = 'stock07',
  physname = '/tpcc_devs/stock07',
  vdevno = 18,
  size = 3543040
go
disk init
  name = 'stock08',
  physname = '/tpcc_devs/stock08',
  vdevno = 19,
  size = 3543040
go
disk init
  name = 'stock09',
  physname = '/tpcc_devs/stock09',
  vdevno = 20,
  size = 3543040
go
disk init
  name = 'stock10',
  physname = '/tpcc_devs/stock10',
  vdevno = 21,
  size = 3543040
go
disk init
  name = 'stock11',
  physname = '/tpcc_devs/stock11',
  vdevno = 22,
  size = 3543040
go
disk init
  name = 'stock12',
  physname = '/tpcc_devs/stock12',
  vdevno = 23,
```

```
  size = 3543040
go
disk init
  name = 'stock13',
  physname = '/tpcc_devs/stock13',
  vdevno = 24,
  size = 3543040
go
disk init
  name = 'stock14',
  physname = '/tpcc_devs/stock14',
  vdevno = 25,
  size = 3543040
go
disk init
  name = 'stock15',
  physname = '/tpcc_devs/stock15',
  vdevno = 26,
  size = 3543040
go
disk init
  name = 'cust01',
  physname = '/tpcc_devs/cust01',
  vdevno = 27,
  size = 2617344
go
disk init
  name = 'cust02',
  physname = '/tpcc_devs/cust02',
  vdevno = 28,
  size = 2617344
go
disk init
  name = 'cust03',
  physname = '/tpcc_devs/cust03',
  vdevno = 29,
  size = 2617344
go
disk init
  name = 'cust04',
  physname = '/tpcc_devs/cust04',
  vdevno = 30,
  size = 2617344
go
disk init
  name = 'cust05',
  physname = '/tpcc_devs/cust05',
  vdevno = 31,
  size = 2617344
go
disk init
  name = 'cust06',
  physname = '/tpcc_devs/cust06',
  vdevno = 32,
  size = 2617344
go
disk init
  name = 'cust07',
  physname = '/tpcc_devs/cust07',
  vdevno = 33,
  size = 2617344
go
disk init
  name = 'cust08',
  physname = '/tpcc_devs/cust08',
  vdevno = 34,
  size = 2617344
go
disk init
  name = 'cust09',
  physname = '/tpcc_devs/cust09',
  vdevno = 35,
  size = 2617344
go
disk init
  name = 'cust10',
  physname = '/tpcc_devs/cust10',
  vdevno = 36,
  size = 2617344
go
disk init
  name = 'cust11',
  physname = '/tpcc_devs/cust11',
  vdevno = 37,
  size = 2617344
go
disk init
  name = 'cust12',
  physname = '/tpcc_devs/cust12',
  vdevno = 38,
  size = 2617344
go
disk init
  name = 'log01',
  physname = '/tpcc_devs/log01',
  vdevno = 39,
  size = 12800000
go
create database tpcc
on master = 1300, ordlne01 = 12500
, ordlne02 = 12500
, ordlne03 = 12500
, ordlne04 = 12500
, ordlne05 = 12500
, ordlne06 = 12500
, orders01 = 1875
, orders02 = 1875
, history01 = 7500
, cidx01 = 2250
, cidx02 = 2250
, stock01 = 6920
, stock02 = 6920
, stock03 = 6920
, stock04 = 6920
, stock05 = 6920
, stock06 = 6920
, stock07 = 6920
, stock08 = 6920
, stock09 = 6920
, stock10 = 6920
, stock11 = 6920
, stock12 = 6920
, stock13 = 6920
, stock14 = 6920
, stock15 = 6920
, cust01 = 5112
, cust02 = 5112
, cust03 = 5112
, cust04 = 5112
, cust05 = 5112
, cust06 = 5112
, cust07 = 5112
, cust08 = 5112
, cust09 = 5112
, cust10 = 5112
, cust11 = 5112
, cust12 = 5112
log on log01 = 25000
go
use tpcc
go
sp_addsegment Scache , tpcc , master
go
sp_addsegment Scidx , tpcc , cidx01
```

```
go
sp_extendsegment Scidx , tpcc ,  cidx02
go
sp_addsegment Scust , tpcc , cust01
go
sp_extendsegment Scust , tpcc ,  cust02
go
sp_extendsegment Scust , tpcc ,  cust03
go
sp_extendsegment Scust , tpcc ,  cust04
go
sp_extendsegment Scust , tpcc ,  cust05
go
sp_extendsegment Scust , tpcc ,  cust06
go
sp_extendsegment Scust , tpcc ,  cust07
go
sp_extendsegment Scust , tpcc ,  cust08
go
sp_extendsegment Scust , tpcc ,  cust09
go
sp_extendsegment Scust , tpcc ,  cust10
go
sp_extendsegment Scust , tpcc ,  cust11
go
sp_extendsegment Scust , tpcc ,  cust12
go
sp_addsegment Shistory , tpcc , history01
go
sp_addsegment Sorders , tpcc , orders01
go
sp_extendsegment Sorders , tpcc ,  orders02
go
sp_addsegment Sordlne , tpcc , ordlne01
go
sp_extendsegment Sordlne , tpcc ,  ordlne02
go
sp_extendsegment Sordlne , tpcc ,  ordlne03
go
sp_extendsegment Sordlne , tpcc ,  ordlne04
go
sp_extendsegment Sordlne , tpcc ,  ordlne05
go
sp_extendsegment Sordlne , tpcc ,  ordlne06
go
sp_addsegment Sstock , tpcc , stock01
go
sp_extendsegment Sstock , tpcc ,  stock02
go
sp_extendsegment Sstock , tpcc ,  stock03
go
sp_extendsegment Sstock , tpcc ,  stock04
go
sp_extendsegment Sstock , tpcc ,  stock05
go
sp_extendsegment Sstock , tpcc ,  stock06
go
sp_extendsegment Sstock , tpcc ,  stock07
go
sp_extendsegment Sstock , tpcc ,  stock08
go
sp_extendsegment Sstock , tpcc ,  stock09
go
sp_extendsegment Sstock , tpcc ,  stock10
go
sp_extendsegment Sstock , tpcc ,  stock11
go
sp_extendsegment Sstock , tpcc ,  stock12
go
sp_extendsegment Sstock , tpcc ,  stock13
go
sp_extendsegment Sstock , tpcc ,  stock14
go
sp_extendsegment Sstock , tpcc ,  stock15
go
use tpcc
go
sp_dropsegment 'default', tpcc , cidx01
go
sp_dropsegment 'system', tpcc , cidx01
go
sp_dropsegment 'default', tpcc , cidx02
go
sp_dropsegment 'system', tpcc , cidx02
go
sp_dropsegment 'default', tpcc , cust01
go
sp_dropsegment 'system', tpcc , cust01
go
sp_dropsegment 'default', tpcc , cust02
go
sp_dropsegment 'system', tpcc , cust02
go
sp_dropsegment 'default', tpcc , cust03
go
sp_dropsegment 'system', tpcc , cust03
go
sp_dropsegment 'default', tpcc , cust04
go
sp_dropsegment 'system', tpcc , cust04
go
sp_dropsegment 'default', tpcc , cust05
go
sp_dropsegment 'system', tpcc , cust05
go
sp_dropsegment 'default', tpcc , cust06
go
sp_dropsegment 'system', tpcc , cust06
go
sp_dropsegment 'default', tpcc , cust07
go
sp_dropsegment 'system', tpcc , cust07
go
sp_dropsegment 'default', tpcc , cust08
go
sp_dropsegment 'system', tpcc , cust08
go
sp_dropsegment 'default', tpcc , cust09
go
sp_dropsegment 'system', tpcc , cust09
go
sp_dropsegment 'default', tpcc , cust10
go
sp_dropsegment 'system', tpcc , cust10
go
sp_dropsegment 'default', tpcc , cust11
go
sp_dropsegment 'system', tpcc , cust11
go
sp_dropsegment 'default', tpcc , cust12
go
sp_dropsegment 'system', tpcc , cust12
go
sp_dropsegment 'default', tpcc , history01
go
sp_dropsegment 'system', tpcc , history01
go
sp_dropsegment 'default', tpcc , orders01
go
sp_dropsegment 'system', tpcc , orders01
go
sp_dropsegment 'default', tpcc , orders02
go
sp_dropsegment 'system', tpcc , orders02
```

```
go
sp_dropsegment 'default', tpcc , ordlne01
go
sp_dropsegment 'system', tpcc , ordlne01
go
sp_dropsegment 'default', tpcc , ordlne02
go
sp_dropsegment 'system', tpcc , ordlne02
go
sp_dropsegment 'default', tpcc , ordlne03
go
sp_dropsegment 'system', tpcc , ordlne03
go
sp_dropsegment 'default', tpcc , ordlne04
go
sp_dropsegment 'system', tpcc , ordlne04
go
sp_dropsegment 'default', tpcc , ordlne05
go
sp_dropsegment 'system', tpcc , ordlne05
go
sp_dropsegment 'default', tpcc , ordlne06
go
sp_dropsegment 'system', tpcc , ordlne06
go
sp_dropsegment 'default', tpcc , stock01
go
sp_dropsegment 'system', tpcc , stock01
go
sp_dropsegment 'default', tpcc , stock02
go
sp_dropsegment 'system', tpcc , stock02
go
sp_dropsegment 'default', tpcc , stock03
go
sp_dropsegment 'system', tpcc , stock03
go
sp_dropsegment 'default', tpcc , stock04
go
sp_dropsegment 'system', tpcc , stock04
go
sp_dropsegment 'default', tpcc , stock05
go
sp_dropsegment 'system', tpcc , stock05
go
sp_dropsegment 'default', tpcc , stock06
go
sp_dropsegment 'system', tpcc , stock06
go
sp_dropsegment 'default', tpcc , stock07
go
sp_dropsegment 'system', tpcc , stock07
go
sp_dropsegment 'default', tpcc , stock08
go
sp_dropsegment 'system', tpcc , stock08
go
sp_dropsegment 'default', tpcc , stock09
go
sp_dropsegment 'system', tpcc , stock09
go
sp_dropsegment 'default', tpcc , stock10
go
sp_dropsegment 'system', tpcc , stock10
go
sp_dropsegment 'default', tpcc , stock11
go
sp_dropsegment 'system', tpcc , stock11
go
sp_dropsegment 'default', tpcc , stock12
go
sp_dropsegment 'system', tpcc , stock12
go
sp_dropsegment 'default', tpcc , stock13
go
sp_dropsegment 'system', tpcc , stock13
go
sp_dropsegment 'default', tpcc , stock14
go
sp_dropsegment 'system', tpcc , stock14
go
use master
go
checkpoint
go
```

## Sybase Table and Index Definition

```
#!/bin/sh -f

isql -Usa -P$PASSWORD << EOF

/* This script will create all the tables required for TPC-C benchmark */
/* It will also create some of the indexes. */
sp_dboption tpcc,"select into/bulkcopy",true
go
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                   real,
        w_ytd                   float                   /*- Updated by
PID, PNM */
) on Scache
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                   real,
        d_ytd                   float,                  /*- Updated by
PID, PNM */
        d_next_o_id             int                     /*- Updated by
NO */
) on Scache
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  real,
        c_delivery_cnt          smallint,
        c_payment_cnt           smallint,   /*- Updated by PNM, PID */
        c_balance   float,                  /*- Updated by PNM, PID */
        c_ytd_payment           float,                  /*- Updated by
PNM, PID */
        c_data1                 char(250),  /*- Updated (?) by PNM, PID
*/
        c_data2                 char(250)   /*- Updated (?) by PNM, PID
*/
) on Scustomer
go
create unique clustered index c_clu
        on customer(c_w_id, c_id, c_d_id)
        on Scustomer
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    float,
        h_data                  char(24)
) on Shistory
go
/* alter table history unpartition */
alter table history partition 8
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 Scache
go
create unique clustered index no_clu
        on new_order(no_w_id, no_d_id, no_o_id)
        on Scache
go
dbcc tune(ascinserts, 1, new_order)
go
dbcc tune(oamtrips, 100, new_order)
go

if exists ( select name from sysobjects where name = 'orders' )
        drop table orders
go
create table orders (
        o_id                    int,
        o_c_id                  int,
        o_d_id                  tinyint,
        o_w_id                  smallint,
        o_entry_d   datetime,
        o_carrier_id smallint,  /*- Updated by D */
        o_ol_cnt    tinyint,
        o_all_local tinyint
) on Sorders
go

create unique clustered index o_clu
        on orders(o_w_id, o_d_id, o_id)
        on Sorders
go


dbcc tune(ascinserts, 1, orders)
go
dbcc tune(oamtrips, 100, orders)
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,   /*- Updated by D */
        ol_quantity smallint,
        ol_amount   float,
        ol_dist_info char(24)
) on Sorder_line
go
create unique clustered index ol_clu
        on order_line(ol_w_id, ol_d_id, ol_o_id, ol_number)
        on Sorder_line
go
dbcc tune(ascinserts, 1, order_line)
go
dbcc tune(oamtrips, 100, order_line)
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                 float,
        i_data                  char(50)
) on Scache
go
create unique clustered index i_clu
        on item(i_id)
        on Scache
go
dbcc tune(indextrips, 10, item)
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,   /*- Updated by NO */
```

```
        s_ytd                   int,                    /*- Updated by
NO */
        s_order_cnt smallint,   /*- Updated by NO */
        s_remote_cnt            smallint,   /*- Updated by NO */
        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_data                  char(50)
) on Sstock
go
create unique clustered index s_clu
        on stock(s_i_id, s_w_id)
        on Sstock
go
dbcc tune(indextrips, 10, stock)
go

checkpoint
go
EOF


#!/bin/sh -f

isql -Usa -P$PASSWORD << EOF
/* This script will create the TPC-C indexes that are best
  created after the load. */
use tpcc
go

create unique clustered index w_clu
        on warehouse(w_id)
        with fillfactor = 1
        on Scache
go
dbcc tune(indextrips, 100, warehouse)
go

create unique clustered index d_clu
        on district(d_w_id, d_id)
        with fillfactor = 1
        on Scache
go
dbcc tune(indextrips, 100, district)
go

create unique nonclustered index c_non1
        on customer(c_w_id, c_d_id, c_last, c_first, c_id)
        on Scidx
go

checkpoint
go
EOF



Sybase Data Load


typedef     unsigned long       BitVector;
#define WSZ                     (sizeof(BitVector)*8)
/* For axposf use WAREBATCH 0f 150 */
#define     WAREBATCH           150
#define     nthbit(map,n)       map[(n)/WSZ] &  (((BitVector)0x1)<<
((n)%WSZ))
#define     setbit(map,n)       map[(n)/WSZ] |= (((BitVector)0x1)<<
((n)%WSZ))

/*************************************************************
Load TPCC tables
*************************************************************/
#include "stdio.h"
#include "string.h"
#include "loader.h"

int load_item;
int load_warehouse;
int load_district;
int load_history;
int load_orders;
int load_new_order;
int load_order_line;
int load_customer;
int load_stock;
ID  w1, w2;
ID  warehouse;
int batch_size = 1000;
char   password[10];

int main(argn, argv)
        int argn;
        char **argv;
{

        /* Setup to use  the dblib version 10 for numeric datatypes */
    dbsetversion(DBVERSION_100);


        getargs(argn, argv);
        Randomize();

        if (load_item)              LoadItems();
        if (load_warehouse)     LoadWarehouse(w1, w2);
        if (load_district)      LoadDistrict(w1, w2);
        if (load_history)       LoadHist(w1, w2);
        if (load_customer)      LoadCustomer(w1, w2);
        if (load_stock)             LoadStock(w1, w2);
        if (load_orders)        LoadOrd(w1, w2);
        if (load_new_order)     LoadNew(w1, w2);
        return 0;
}



/*************************************************************
******
*************************************************************
*****

Warehouse

*************************************************************
*******
*************************************************************
*******/


ID   w_id;
TEXT w_name[10+1];
TEXT w_street_1[20+1];
TEXT w_street_2[20+1];
TEXT w_city[20+1];
TEXT w_state[2+1];
TEXT w_zip[9+1];
FLOAT w_tax;
```

```
MONEY w_ytd;


int bulk_w;

LoadWarehouse(w1, w2)
        ID w1, w2;
{

        begin_warehouse_load();
        for (warehouse=w1; warehouse<=w2; warehouse++)
        {
                printf("Loading warehouse for warehouse %d\n",
warehouse);

                w_id = warehouse;
                MakeAlphaString(6, 10, w_name);
                MakeAddress(w_street_1, w_street_2, w_city, w_state,
w_zip);

                w_tax = RandomNumber(10, 20) / 100.0;
                w_ytd = 300000.00;

                warehouse_load();

                printf("loaded warehouse for warehouse %d\n",
warehouse);
        }
        end_warehouse_load();
        return;
}


begin_warehouse_load()
{
        int             i = 1;

        bulk_w = bulk_open("tpcc", "warehouse", password);

        bulk_bind(bulk_w, i++, "w_id",   &w_id, ID_T);
        bulk_bind(bulk_w, i++, "w_name", w_name, TEXT_T);
        bulk_bind(bulk_w, i++, "w_street_1", w_street_1, TEXT_T);
        bulk_bind(bulk_w, i++, "w_street_2", w_street_2, TEXT_T);
        bulk_bind(bulk_w, i++, "w_city", w_city, TEXT_T);
        bulk_bind(bulk_w, i++, "w_state", w_state, TEXT_T);
        bulk_bind(bulk_w, i++, "w_zip", w_zip, TEXT_T);
        bulk_bind(bulk_w, i++, "w_tax", &w_tax, FLOAT_T);
        bulk_bind(bulk_w, i++, "w_ytd", &w_ytd, MONEY_T);
}


warehouse_load()
{
        debug("Loading Warehouse %d\n", w_id);
        bulk_load(bulk_w);
}


end_warehouse_load()
{
        bulk_close(bulk_w);
}




/*************************************************************
*******
*************************************************************
********

District

*************************************************************
*******
*************************************************************
*******/



ID d_id;
ID d_w_id;
TEXT d_name[10+1];
TEXT d_street_1[20+1];
TEXT d_street_2[20+1];
TEXT d_city[20+1];
TEXT d_state[2+1];
TEXT d_zip[9+1];
FLOAT d_tax;
MONEY d_ytd;
ID   d_next_o_id;

int bulk_d;

LoadDistrict(w1, w2)
        ID w1, w2;
{
        ID w_id;

        begin_district_load();
        for (w_id=w1; w_id<=w2; w_id++)
        {
                printf("Loading districts for warehouse %d\n", w_id);

                d_w_id = w_id;
                d_ytd = 30000.00;
                d_next_o_id = 3001;

                for (d_id = 1;  d_id <= DIST_PER_WARE;  d_id++)
                {

                        MakeAlphaString(6, 10, d_name);
                        MakeAddress(d_street_1, d_street_2,
d_city, d_state, d_zip);
                        d_tax = RandomNumber(10,20) / 100.0;

                        district_load();
                }
                printf("loaded district for warehouse %d\n", w_id);
        }
        end_district_load();
        return;
}




begin_district_load()
{
        int             i = 1;

        bulk_d = bulk_open("tpcc", "district", password);

        bulk_bind(bulk_d, i++, "d_id", &d_id, ID_T);
        bulk_bind(bulk_d, i++, "d_w_id", &d_w_id, ID_T);
        bulk_bind(bulk_d, i++, "d_name", d_name, TEXT_T);
        bulk_bind(bulk_d, i++, "d_street_1", d_street_1, TEXT_T);
        bulk_bind(bulk_d, i++, "d_street_2", d_street_2, TEXT_T);
        bulk_bind(bulk_d, i++, "d_city", d_city, TEXT_T);
        bulk_bind(bulk_d, i++, "d_state", d_state, TEXT_T);
        bulk_bind(bulk_d, i++, "d_zip", d_zip, TEXT_T);
        bulk_bind(bulk_d, i++, "d_tax", &d_tax, FLOAT_T);
        bulk_bind(bulk_d, i++, "d_ytd", &d_ytd, MONEY_T);
        bulk_bind(bulk_d, i++, "d_next_o_id", &d_next_o_id, ID_T);
```

```
}

district_load()
{
        debug("District %d  w_id=%d\n", d_id, d_w_id);
        bulk_load(bulk_d);
}

end_district_load()
{
        bulk_close(bulk_d);
}




/*************************************************************
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Item

*************************************************************
*****
*************************************************************
******/



ID i_id;
ID i_im_id;
TEXT i_name[24+1];
MONEY i_price;
TEXT  i_data[50+1];

int bulk_i;

LoadItems()
{

        int perm[MAXITEMS+1];
        int i, r, t;

        printf("Loading items\n");

        begin_item_load();

        /* select exactly 10% of items to be labeled "original" */
        RandomPermutation(perm, MAXITEMS);

        /* do for each item */
        for (i_id=1;   i_id <= MAXITEMS; i_id++)
        {

        /* Generate Item Data */
        MakeAlphaString(14, 24, i_name);
        i_price = RandomNumber(100,10000) / 100.0;
        MakeAlphaString(26, 50, i_data);
        if (perm[i_id] <= (MAXITEMS+9)/10)
                Original(i_data);

        /* Generate i_im_id for V 3.0 */
        i_im_id = RandomNumber(1, 10000);

         item_load();
         }

        end_item_load();
        return;
}


begin_item_load()
{
        int             i = 1;

        bulk_i = bulk_open("tpcc", "item", password);

        /* bind the variables to the sybase columns */
        bulk_bind(bulk_i, i++, "i_id", &i_id, ID_T);
        bulk_bind(bulk_i, i++, "i_im_id", &i_im_id, ID_T);
        bulk_bind(bulk_i, i++, "i_name", i_name, TEXT_T);
        bulk_bind(bulk_i, i++, "i_price", &i_price, MONEY_T);
        bulk_bind(bulk_i, i++, "i_data", i_data, TEXT_T);
}



item_load()
{
        debug("i_id=%3d price=%5.2f data=%s\n",
          i_id,         i_price,       i_data);
        bulk_load(bulk_i);
}


end_item_load()
{
        bulk_close(bulk_i);
}



/*************************************************************
****
*************************************************************
****

History

*************************************************************
*****
*************************************************************
***/



ID h_c_id;
ID h_c_d_id;
ID h_c_w_id;
ID h_d_id;
ID h_w_id;
DATE h_date;
MONEY h_amount;
TEXT h_data[24+1];

int bulk_h;

LoadHist(w1, w2)
        ID w1, w2;
{
        ID w_id;
        ID d_id, c_id;

        begin_history_load();
        for (w_id=w1; w_id<=w2; w_id++)
        {
```

```
                        for (d_id=1;  d_id <= DIST_PER_WARE; d_id++)
                        {
                                for (c_id=1; c_id <= CUST_PER_DIST;
c_id++)
                                        LoadCustHist(w_id, d_id,
c_id);
                        }

                        printf("\nLoaded history for warehouse %d\n", w_id);
                }
                end_history_load();
}


LoadCustHist(w_id, d_id, c_id)
                ID w_id, d_id, c_id;
{

                h_c_id = c_id;
                h_c_d_id = d_id;
                h_c_w_id = w_id;
                h_d_id = d_id;
                h_w_id = w_id;
                h_amount = 10.0;
                MakeAlphaString(12, 24,h_data);
                datetime(&h_date);
                history_load();
}



begin_history_load()
{
                int             i = 1;

                bulk_h = bulk_open("tpcc", "history", password);

                bulk_bind(bulk_h, i++, "h_c_id",   &h_c_id,   ID_T);
                bulk_bind(bulk_h, i++, "h_c_d_id", &h_c_d_id, ID_T);
                bulk_bind(bulk_h, i++, "h_c_w_id", &h_c_w_id, ID_T);
                bulk_bind(bulk_h, i++, "h_d_id",   &h_d_id,   ID_T);
                bulk_bind(bulk_h, i++, "h_w_id",   &h_w_id,   ID_T);
                bulk_bind(bulk_h, i++, "h_date",   &h_date,   DATE_T);
                bulk_bind(bulk_h, i++, "h_amount", &h_amount, MONEY_T);
                bulk_bind(bulk_h, i++, "h_data",   h_data,    TEXT_T);
}

history_load()
{

                debug("h_c_id=%d  h_amount=%g\n", h_c_id, h_amount);
                bulk_load(bulk_h);
}


end_history_load()
{
                bulk_close(bulk_h);
}




/*************************************************************************
**********
*************************************************************************
**********

Customer
```

```
*************************************************************************
*********
*************************************************************************
*******/

/* static variables containing fields for customer record */
ID c_id;
ID c_d_id;
ID c_w_id;
TEXT c_first[16+1];
TEXT c_middle[2+1] = "OE";
TEXT c_last[16+1];
TEXT c_street_1[20+1];
TEXT c_street_2[20+1];
TEXT c_city[20+1];
TEXT c_state[2+1];
TEXT c_zip[9+1];
TEXT c_phone[16+1];
DATE c_since;
TEXT c_credit[2+1] = "?C";
MONEY c_credit_lim = 50000.0;       /* is this money or long or float? */
FLOAT c_discount;
MONEY c_balance = -10.0;
MONEY c_ytd_payment = 10.0;
COUNT c_payment_cnt = 1;
COUNT c_delivery_cnt = 0;
TEXT c_data[500+1];
TEXT c_data1[250+1];
TEXT c_data2[250+1];
ID              len;

int bulk_c;


LoadCustomer(w1, w2)
                ID w1, w2;
{
                ID w_id;

                begin_customer_load();
                for (w_id=w1; w_id<=w2; w_id++)
                {
                        Customer(w_id);
                        printf("\nLoaded customer for warehouse %d\n",
w_id);
                }
                end_customer_load();
}

Customer(w_id)
                int w_id;
{
                BitVector badcredit[DIST_PER_WARE][(3000+WSZ-1)/WSZ], *
bmp;
                int i, j;
                ID d_id;

                /* Mark exactly 10% of customers as having bad credit */
                for (d_id=1;  d_id <= DIST_PER_WARE;  d_id++)
                {
                        bmp = badcredit[d_id-1];
                        for (i=0; i<(3000+WSZ-1)/WSZ; i++)
                                bmp[i] = (BitVector)0x0000;
                        for (i=0; i<(3000+9)/10; i++)
                        {
                                do {
                                        j = RandomNumber(0,3000-
1);
                                } while (nthbit(bmp,j));
                                setbit(bmp,j);
                        }
                }
```

```
        c_w_id = w_id;
        for (i=0; i<CUST_PER_DIST; i++)
        {
                c_id = i+1;
                for (d_id=1;  d_id <= DIST_PER_WARE;  d_id++)
                {
                        c_d_id = d_id;

        LastName(i<1000?i:NURandomNumber(255,123,0,999),c_last);
                        MakeAlphaString(8, 16, c_first);

        MakeAddress(c_street_1,c_street_2,c_city,c_state,c_zip);
                        MakeNumberString(16, 16, c_phone);
                        MakeAlphaString(300, 500, c_data);
                        datetime(&c_since);
                        c_credit[0] = nthbit(badcredit[d_id-1],i) ?
'B' : 'G';
                        c_discount = RandomNumber(0, 50) /
100.0;
                        c_balance = -10.0;
                        customer_load();
                }
        }
}

begin_customer_load()
{
        int             i = 1;

        bulk_c = bulk_open("tpcc", "customer", password);

        bulk_bind(bulk_c, i++, "c_id",              &c_id,   ID_T);
        bulk_bind(bulk_c, i++, "c_d_id",        &c_d_id, ID_T);
        bulk_bind(bulk_c, i++, "c_w_id",        &c_w_id, ID_T);
        bulk_bind(bulk_c, i++, "c_first",   c_first, TEXT_T);
        bulk_bind(bulk_c, i++, "c_middle",  c_middle, TEXT_T);
        bulk_bind(bulk_c, i++, "c_last",          c_last,   TEXT_T);
        bulk_bind(bulk_c, i++, "street_1",  c_street_1 , TEXT_T);
        bulk_bind(bulk_c, i++, "street_2",  c_street_2,  TEXT_T);
        bulk_bind(bulk_c, i++, "c_city",          c_city,           TEXT_T);
        bulk_bind(bulk_c, i++, "c_state",   c_state,            TEXT_T);
        bulk_bind(bulk_c, i++, "c_zip",           c_zip,            TEXT_T);
        bulk_bind(bulk_c, i++, "c_phone",   c_phone,        TEXT_T);
        bulk_bind(bulk_c, i++, "c_since",   &c_since,         DATE_T);
        bulk_bind(bulk_c, i++, "c_credit",  c_credit,         TEXT_T);
        bulk_bind(bulk_c, i++, "c_credit_lim", &c_credit_lim,
MONEY_T);
        bulk_bind(bulk_c, i++, "c_discount", &c_discount, FLOAT_T);
        bulk_bind(bulk_c, i++, "c_delivery_cnt", &c_delivery_cnt,
COUNT_T);
        bulk_bind(bulk_c, i++, "c_payment_cnt",&c_payment_cnt,
COUNT_T);
        bulk_bind(bulk_c, i++, "c_balance", &c_balance, MONEY_T);
        bulk_bind(bulk_c, i++, "c_ytd_payment", &c_ytd_payment,
MONEY_T);
        bulk_bind(bulk_c, i++, "c_data_1", c_data1, TEXT_T);
        bulk_bind(bulk_c, i++, "c_data_2", c_data2, TEXT_T);
}

customer_load()
{
        debug("c_id=%-5d  d_id=%-5d  w_id=%-5d  c_last=%s\n",
          c_id,         c_d_id,  c_w_id,  c_last);


        /* Break the string c_data into 2 pieces */
        len = strlen(c_data);
        if (len > 250)
                {
                memcpy(c_data1, c_data, 250);
                c_data1[250]='\0';
                memcpy(c_data2, c_data+250, len-250 +1);
                }

        else
                {
                memcpy(c_data1, c_data, 250+1);
                strcpy(c_data2,"");
                }

        /* load the data */
        bulk_load(bulk_c);
}

end_customer_load()
{
        bulk_close(bulk_c);
}



/*************************************************************
*
*************************************************************

Order, Order line, New order

*************************************************************
**
*************************************************************
**/

/* Order row */
ID o_id;
ID o_c_id;
ID o_d_id;
ID o_w_id;
DATE o_entry_d;
ID o_carrier_id;
COUNT o_ol_cnt;
LOGICAL o_all_local;

/* Order line row */
ID   ol_o_id;
ID   ol_d_id;
ID   ol_w_id;
ID   ol_number;
ID   ol_i_id;
ID   ol_supply_w_id;
DATE ol_delivery_d;
COUNT ol_quantity;
MONEY ol_amount;
TEXT  ol_dist_info[24+1];

/* new order row */
ID no_o_id;
ID no_d_id;
ID no_w_id;


int  o_bulk;
int ol_bulk;
int no_bulk;



LoadOrd(w1, w2)
        ID w1, w2;
{
        ID w_id;
        ID d_id;
```

```
        begin_order_load();
        begin_order_line_load();
        for (w_id=w1; w_id<=w2; w_id++)
        {

                for (d_id = 1;  d_id <= DIST_PER_WARE;  d_id++)
                        Orders(w_id, d_id);

                printf("\nLoaded order + order_line for warehouse
%d\n", w_id);
        }
        end_order_line_load();
        end_order_load();
}

LoadNew(w1, w2)
        ID w1, w2;
{
        ID w_id;
        ID d_id;

        begin_new_order_load();
        for (w_id=w1; w_id<=w2; w_id++)
        {
                for (d_id = 1;  d_id <= DIST_PER_WARE;  d_id++)
                {
                        no_d_id = d_id;
                        no_w_id = w_id;
                        for (no_o_id=2101;  no_o_id <=
ORD_PER_DIST; no_o_id++)
                                new_order_load();
                }
                printf("\nLoaded new_order for warehouse %d\n",
w_id);
        }
        end_new_order_load();
}

Orders(w_id, d_id)
        ID w_id;
        ID d_id;
{
        int cust[ORD_PER_DIST+1];
        int ol_cnt[ORD_PER_DIST+1], sum;
        ID ol;

        printf("\nLoading orders and order lines  for warehouse %d district
%d\n",
         w_id, d_id);

        RandomPermutation(cust, ORD_PER_DIST);


        for (o_id = 1, sum=0;  o_id <= ORD_PER_DIST;  o_id++)
      sum += (ol_cnt[o_id] = RandomNumber(5, 15));

    while (sum > 10*ORD_PER_DIST)
    {
        do {
            o_id = RandomNumber(1,ORD_PER_DIST);
        } while (ol_cnt[o_id]==5);
        ol_cnt[o_id]--;
        sum--;
    }

    while (sum < 10*ORD_PER_DIST)
    {
        do {
            o_id = RandomNumber(1,ORD_PER_DIST);
        } while (ol_cnt[o_id]==15);
        ol_cnt[o_id]++;
        sum++;
    }

        for (o_id = 1;  o_id <= ORD_PER_DIST;  o_id++)
        {
        o_c_id = cust[o_id];
        o_d_id = d_id;
        o_w_id = w_id;
        datetime(&o_entry_d);
        if (o_id <= 2100)
        o_carrier_id = RandomNumber(1,10);
        else o_carrier_id = -1;
        o_ol_cnt = ol_cnt[o_id];
        /* o_ol_cnt = RandomNumber(5, 15); */
        o_all_local = 1;
        order_load();

        for (ol=1;  ol<=o_ol_cnt; ol++)
                OrderLine(ol);

        }
}



OrderLine(ol)
        ID ol;
{

        ol_o_id = o_id;
        ol_d_id = o_d_id;
        ol_w_id = o_w_id;
        ol_number = ol;
        ol_i_id = RandomNumber(1, MAXITEMS);
        ol_supply_w_id = o_w_id;
        ol_delivery_d = o_entry_d;
        ol_quantity = 5;
        if (o_id <= 2100) ol_amount = 0;
        else                    ol_amount = RandomNumber(1, 999999)
/ 100.0;
        MakeAlphaString(24, 24, ol_dist_info);
        order_line_load();
}


NewOrder(w_id, d_id)
        ID w_id, d_id;
{

        no_d_id = o_d_id;
        no_w_id = o_w_id;
        for (no_o_id=2101;  no_o_id <= ORD_PER_DIST; no_o_id++)
        new_order_load();
}



begin_order_load()
{
        int             i = 1;

        o_bulk = bulk_open("tpcc", "orders", password);

        bulk_bind(o_bulk, i++, "o_id", &o_id, ID_T);
        bulk_bind(o_bulk, i++, "o_c_id", &o_c_id, ID_T);
        bulk_bind(o_bulk, i++, "o_d_id", &o_d_id, ID_T);
        bulk_bind(o_bulk, i++, "o_w_id", &o_w_id, ID_T);
        bulk_bind(o_bulk, i++, "o_entry_d", &o_entry_d, DATE_T);
        bulk_bind(o_bulk, i++, "o_carrier_id", &o_carrier_id, ID_T);
        bulk_bind(o_ol_cnt, i++, "o_ol_cnt", &o_ol_cnt, COUNT_T);
```

```
        bulk_bind(o_all_local, i++, "o_all_local", &o_all_local,
LOGICAL_T);
}

order_load()
{
        debug("o_id=%d o_c_id=%d  count=%d\n", o_id, o_c_id,
o_ol_cnt);
        bulk_load(o_bulk);
}

end_order_load()
{
        bulk_close(o_bulk);
}



begin_order_line_load()
{
        int             i = 1;

        ol_bulk = bulk_open("tpcc", "order_line", password);

        bulk_bind(ol_bulk, i++, "ol_o_id", &ol_o_id, ID_T);
        bulk_bind(ol_bulk, i++, "ol_d_id", &ol_d_id, ID_T);
        bulk_bind(ol_bulk, i++, "ol_w_id", &ol_w_id, ID_T);
        bulk_bind(ol_bulk, i++, "ol_number", &ol_number, ID_T);
        bulk_bind(ol_bulk, i++, "ol_i_id", &ol_i_id, ID_T);
        bulk_bind(ol_bulk, i++, "ol_supply_w_id", &ol_supply_w_id,
ID_T);
        bulk_bind(ol_bulk, i++, "ol_delivery_d", &ol_delivery_d,
DATE_T);
        bulk_bind(ol_bulk, i++, "ol_quantity", &ol_quantity, COUNT_T);
        bulk_bind(ol_bulk, i++, "ol_amount", &ol_amount, MONEY_T);
        bulk_bind(ol_bulk, i++, "ol_dist_info", ol_dist_info, TEXT_T);
}

order_line_load()
{
        static int ol_count = 0;
        debug("  ol_o_id=%d  ol_number=%d  ol_amount=%g\n",
                        ol_o_id,      ol_number,  ol_amount);
        bulk_load(ol_bulk);
}


end_order_line_load()
{
        bulk_close(ol_bulk);
}

begin_new_order_load()
{
        int             i = 1;

        no_bulk = bulk_open("tpcc", "new_order", password);

        bulk_bind(no_bulk, i++, "no_o_id", &no_o_id, ID_T);
        bulk_bind(no_bulk, i++, "no_d_id", &no_d_id, ID_T);
        bulk_bind(no_bulk, i++, "no_w_id", &no_w_id, ID_T);
}

new_order_load()
{
        debug("  no_o_id=%d  \n", no_o_id);
        bulk_load(no_bulk);
}


end_new_order_load()
{
        bulk_close(no_bulk);
}


/*************************************************************
**********
*************************************************************
**********

Stock

*************************************************************
*********
*************************************************************
*******/


ID s_i_id;
ID s_w_id;
COUNT s_quantity;
TEXT s_dist_01[24+1];
TEXT s_dist_02[24+1];
TEXT s_dist_03[24+1];
TEXT s_dist_04[24+1];
TEXT s_dist_05[24+1];
TEXT s_dist_06[24+1];
TEXT s_dist_07[24+1];
TEXT s_dist_08[24+1];
TEXT s_dist_09[24+1];
TEXT s_dist_10[24+1];
COUNT s_ytd;
COUNT s_order_cnt;
COUNT s_remote_cnt;
TEXT s_data[50+1];

int bulk_s;

/*
** On loading stock in major order of item_id:
** 10% of the MAXITEMS items in each warehouse need to marked as original
** (i.e., s_data like '%ORIGINAL%'.)  This is a bit harder to do when we
** load by item number, rather than by warehouses.  The trick is to first
** generate a huge WAREBATCH * MAXITEMS bitmap, initialize all bits to
zero,
** and then set 10% of bits in each row to 1.  While loading item i in
** warehouse w, we simply lookup bitmap[w][i] to see whether it needs to
** be marked as original.
*/

LoadStock(w1, w2)
        ID w1, w2;
{
        ID w_id;
        BitVector original[WAREBATCH][((MAXITEMS+(WSZ-
1))/WSZ)], * bmp;
        int w, i, j;


        if (w2-w1+1 > WAREBATCH)
        {
                fprintf(stderr, "Can't load stock for %d warehouses.\n",
                        w2-w1+1);
                fprintf(stderr, "Please use batches of %d.\n",
WAREBATCH);
        }

        for (w=w1; w<=w2; w++)
        {
                bmp = original[w-w1];
                /* Mark all items as not "original" */
                for (i=0; i<(MAXITEMS+(WSZ-1))/WSZ; i++)
```

```
                        bmp[i] = (BitVector)0x0000;
                /* Mark exactly 10% of items as "original" */
                for (i=0; i<(MAXITEMS+9)/10; i++)
                {
                        do {
                                j =
RandomNumber(0,MAXITEMS-1);
                        } while (nthbit(bmp,j));
                        setbit(bmp,j);
                }
        }

        printf("Loading stock for warehouse %d to %d.\n", w1, w2);
        begin_stock_load();
        /* do for each item */
        for (s_i_id=1;  s_i_id <= MAXITEMS; s_i_id++)
        {
                for (w_id=w1; w_id<=w2; w_id++)
                {
                /* Generate Stock Data */
                        s_w_id = w_id;
                        s_quantity = RandomNumber(10,100);
                        MakeAlphaString(24, 24, s_dist_01);
                        MakeAlphaString(24, 24, s_dist_02);
                        MakeAlphaString(24, 24, s_dist_03);
                        MakeAlphaString(24, 24, s_dist_04);
                        MakeAlphaString(24, 24, s_dist_05);
                        MakeAlphaString(24, 24, s_dist_06);
                        MakeAlphaString(24, 24, s_dist_07);
                        MakeAlphaString(24, 24, s_dist_08);
                        MakeAlphaString(24, 24, s_dist_09);
                        MakeAlphaString(24, 24, s_dist_10);
                        s_ytd = 0;
                        s_order_cnt = 0;
                        s_remote_cnt = 0;
                        MakeAlphaString(26, 50, s_data);
                        if (nthbit(original[w_id-w1],s_i_id-1))
                        {
                                Original(s_data);
                        }
                        stock_load();
                }
        }
        end_stock_load();
        printf("\nLoaded stock for warehouses %d to %d.\n", w1, w2);
}

begin_stock_load()
{
        int             i = 1;

        bulk_s = bulk_open("tpcc", "stock", password);

        bulk_bind(bulk_s, i++, "s_i_id", &s_i_id, ID_T);
        bulk_bind(bulk_s, i++, "s_w_id", &s_w_id, ID_T);
        bulk_bind(bulk_s, i++, "s_quantity", &s_quantity, COUNT_T);
        bulk_bind(bulk_s, i++, "s_ytd",          &s_ytd,      COUNT_T);
        bulk_bind(bulk_s, i++, "s_order_cnt", &s_order_cnt, COUNT_T);
        bulk_bind(bulk_s, i++, "s_remote_cnt", &s_remote_cnt,
COUNT_T);
        bulk_bind(bulk_s, i++, "s_dist_01", s_dist_01, TEXT_T);
        bulk_bind(bulk_s, i++, "s_dist_02", s_dist_02, TEXT_T);
        bulk_bind(bulk_s, i++, "s_dist_03", s_dist_03, TEXT_T);
        bulk_bind(bulk_s, i++, "s_dist_04", s_dist_04, TEXT_T);
        bulk_bind(bulk_s, i++, "s_dist_05", s_dist_05, TEXT_T);
        bulk_bind(bulk_s, i++, "s_dist_06", s_dist_06, TEXT_T);
        bulk_bind(bulk_s, i++, "s_dist_07", s_dist_07, TEXT_T);
        bulk_bind(bulk_s, i++, "s_dist_08", s_dist_08, TEXT_T);
        bulk_bind(bulk_s, i++, "s_dist_09", s_dist_09, TEXT_T);
        bulk_bind(bulk_s, i++, "s_dist_10", s_dist_10, TEXT_T);
        bulk_bind(bulk_s, i++, "s_data",        s_data,         TEXT_T);
}

stock_load()
{
        debug("s_i_id=%d w_id=%d s_data=%s\n",
          s_i_id, s_w_id,   s_data);
        bulk_load(bulk_s);
}


end_stock_load()
{
        bulk_close(bulk_s);
}



test(){}


getargs(argc, argv)

/*****************************************************************
**
configure configures the load stuff
  By default, loads all the tables for a the specified warehouse.
                        When loading warehouse 1, also loads the item table.
*****************************************************************
****/
        int argc;
        char **argv;
{
        char ch;

        /* define the defaults */
        load_item = load_warehouse = load_district = load_history =
        load_orders = load_new_order = load_order_line =
        load_customer = load_stock = NO;


        if              (strcmp(argv[1], "warehouse") == 0) load_warehouse
= YES;
        else if (strcmp(argv[1], "district") == 0)  load_district = YES;
        else if (strcmp(argv[1], "stock") == 0)  load_stock = YES;
        else if (strcmp(argv[1], "item") == 0)  load_item = YES;
        else if (strcmp(argv[1], "history") == 0)  load_history = YES;
        else if (strcmp(argv[1], "orders") == 0)  load_orders = YES;
        else if (strcmp(argv[1], "customer") == 0)  load_customer = YES;
        else if (strcmp(argv[1], "new_order") ==0) load_new_order = YES;
        else
        {
                printf("%s is not a valid table name\n", argv[1]);
                exit(0);

        }

        /* Set the w1 and w2 to argv[2] and arg[3] */
        if (argc < 3)
        {
                printf("Usage: %s <table> <w_first> [<w_last>]\n",
argv[0]);
                exit(1);
        }
        {
                w1 = atoi(argv[2]);
                if (argc >= 3)
                        w2 = atoi(argv[3]);
                else
                        w2 = w1;
        }
```

```
        /* Get the password for sa */
        if (argc > 4)
        strcpy(password,argv[4]);

        /* Check if warehouse is within the range */
        if (w1 <= 0 || w2 > 1000 || w1 > w2)
        {
                printf("Warehouse id is out of range\n");
                exit(0);
        }
}

double drand48();

MakeAddress(str1, str2, city, state, zip)
        TEXT str1[20+1];
        TEXT str2[20+1];
        TEXT city[20+1];
        TEXT state[2+1];
        TEXT zip[9+1];
{
        MakeAlphaString(10,20,str1);
        MakeAlphaString(10,20,str2);
        MakeAlphaString(10,20,city);
        MakeAlphaString(2,2,state);
        MakezipString(0,9999,zip);

        /* Changed for TPCC V 3.0 */
        strcat(zip, "11111");

}



LastName(num, name)
/*************************************************************
Lastname generates a lastname from a number.
*************************************************************/
        int num;
        char name[20+1];
{
        int i;
        static char *n[] = {"BAR", "OUGHT", "ABLE", "PRI", "PRES",

        "ESE", "ANTI", "CALLY", "ATION", "EING"};

        strcpy(name, n[(num/100)%10]);
        strcat(name, n[(num/10) %10]);
        strcat(name, n[(num/1)  %10]);
}


int MakeNumberString(min, max, num)
        int min;
        int max;
        TEXT num[];
{
        static char digit[]="0123456789";
        int length;
        int i;

        length = RandomNumber(min, max);

        for (i=0;  i<length;  i++)
        num[i] = digit[RandomNumber(0,9)];
        num[length] = '\0';

        return length;
}

int MakezipString(min, max, num)
        int min;
        int max;
        TEXT num[];
{
        static char digit[]="0123456789";
        int length;
        int i;

        length = 4;

        for (i=0;  i<length;  i++)
        num[i] = digit[RandomNumber(0,9)];
        num[length] = '\0';

        return length;
}



int MakeAlphaString(min, max, str)
        int min;
        int max;
        TEXT str[];
{
        static char character[] =
"abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ012345
6789";
        int length;
        int i;

        length = RandomNumber(min, max);

        for (i=0;  i<length;  i++)
        str[i] = character[RandomNumber(0, sizeof(character)-2)];
        str[length] = '\0';

        return length;
}


Original(str)
        TEXT str[];
{
        int pos;
        int len;

        len = strlen(str);
        if (len < 8) return;

        pos = RandomNumber(0,len-8);

        str[pos+0] = 'O';
        str[pos+1] = 'R';
        str[pos+2] = 'I';
        str[pos+3] = 'G';
        str[pos+4] = 'I';
        str[pos+5] = 'N';
        str[pos+6] = 'A';
        str[pos+7] = 'L';
}



RandomPermutation(perm, n)
        int perm[];
        int n;
{
        int i, r, t;

        /* generate the identity permutation to start with */
        for (i=1; i<=n; i++)
```

```
                perm[i] = i;

                /* randomly shuffle the permutation */
                for (i=1; i<=n; i++)
                {
                r = RandomNumber(i, n);
                t = perm[i]; perm[i] = perm[r]; perm[r] = t;
                }
}



int Randomize()
{
                srand48(time(0)+getpid());
}



int RandomNumber(min, max)
                int min;
                int max;
{
                int r;
                r = (int)(drand48() * (max - min + 1)) + min;
                return r;
}


int NURandomNumber(a, c, min, max)
                int a;
                int c;
                int min;
                int max;
{
                int r;

                r = ((RandomNumber(0, a) | RandomNumber(min, max)) + c)
                % (max - min + 1) + min;

                return r;
}
#ifndef TPCC_INCLUDED
#define TPCC_INCLUDED

#include <sybfront.h>
#include <sybdb.h>
#include <time.h>


/* Population constants */
#ifdef CACHED
#define MAXITEMS 10000
#define CUST_PER_DIST 300
#define DIST_PER_WARE 10
#define ORD_PER_DIST 300
#else
#define MAXITEMS 100000
#define CUST_PER_DIST 3000
#define DIST_PER_WARE 10
#define ORD_PER_DIST 3000
#endif

/* Types of application variables */
typedef int     COUNT;
typedef int     ID;
typedef double  MONEY;
typedef double  FLOAT;
typedef char    TEXT;
typedef struct { int x[2];} DATE;
typedef int     LOGICAL;

typedef enum
   {COUNT_T, ID_T, MONEY_T, FLOAT_T, TEXT_T,
    DATE_T, LOGICAL_T, MAX_T}
   DATA_TYPE;

typedef struct timeval TIME;



#define YES 1
#define NO 0
#define EOF (-1)

#ifndef NULL
#define NULL ((void *)0)
#endif

#ifdef DEBUG
#define debug printf
#else
#define debug (void)
#endif

/* define function types */
extern          int             msg_handler();
extern          int             err_handler();
extern          int             batch_size;

#endif /* TPCC_INCLUDED */
#if ! lint
static char *sddsId = "@(#)  error.c  1.1  4/30/91  19:47:32";
#endif /* ! lint */

/*
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*/

/*
** error.c:    1.1     4/30/91 19:47:32
**      Standard error handler for RungenII and supporting code
**
**      HMS [04/30/91]
*/

/* Required standard include files */
#include <stdio.h>
#ifdef _NTINTEL
#include <stdlib.h>
#include <windows.h>
#endif

/* Required Sybase include files */
#include <sybfront.h>
#include <sybdb.h>

/* message numbers that we don't want to deal with */
#define DUMB_MESSAGE    5701
#define ABORT_ERROR     6104


#ifdef _NTINTEL
int
 err_handler(dbproc, severity, errno, oserr, errstr, oserrstr)
  DBPROCESS *dbproc;
  int severity;
  int errno;
  int oserr;
  char  *errstr;
```

```
 char  *oserrstr;
{

      /* changing databases message */
      if (errno == DUMB_MESSAGE || errno == ABORT_ERROR)
            return(INT_CANCEL);

      fprintf(stderr,"DB-LIBRARY Error: \n\t%s\n",errstr);

      if (oserr != DBNOERR)
            fprintf(stderr,"O/S Error: \n\t%s\n",oserrstr);

      /* exit on any error */
      exit(-100);
}
#else
int
err_handler(dbproc, severity, errno, oserr)
 DBPROCESS *dbproc;
 int severity;
 int errno;
 int oserr;
{
      /* changing databases message */
      if (errno == DUMB_MESSAGE || errno == ABORT_ERROR)
            return(INT_CANCEL);

      fprintf(stderr,"DB-LIBRARY Error: \n\t%s\n",dberrstr(errno));

      if (oserr != DBNOERR)
            fprintf(stderr,"O/S Error: \n\t%s\n",dboserrstr(oserr));

      /* exit on any error */
      exit(-100);
}
#endif


int
msg_handler(dbproc,msgno,msgstate,severity,msgtext,servername,procname,line
)
DBPROCESS      *dbproc;
int            msgno;
int            msgstate;
int            severity;
char           *msgtext;
char           *servername;
char           *procname;
int            line;
{

      /* changing database messages */
      if (msgno == DUMB_MESSAGE || msgno == ABORT_ERROR || msgno ==
5703 || msgno == 5704 || msgno == 4843)
            return(SUCCEED);

      /* Is this a deadlock message */
      if (msgno == 1205)
      {
            /* Set the deadlock indicator */
            *((DBBOOL *) dbgetuserdata(dbproc)) = TRUE;

            /* Sleep a few seconds before going back */
#ifdef _NTINTEL
            Sleep((DWORD) 2000);
#else
            sleep((unsigned) 2);
#endif
            return(SUCCEED);

      }
      fprintf(stderr, "msg no %d -\n%s", msgno, msgtext);

      /* exit on any error */
      exit(-101);
}

/*****************************************************************
**
*****************************************************************
***

Sybase Specific Routines

*****************************************************************
****
*****************************************************************
****/

#include <stdio.h>
#include <sys/time.h>
#include <string.h>
#include "loader.h"

datetime(date)
            DBDATETIME *date;
{
            struct timeval time;
            gettimeofday(&time, NULL);
            date->dtdays = time.tv_sec / (60*60*24)
                        + (1970-1900)*365 + (1970-1900)/4;
            date->dttime = (time.tv_sec % (60*60*24))*300
                        + time.tv_usec*300/1000000;
}


/* define the type information for each field */
typedef struct
{
            char *terminator;
            int termlen;
            int type;
} bind_parm;

bind_parm parm[MAX_T] =
{
            /* COUNT */          {NULL, 0, SYBINT4},
            /* ID       */       {NULL, 0, SYBINT4},
            /* MONEY */          {NULL, 0, SYBFLT8},
            /* FLOAT */          {NULL, 0, SYBFLT8},
            /* TEXT */  {"",   1, SYBCHAR},
            /* DATE */  {NULL, 0, SYBDATETIME},
            /* LOGICAL */        {NULL, 0, SYBINT4}
};

#define MAXOPENS 10

DBPROCESS *dbproc[MAXOPENS];
int            count[MAXOPENS];

int bulk_open(database, table, password)
            char database[];
            char table[];
            char password[];
{
            LOGINREC *login;
            int db;

            /* make note we have established a connection */
            for (db=0; db<MAXOPENS; db++)
                        if (dbproc[db] == NULL) break;
            count[db] = 0;
```

```
        /* Install an error and Message handler */
        dbmsghandle(msg_handler);
        dberrhandle(err_handler);

        /* initialize dblib */
        if (dbinit() != SUCCEED)
                printf("Can't initialize the DB library\n");

        /* allocate a login record and fill it in */
        login = dblogin();
        if (login == NULL)
                printf("Can't allocate a login record.\n");
        DBSETLUSER(login, "sa");

        if(strlen(password) > 0)
        DBSETLPWD(login, password);

        DBSETLAPP(login, table);
        BCP_SETL(login, TRUE);

        /* Set Packet Size to 4096 */
        DBSETLPACKET(login, 4096);

        /* establish a connection with the server specified by DSQUERY */
        dbproc[db] = dbopen(login, NULL);
        if (dbproc[db] == NULL)
                printf("Can't establish connection. Is DSQUERY
set?\n");

        /* select the database to use */
        if (database != NULL)
                if (dbuse(dbproc[db], database) != SUCCEED)
                        printf("Can't select database: %s\n",
database);

        /* release the login record */
        dbloginfree(login);

        /* prepare to do a bulk copy */
        if (bcp_init(dbproc[db], table, NULL, NULL, DB_IN) !=
SUCCEED)
        printf("Can't initialize the bulk copy to table %s\n", table);

        return db;
}



bulk_bind(db, column, name, address, type)
        int db;
        int column;
        char name[];
        void *address;
        int type;
{
        if (bcp_bind(dbproc[db], address, 0, -1, parm[type].terminator,
                        parm[type].termlen, parm[type].type,
column) != SUCCEED)
                printf("Can't bind column %d to 0x%x, type=%d\n",
                        column,address,type);
}

bulk_null(db, column)
        int db;
        int column;
{
        if (bcp_collen(dbproc[db], 0, column) != SUCCEED)
                printf("Can't null column %d\n", column);
}


bulk_non_null(db, column)
        int db;
        int column;
{
        if (bcp_collen(dbproc[db], -1, column) != SUCCEED)
                printf("Can't non-null column %d\n", column);
}


bulk_load(db)
        int db;
{
        count[db]++;
        if (bcp_sendrow(dbproc[db]) != SUCCEED)
                printf("bulk_load: Can't load row\n");
        if (count[db]%batch_size == 0 && (bcp_batch(dbproc[db]) == -1))
        printf("bulk_load: Can't post rows\n");
        if (count[db]%1000 == 0) write(1,".",1);
        if (count[db]%50000 == 0) write(1,"\n",1);

}

bulk_close(db)
        int db;
{
        if (bcp_done(dbproc[db]) == -1)
                printf("Problems completing the bulk copy.\n");
        dbproc[db] = NULL;
        if (count[db] >= 1000) write(1,"\n",1);
}
```

tpcc_cache_bind.sh

```
#!/bin/sh -f

isql -Usa -P$PASSWORD << EOF

use master
go
sp_dboption tpcc, "single user", true
go

use tpcc
go
checkpoint
go

/*
** Cache c_log
*/

sp_bindcache "c_log", "tpcc", "syslogs"
go



use master
go
sp_dboption tpcc, "single user", false
go

use tpcc
go
checkpoint
go

/*
** Cache c_tinyhot (continued)
*/
```

```
sp_bindcache "c_tinyhot", "tpcc", "item"
go
sp_bindcache "c_tinyhot", "tpcc", "item","i_clu"
go
sp_bindcache "c_tinyhot", "tpcc", "warehouse"
go
sp_bindcache "c_tinyhot", "tpcc", "warehouse","w_clu"
go
sp_bindcache "c_tinyhot", "tpcc", "district"
go
sp_bindcache "c_tinyhot", "tpcc", "district","d_clu"
go
sp_bindcache "c_tinyhot", "tpcc", "sysindexes"
go
sp_bindcache "c_tinyhot", "tpcc", "sysindexes","sysindexes"
go

/*
** Cache c_no_ol
*/

sp_bindcache "c_no_ol", "tpcc", "new_order"
go
sp_bindcache "c_no_ol", "tpcc", "new_order","no_clu"
go
sp_bindcache "c_no_ol", "tpcc", "order_line"
go

/*
** Cache c_ol_index
*/

sp_bindcache "c_ol_index", "tpcc", "order_line","ol_clu"
go

/*
** Cache c_orders
*/

sp_bindcache "c_orders", "tpcc", "orders"
go
sp_bindcache "c_orders", "tpcc", "orders","o_clu"
go

/*
** Cache c_stock_index
*/

sp_bindcache "c_stock_index", "tpcc", "stock","s_clu"
go

/*
** Cache c_stock
*/

sp_bindcache "c_stock", "tpcc", "stock"
go

/*
** Cache c_customer
*/

sp_bindcache "c_customer", "tpcc", "customer"
go
sp_bindcache "c_customer_index", "tpcc", "customer","c_clu"
go
sp_bindcache "c_non_customer_index", "tpcc", "customer","c_non1"
go

EOF
```

# Appendix C

## scr_util.c

```
/*+*************************************************************
*************
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 *                                                             *
 *                                                             *

*****************************************************************
***********-*/
#include <stdio.h>
#include <stdlib.h>
#include <math.h>
#include <string.h>
#include <ctype.h>
#include <stdarg.h>
#include <stdtypes.h>

#ifdef _WIN32
# include <nt_lib.h>
#endif

#include <prte.h>

#include <common.h>

#include <tpccstruct.h>
#include <tpccerr.h>
#include <config.h>

#define SCR_UTIL_C
#include <scr_util.h>


/* Static functions */
static print_getnet_debug(char *name, char *ret_string, char *def_string);


int
GetCallingThreadLimit( int *pCallingThreadLimit )
{
 *pCallingThreadLimit = PRTEget_worker_thread_limit( );

 return( ERR_SUCCESS );
}



int
GetConfigValue( char *Name, int *Len, char *Value )
{
 int                                    Status;

 Status = GetConfigValueTX( Name, Len, Value );
 if( SCR_E_SUCCESS == Status )
 {
  /* Convert to FFE style error code. */
  Status = ERR_SUCCESS;
 }

 return( Status );
}



int
GetConfigValueTX( char *Name, int *Len, char *Value )
{
 char                                   *locValue;
 int                                    locLen;
 char
                FullName[PRTE_MAX_NET_VAR_NAME_LENGTH+1];

 strcpy( FullName, Sut_name );
 strcat( FullName, "_" );
 strcat( FullName, Name );
 locValue = PRTEget_network_variable( FullName );

 if( NULL == locValue )
 {
  Value[0] = '\0';
  *Len = 0;
  return( ERR_CANT_FIND_VALUE );
 }
 else
 {
  locLen = strlen( locValue );
  if( locLen < *Len )
  {
   memcpy( Value, locValue, locLen+1 );
   *Len = locLen;
   return( SCR_E_SUCCESS );
  }
  else
  {
   return( ERR_VALUE_TOO_LONG );
  }
 }
}


/*****************************************************************
***************/
/*                                                               */
/* Name: GetConnectInfo                                          */
/*                                                               */
/* Purpose: This routine gets all the information about the FEs that we      */
```

```
/*        need.                                          */
/*                                                       */
/* Inputs:                                               */
/*                                                       */
/* Outputs:                                              */
/*                                                       */
/* Function Value:                                       */
/*                                                       */
/* Notes:                                                */
/*                                                       */
/*********************************************************************
***************/
int32
GetConnectInfo( int32 RunMode, int32 *pTpccUsers, int32 *pNumFEs,
                               int32 *pAdminUsers,
                               int32 *pNumConnects, connect_t **ppConnects )
{
#define COUNT_UNSPECIFIED -1
#define CONNECT_INFO              "CONNECT%d"
  char                            Field[11];
  int                             Index;
  char                            NetVarName[50];
  int32                           NetVarNum;
  int                             NumCountUnspec;
  char                            *pConnect;
  char                            Script[PATH_MAX];
  char                            *pTmpChar;
  int                             Remainder;
  int                             UcntSpec;
  int                             TotalUcnt;
  int                             TotalDcnt;
  int                             Ucnt;

  /* Get the name of the user emulation script. */
  if( NULL == ( pTmpChar = PRTEget_network_variable(
"USER_SCRIPT_NAME" )))
  {
    Script[0] = '\0';
  }
  else
  {
    strcpy( Script, pTmpChar );
  }

  /* Get total count of districts. */
  if( NULL == ( pTmpChar = PRTEget_network_variable(
"TOTAL_DISTRICT_COUNT" )))
  {
    return( SCRerr( SCR_E_TOTAL_DISTRICT_COUNT_NOT_SET ));
  }
  else
  {
    TotalDcnt = atoi( pTmpChar );
  }

  /* Get total count of users. */
  if( NULL == ( pTmpChar = PRTEget_network_variable(
"TOTAL_USER_COUNT" )))
  {
    TotalUcnt = COUNT_UNSPECIFIED;
  }
  else
  {
    TotalUcnt = atoi( pTmpChar );
  }

  /* Collect user connect info */
  *pNumConnects = 0;
  NetVarNum = 1;
  while( TRUE )
  {
    sprintf( NetVarName, CONNECT_INFO, NetVarNum++ );
    if( NULL == (pConnect = PRTEget_network_variable( NetVarName )))
    {
      break;
    }
    /* Check if there is a placeholder. I.e. an FE not to be used. */
    if( '\0' == pConnect[0] )
    {
      continue;
    }
    (*pNumConnects)++;
  }
  if( 0 == *pNumConnects )
  {
    return( SCRerr( SCR_E_NO_CONNECTS ));
  }

  /* Now we know how many connects there are, so we can allocate space. */
  *ppConnects = ( connect_t * ) malloc( *pNumConnects * sizeof( **ppConnects
));
  if( NULL == *ppConnects )
  {
    return( SCRerr( SCR_E_MALLOC_CONNECT_ARRAY ));
  }

  /* Now we need to get the connect info */
  *pNumFEs = 0;
  *pAdminUsers = 0;
  NumCountUnspec = 0;
  UcntSpec = 0;
  Index = 0;
  NetVarNum = 1;
  while( TRUE )
  {
    sprintf( NetVarName, CONNECT_INFO, NetVarNum++ );
    if( NULL == (pConnect = PRTEget_network_variable( NetVarName )))
    {
      break;
    }
    /* Check if there is a placeholder. I.e. an entry not to be used. */
    if( '\0' == pConnect[0] )
    {
      continue;
    }

    /* Parse the connect information */
    pTmpChar = SCR_next_list_element( pConnect,
(*ppConnects)[Index].RTEName );
    if( '\0' == (*ppConnects)[Index].RTEName[0] )
    {
      free( *ppConnects );
      SCRlog( "Parsing %s.", NetVarName );
      return( SCRerr( SCR_E_NO_RTE_IN_CONNECT ));
    }

    pTmpChar = SCR_next_list_element( pTmpChar,
(*ppConnects)[Index].FEName );

    pTmpChar = SCR_next_list_element( pTmpChar, Field );
    if( (*ppConnects)[Index].ConfConn = ( 'T' == Field[0] || 't' == Field[0] ))
    {
      (*pNumFEs)++;
    }

    pTmpChar = SCR_next_list_element( pTmpChar, Field );
    if( (*ppConnects)[Index].AdminConn = ( 'T' == Field[0] || 't' == Field[0] ))
    {
      (*pAdminUsers)++;
    }

    pTmpChar = SCR_next_list_element( pTmpChar, Field );
    if( '\0' == Field[0] )
    {
```

```
    (*ppConnects)[Index].Ucnt = COUNT_UNSPECIFIED;
    NumCountUnspec++;
   }
   else
   {
    UcntSpec += (*ppConnects)[Index].Ucnt = atoi( Field );
   }

   pTmpChar = SCR_next_list_element( pTmpChar,
(*ppConnects)[Index].Script );
   if( '\0' == (*ppConnects)[Index].Script[0] )
   {
    if( '\0' == Script[0] )
    {
                free( *ppConnects );
                SCRlog( "Parsing %s.", NetVarName );
                return( SCRerr( SCR_E_USER_SCRIPT_NAME_NOT_SET ));
    }
    strcpy( (*ppConnects)[Index].Script, Script );
   }
   Index++;
  }

  /* Check that all specified user counts agree. */
  if( 0 == NumCountUnspec )
  {
   if( COUNT_UNSPECIFIED != TotalUcnt && UcntSpec != TotalUcnt )
   {
    free( *ppConnects );
    return( SCRerr( SCR_E_USER_COUNT_MISMATCH ));
   }
   *pTpccUsers = UcntSpec;
  }
  else
  {
   if( COUNT_UNSPECIFIED == TotalUcnt )
   {
    TotalUcnt = TotalDcnt;
   }
   /* Distribute the user counts */
   *pTpccUsers = 0;
   Ucnt = ( TotalUcnt - UcntSpec ) / NumCountUnspec;
   Remainder = ( TotalUcnt - UcntSpec ) % NumCountUnspec;
   for( Index = 0; Index < *pNumConnects; Index++ )
   {
    if( COUNT_UNSPECIFIED == (*ppConnects)[Index].Ucnt )
    {
                (*ppConnects)[Index].Ucnt = Ucnt + ( Remainder-- > 0 ? 1 : 0 );
    }
    *pTpccUsers += (*ppConnects)[Index].Ucnt;
   }
  }

  /* Make sure all specified counts are in sync. */
  if( END_TO_END_MODE == RunMode &&
     TotalDcnt != *pTpccUsers )
  {
   free( *ppConnects );
   return( SCRerr( SCR_E_DISTRICT_USER_COUNT_MISMATCH ));
  }

# pragma message ("FIXME: GetConnectInfo: Should warn tester if user count
won't fully access all districts for the last warehouse.")
# pragma message ("FIXME: GetConnectInfo: Should warn tester if user count
on a given network card exceeds limit (currently 1023).")

  return( SCR_E_SUCCESS );
}


int32
SCRerr( int32 ErrCode )
{
  char                                  ErrFmt[] = "\007ERROR( %d ): %s\n\n";
  int32                                 Idx;
  char                                  *ErrString;

  Idx = 0;
  while( '\0' != ScrErrMsgs[Idx].ErrMsg[0] &&
                ErrCode != ScrErrMsgs[Idx].ErrCode )
  {
   Idx++;
  }
  if( '\0' != ScrErrMsgs[Idx].ErrMsg[0] )
  {
   ErrString = ScrErrMsgs[Idx].ErrMsg;
  }
  else
  {
   /* No SCR error message defined for this error code, check TPCC errors. */
   Idx = 0;
   while( '\0' != errorMsgs[Idx].szMsg[0] &&
                  ErrCode != errorMsgs[Idx].iError )
   {
    Idx++;
   }
   if( '\0' != errorMsgs[Idx].szMsg[0] )
   {
    ErrString = errorMsgs[Idx].szMsg;
   }
   else
   {
    ErrString = ScrErrMsgs[SCR_E_NO_ERR_MSG - SCR_E_BASE].ErrMsg;
   }
  }

  SCRlog( ErrFmt, ErrCode, ErrString );
  return( ErrCode );
}


void
SCRlog( char *Format, ... )
{
  char                          Buf[8192];
  va_list       VarArgs;


  /* Expand the format string and arguments */
  if( NULL != Format ) {
   va_start( VarArgs, Format );
   vsprintf( Buf, Format, VarArgs );
   va_end( VarArgs );
  }
  else
  {
   strcpy( Buf, "[NULL]" );
  }

  PRTEsend_console_message( Buf );
  PRTEto_log( 555, Buf );

  return;
}



/* SCR_inverse_random
   Inputs: Mean - average value needed from function
                Iexp - pointer to double for storage of result
   Return: NONE
   Implementation:  Does inverse-random function using drand48.
```

```
                Will try again if value caluclated is > Max
*/
void
SCR_inverse_random(double Mean, double Max, double *Iexp) {
  double Randval, lval;

  do {
    Randval = drand48();
    if( 0.0 == Randval )
    {
      /* We have to treat a zero value returned from the random number */
      /* generator as a special case because log( 0.0 ) would result in */
      /* an infinite negative number.  Passing an infinite negative number */
      /* onto the following equation would result in a floating point */
      /* exception.  However, mathematically, negating an infinite negative */
      /* number and then scaling it by the desired mean value would still */
      /* result in an infinite positive number which would excced the maximum */
      /* requested value.  Exceeding the maximum requested value causes a */
      /* loop to get a new random value, which is what we shall do now. */
      continue;
    }
    lval = log(Randval);
    *Iexp  = -1.0 * Mean * lval;

  } while (*Iexp > Max );
}

char *
SCR_getnet_int ( char *varname, char *default_str, int *pInt) {
  char *pnet;

  if (!varname) return NULL;

  pnet = PRTEget_network_variable (varname);
  if (pnet) *pInt = atoi(pnet);
  else *pInt = atoi(default_str);
#ifdef DEBUG
  print_getnet_debug(varname,pnet,default_str);
#endif

  return pnet;
}

char *
SCR_getnet_long ( char *varname, char *default_str, long *pLong) {
  char *pnet;

  if (!varname) return NULL;

  pnet = PRTEget_network_variable (varname);
  if (pnet) *pLong = atol(pnet);
  else *pLong = atol(default_str);
#ifdef DEBUG
  print_getnet_debug(varname,pnet,default_str);
#endif

  return pnet;
}

char *
SCR_getnet_float ( char *varname, char *default_str, float *pFloat) {
  char *pnet;

  if (!varname) return NULL;

  pnet = PRTEget_network_variable (varname);
  if (pnet) *pFloat = (float) atof(pnet);
  else *pFloat = (float) atof(default_str);
#ifdef DEBUG
  print_getnet_debug(varname,pnet,default_str);
#endif

  return pnet;
}

char *
SCR_getnet_double ( char *varname, char *default_str, double *pDouble) {
  char *pnet;

  if (!varname) return NULL;

  pnet = PRTEget_network_variable (varname);
  if (pnet) *pDouble = atof(pnet);
  else *pDouble = atof(default_str);

  return pnet;
}


char *
SCR_getnet_string ( char *varname, char *default_str, char *pString) {
  char *pnet;

  if (!varname) return NULL;

  pnet = PRTEget_network_variable (varname);

  if (pnet != NULL) strcpy(pString,pnet);

  else {
    if (default_str != NULL) strcpy(pString,default_str);
    else (pString[0] = '\0');
  }
#ifdef DEBUG
  print_getnet_debug(varname,pnet,default_str);
#endif

  return pString;
}

char *
SCR_getnet_bool ( char *varname, char *default_str, BOOL *pBool) {
  char *pnet;
  char first_letter;

  if (!varname) return NULL;

  pnet = PRTEget_network_variable (varname);
  if (pnet)
  {
    first_letter = pnet[0];
  }
  else
  {
    first_letter = default_str[0];
    pnet = default_str;
  }
  switch (first_letter)
  {
    case 't':
    case 'T':
    case '1':
      *pBool = TRUE;
      break;

    case 'f':
    case 'F':
    case '0':
    default:
      *pBool = FALSE;
      break;
    }
#ifdef DEBUG
  print_getnet_debug(varname,pnet,default_str);
```

```
#endif

 return pnet;
}

#ifdef DEBUG
static
print_getnet_debug(char *name, char *ret_string, char *def_string) {
 char temp_string[256];

 SCRlog( "Netvar: name = %s netvar = %s, default = %s\n",
                name, ret_string, def_string );
}
#endif


/*****************************************************************
***************/
/*                                                               */
/* Name: SCR_next_list_element                                   */
/*                                                               */
/* Purpose: Return an element in Element and a pointer to the next element   */
/*         in a comma separated list                             */
/* Inputs:  List -- pointer to list                              */
/*         Element-- pointer to string for storing element       */
/* Outputs: Returns pointer to next element in list              */
/*                                                               */
/*****************************************************************
***************/

char
*SCR_next_list_element( char *List, char *Element )
{
#define EAT_LEADING_WHITESPACE(p) while( isspace(*(p)) ) (p)++
#define EAT_TRAILING_WHITESPACE(p) while( isspace(*((p)-1)) ) (p)--
#define IS_SEPARATOR(c) (( ',' == (c)))
 char *pTmpChar;

 pTmpChar = Element;
 if( NULL != pTmpChar )
 {
  *pTmpChar = '\0';                     /* Null terminate Element */
 }

 if( List && *List )
 {
  EAT_LEADING_WHITESPACE( List );
  while( '\0' != *List && !IS_SEPARATOR( *List ))
  {
   if( '\\' == *List )
   {
                List++;                                         /* Skip the
escape char */
                if( '\0' == *List )
                {
                 break;
                }
   }
   if( NULL != pTmpChar )
   {
                *pTmpChar++ = *List;       /* Copy the element to Element */
   }
   List++;
  }
  if( NULL != pTmpChar )
  {
   EAT_TRAILING_WHITESPACE( pTmpChar );
   *pTmpChar = '\0';                    /* Null terminate Element */
  }

  /* Now eat up trailing separator */
  if( IS_SEPARATOR( *List ))
  {
   List++;
  }

  return( List );
 }
 else
 {
  return( NULL );
 }
}

/*****************************************************************
***************/
/*                                                               */
/* Name: SCR_count_elements                                      */
/*                                                               */
/* Purpose: Return count of elements in an element list
          */
/* Inputs:  List -- pointer to list                              */
/* Outputs: Returns count of elements                            */
/*                                                               */
/*****************************************************************
***************/


int
SCR_count_elements( char *List )
{
 char *pTmpChar;
 int Count = 0;

 /* Now count elements */
 pTmpChar = List;
 while( NULL != ( pTmpChar = SCR_next_list_element( pTmpChar, NULL )))
 {
  Count++;
 }

 /* This is a bit of a hack.  If the list contains one zero length element,  */
 /* the count will return 0.  What we really want is 1.  So update the count.*/
 if( 0 == Count )
 {
  Count++;
 }

 return Count;
}


void
SCR_make_delta_time_string( char *timestr, double DeltaSeconds )
{
#define ONE_MINUTE 60
#define ONE_HOUR (60*ONE_MINUTE)
 int                                    Hours;
 int                                    Minutes;
 int                                    Seconds;
 int                                    MilliSeconds;

 Seconds = (int)DeltaSeconds;
 MilliSeconds = (int)( DeltaSeconds*1000.0 - Seconds*1000.0 );

 Hours = Seconds / ONE_HOUR;
 Seconds = Seconds % ONE_HOUR;

 Minutes = Seconds / ONE_MINUTE;
 Seconds = Seconds % ONE_MINUTE;

 sprintf(timestr,"%2d:%02d:%02d.%03d", Hours, Minutes, Seconds,
MilliSeconds);
}
```

```
int
SetConfigValueTX( char *Name, char *Value )
{
 char
                FullName[PRTE_MAX_NET_VAR_NAME_LENGTH+1];

 strcpy( FullName, Sut_name );
 strcat( FullName, "_" );
 strcat( FullName, Name );

 PRTEset_network_variable( FullName, Value );

 return( SCR_E_SUCCESS );
}
```

## scr_util.h

```
#ifndef SCR_UTIL_H
#define SCR_UTIL_H
/*+*****************************************************************
*************
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 *                                                                 *
 *                                                                 *

*****************************************************************
**********-*/

#define ATOI(pStr,pNext,val)\
  {\
    int                                    ival;\
    char                        *pSrc = (pStr);\
    ival = 0;\
    while ('0' <= *pSrc && *pSrc <= '9')\
    {\
      ival = (ival * 10) + (*pSrc - '0');\
      pSrc++;\
    }\
    (pNext) = pSrc;\
    (val) = ival;\
  }

#define ITOA(val,pStr,pNext)\
  {\
    int                                    ival;\
    char                        *pDst = (pStr);\
    char                        Tmp[12]; /* size of base10 32 bit # -2,147,483,648 */\
    char                        *pTmp = &Tmp[0];\
    ival = (val);\
    if( 0 > ival )\
    {\
      *pDst++ = '-';\
      ival = -ival;\
    }\
    *pTmp++ = '\0';\
    if( 0 == ival )\
    {\
      *pTmp++ = '0';\
    }\
    while( 0 < ival )\
    {\
      *pTmp++ = ( ival % 10 ) + '0';\
      ival /= 10;\
    }\
    while( '\0' != ( *pDst++ = *--pTmp ));\
    (pNext) = pDst;\
  }


typedef struct _connect_t
{
  BOOL                                  ConfConn;
  BOOL                                  ConfMod;
  BOOL                                  AdminConn;
  int32                                 AideID;
  char                                  RTEName[MAXHOSTNAMELEN];
  char                                  FEName[MAXHOSTNAMELEN];
  int32                                 Ucnt;
  char                                  Script[PATH_MAX];
} connect_t;


union dataptr {
  double *pDouble;
  int *pInt;
  float *pFloat;
};


int  GetCallingThreadLimit( int *pCallingThreadLimit );
int32 GetConnectInfo( int32 RunMode, int32 *pTpccUsers, int32 *pNumFEs,
                                  int32 *pAdminUsers,
                                  int32 *pNumConnects, connect_t **ppConnects );

void SCR_inverse_random (double Mean, double Max, double *Iexp);

char *SCR_getnet_int      (char *varname, char *default_str, int *pInt);
char *SCR_getnet_float    (char *varname, char *default_str, float *pFloat);
char *SCR_getnet_long     (char *varname, char *default_str, long *pLong);
char *SCR_getnet_double (char *varname, char *default_str, double *pDouble);
char *SCR_getnet_bool     (char *varname, char *default_str, BOOL *pBool);
char *SCR_getnet_string (char *varname, char *default_str, char *pString);
void            SCRlog( char *Format, ... );
int32           SCRerr( int32 ErrCode );
char *SCR_next_list_element (char *List, char *Element);
int SCR_count_elements (char *List);
void SCR_make_delta_time_string( char *timestr, double DeltaSeconds );
int SetConfigValueTX( char *Name, char *Value );
int GetConfigValueTX( char *Name, int *Len, char *Value );

/* #define's for all errors we can detect. */

#define       SCR_E_SUCCESS
                (0)
```

```
#define SCR_E_BASE
        200000

#define SCR_E_NO_ERR_MSG
        (SCR_E_BASE+1)
#define SCR_E_INIT
        (SCR_E_BASE+2)
#define SCR_E_MAKING_RUN_DIR
        (SCR_E_BASE+3)
#define SCR_E_NO_REDUCER
        (SCR_E_BASE+4)
#define SCR_E_CKPT_INT_TOO_LONG
        (SCR_E_BASE+5)
#define SCR_E_CKPT_INT_GREATER_THAN_MEASUREMENT_INT
        (SCR_E_BASE+6)
#define SCR_E_MEASUREMENT_NOT_INTEGRAL_MULTIPLE
        (SCR_E_BASE+7)
#define SCR_E_WARMUP_TOO_SHORT
        (SCR_E_BASE+8)
#define SCR_E_CANT_PARSE_SERVICE_CONTROL_PAGE
        (SCR_E_BASE+9)
#define SCR_E_CANT_STOP_WEB
        (SCR_E_BASE+10)
#define SCR_E_CANT_START_WEB
        (SCR_E_BASE+11)
#define SCR_E_AIDE_TIMEOUT_STOP_FE
        (SCR_E_BASE+12)
#define SCR_E_GET_BE_INFO
        (SCR_E_BASE+13)
#define SCR_E_INVALID_RUN_MODE
        (SCR_E_BASE+14)
#define SCR_E_AUDIT_FUNC_NETVARS
        (SCR_E_BASE+15)
#define SCR_E_BE_NAMES
        (SCR_E_BASE+16)
#define SCR_E_MALLOC_BE_ARRAY
        (SCR_E_BASE+17)
#define SCR_E_CODE_VERSION_NOT_SET
        (SCR_E_BASE+18)
#define SCR_E_RUN_DIR_NOT_SET
        (SCR_E_BASE+19)
#define SCR_E_CODE_VERSION_MISMATCH
        (SCR_E_BASE+20)
#define SCR_E_OPEN_BIN_LOG_FILE
        (SCR_E_BASE+21)
#define SCR_E_WRITE_BIN_LOG_FILE_HEADER_SIZE
        (SCR_E_BASE+22)
#define SCR_E_WRITE_BIN_LOG_FILE_HEADER
        (SCR_E_BASE+23)
#define SCR_E_MASTER_ID_NOT_SET
        (SCR_E_BASE+24)
#define SCR_E_RUN_NUMBER_NOT_SET
        (SCR_E_BASE+25)
#define SCR_E_VERSION_NUMBER_NOT_SET
        (SCR_E_BASE+26)
#define SCR_E_REDUCER_UPDATE_INTERVAL_NOT_SET
        (SCR_E_BASE+27)
#define SCR_E_REDUCER_HEADER_INTERVAL_NOT_SET
        (SCR_E_BASE+28)
#define SCR_E_OPEN_AIDE_DATA_FILE
        (SCR_E_BASE+29)
#define SCR_E_DATABASE_TYPE_NOT_SET
        (SCR_E_BASE+30)
#define SCR_E_INVALID_DATABASE_TYPE
        (SCR_E_BASE+31)
#define SCR_E_AIDE_INIT_TIMEOUT
        (SCR_E_BASE+32)
#define SCR_E_TOTAL_DISTRICT_COUNT_NOT_SET
        (SCR_E_BASE+33)
#define SCR_E_NO_CONNECTS
        (SCR_E_BASE+34)
#define SCR_E_NO_RTE_IN_CONNECT
        (SCR_E_BASE+35)
#define SCR_E_CALC_VALID_TXN_MIX
        (SCR_E_BASE+36)
#define SCR_E_REDUCER_INIT_TIMEOUT
        (SCR_E_BASE+37)
#define SCR_E_LOAD_FE_TIMEOUT
        (SCR_E_BASE+38)
#define SCR_E_CONNECT_APPLICATION
        (SCR_E_BASE+39)
#define SCR_E_SEND
        (SCR_E_BASE+40)
#define SCR_E_WAIT_FOR
        (SCR_E_BASE+41)
#define SCR_E_HTTP_STATUS_OFFSET
        (SCR_E_BASE+42)
#define SCR_E_FORM_TYPE_OFFSET
        (SCR_E_BASE+43)
#define SCR_E_WEB_PAGE_TOO_SHORT
        (SCR_E_BASE+44)
#define SCR_E_WEB_PAGE_STATUS_CODE
        (SCR_E_BASE+45)
#define SCR_E_ERROR_STATUS_CODE
        (SCR_E_BASE+46)
#define SCR_E_ERROR_WEB_PAGE
        (SCR_E_BASE+47)
#define SCR_E_WRONG_WEB_PAGE
        (SCR_E_BASE+48)
#define SCR_E_AIDE_TASK_TIMEOUT
        (SCR_E_BASE+49)
#define SCR_E_AIDES_FAILED_TASK
        (SCR_E_BASE+50)
#define SCR_E_BE_CKPT_TIMEOUT
        (SCR_E_BASE+51)
#define SCR_E_BE_CKPT_FAILED
        (SCR_E_BASE+52)
#define SCR_E_AIDE_CKPT_INIT_TIMEOUT
        (SCR_E_BASE+53)
#define SCR_E_USER_LOGIN_TIMEOUT
        (SCR_E_BASE+54)
#define SCR_E_USER_LOGIN_FAILED
        (SCR_E_BASE+55)
#define SCR_E_LOG_DIR_NOT_SET
        (SCR_E_BASE+56)
#define SCR_E_CGI_SCRIPT_NAME_NOT_SET
        (SCR_E_BASE+57)
#define SCR_E_INVALID_TXN_TYPE_REQUESTED
        (SCR_E_BASE+58)
#define SCR_E_USER_START_FAILED
        (SCR_E_BASE+59)
#define SCR_E_USER_START_TIMEOUT
        (SCR_E_BASE+60)
#define SCR_E_USER_STOP_FAILED
        (SCR_E_BASE+61)
#define SCR_E_USER_STOP_TIMEOUT
        (SCR_E_BASE+62)
#define SCR_E_AIDE_TIMEOUT_START_FE
        (SCR_E_BASE+63)
#define SCR_E_AIDES_FAILED_START
        (SCR_E_BASE+64)
#define SCR_E_UNUSED_4
        (SCR_E_BASE+65)
#define SCR_E_UNUSED_5
        (SCR_E_BASE+66)
#define SCR_E_AIDE_CKPT_RUN_TIMEOUT
        (SCR_E_BASE+67)
#define SCR_E_AIDE_CKPT_STOP_TIMEOUT
        (SCR_E_BASE+68)
#define SCR_E_WRITE_SENDERS_ID
        (SCR_E_BASE+69)
#define SCR_E_WRITE_MSG_TYPE
        (SCR_E_BASE+70)
```

```
#define SCR_E_WRITE_MSG_SIZE
        (SCR_E_BASE+71)
#define SCR_E_WRITE_MSG
        (SCR_E_BASE+72)
#define SCR_E_AIDE_EXIT_TIMEOUT
        (SCR_E_BASE+73)
#define SCR_E_OPEN_C_LAST_FILE
        (SCR_E_BASE+74)
#define SCR_E_SYNC_USER_TIMEOUT
        (SCR_E_BASE+75)
#define SCR_E_MALLOC_CONNECT_ARRAY
        (SCR_E_BASE+76)
#define SCR_E_MALLOC_USER_STOP_ARRAY
        (SCR_E_BASE+77)
#define SCR_E_AIDES_FAILED_STOP
        (SCR_E_BASE+78)
#define SCR_E_ACTION_NOT_SET
        (SCR_E_BASE+79)
#define SCR_E_UNUSED_1
        (SCR_E_BASE+80)
#define SCR_E_DELI_OFFSET
        (SCR_E_BASE+81)
#define SCR_E_DURA_PARSE_WAREHOUSE
        (SCR_E_BASE+82)
#define SCR_E_DURA_PARSE_DISTRICT
        (SCR_E_BASE+83)
#define SCR_E_DURA_PARSE_ORDER_ID
        (SCR_E_BASE+84)
#define SCR_E_GREETING
        (SCR_E_BASE+85)
#define SCR_E_CONNECT_ABORTED
        (SCR_E_BASE+86)
#define SCR_E_MENU_BAR
        (SCR_E_BASE+87)
#define SCR_E_AIDE_GET_LOG_SIZE
        (SCR_E_BASE+88)
#define SCR_E_RUN_ID_NOT_SET
        (SCR_E_BASE+89)
#define SCR_E_AIDE_SKIPPING_STATS
        (SCR_E_BASE+90)
#define SCR_E_AIDE_SWITCH_LOG
        (SCR_E_BASE+91)
#define SCR_E_NO_VALUE
        (SCR_E_BASE+92)
#define SCR_E_NO_TYPE
        (SCR_E_BASE+93)
#define SCR_E_NO_DATA
        (SCR_E_BASE+94)
#define SCR_E_UNUSED_6
        (SCR_E_BASE+95)
#define SCR_E_REDUCER_ID_NOT_SET
        (SCR_E_BASE+96)
#define SCR_E_RTE_NAMES_NOT_SET
        (SCR_E_BASE+97)
#define SCR_E_USER_COUNT_MISMATCH
        (SCR_E_BASE+98)
#define SCR_E_LOAD_FE_FAILURE
        (SCR_E_BASE+99)
#define SCR_E_USER_CREATE_FAILED
        (SCR_E_BASE+100)
#define SCR_E_USER_INIT_FAILED
        (SCR_E_BASE+101)
#define SCR_E_USER_INIT_TIMEOUT
        (SCR_E_BASE+102)
#define SCR_E_FIRST_USER_ID_NOT_SET
        (SCR_E_BASE+103)
#define SCR_E_VALUE_MODIFIED
        (SCR_E_BASE+104)
#define SCR_E_CANT_PARSE_GET_REG_PAGE
        (SCR_E_BASE+105)
#define SCR_E_CANT_INIT_TIME_COUNTER
        (SCR_E_BASE+106)
#define SCR_E_USER_SCRIPT_NAME_NOT_SET
        (SCR_E_BASE+107)
#define SCR_E_WRONG_DATA_ITEM_COUNT
        (SCR_E_BASE+108)
#define SCR_E_AIDE_TIMEOUT_CONFIG_FE
        (SCR_E_BASE+109)
#define SCR_E_AIDES_FAILED_CONFIG
        (SCR_E_BASE+110)
#define SCR_E_NOT_CORRECT_TRANS
        (SCR_E_BASE+111)
#define SCR_E_INVALID_CONNECT
        (SCR_E_BASE+112)
#define SCR_E_INVALID_DISCONNECT
        (SCR_E_BASE+113)
#define SCR_E_UI_NOT_SET
        (SCR_E_BASE+114)
#define SCR_E_UI_LOAD_FAILED
        (SCR_E_BASE+115)
#define SCR_E_NO_PARSE_INIT_FAILED
        (SCR_E_BASE+116)
#define SCR_E_DURA_PARSE_EXECUTION_STATUS
        (SCR_E_BASE+117)
#define SCR_E_UI_UNLOAD_FAILED
        (SCR_E_BASE+118)
#define SCR_E_AIDE_CKPT_DISCONNECT_TIMEOUT
        (SCR_E_BASE+119)
#define SCR_E_DISTRICT_USER_COUNT_MISMATCH
        (SCR_E_BASE+120)
#define SCR_E_REDUCER_CREATE_FAILED
        (SCR_E_BASE+121)
#define SCR_E_AIDE_CREATE_FAILED
        (SCR_E_BASE+122)

#define SCR_E_MAX_ERROR
        (SCR_E_BASE+122)

/* Error message strucure. */
typedef struct _scr_e_msg_t
{
  int32                 ErrCode;     /* error id of message */
  char                  ErrMsg[256];            /* message to sent to browser
*/
} scr_e_msg_t;

#ifdef SCR_UTIL_C
/* Error messages for all errors we can detect. */
scr_e_msg_t ScrErrMsgs[] =
{
  { SCR_E_SUCCESS, "Success, no error." },
  { SCR_E_NO_ERR_MSG, "No error message available for this error code." },
  { SCR_E_INIT, "Failed to initialize." },
  { SCR_E_MAKING_RUN_DIR, "Failed to make the run directory." },
  { SCR_E_NO_REDUCER, "Failed to get the reducer's PRTE user id." },
  { SCR_E_CKPT_INT_TOO_LONG, "Checkpoint interval > 1800 seconds, this
violates the benchmark specification." },
  { SCR_E_CKPT_INT_GREATER_THAN_MEASUREMENT_INT,
"Checkpoint interval > measurement interval, this violates the benchmark
specification." },
  { SCR_E_MEASUREMENT_NOT_INTEGRAL_MULTIPLE, "Measurement
interval is not an integral multiple of checkpoint interval, this violates the
benchmark specification." },
  { SCR_E_WARMUP_TOO_SHORT, "The warmup interval is too short to
support requested checkpoint interval." },
  { SCR_E_CANT_PARSE_SERVICE_CONTROL_PAGE, "Error parsing the
service control response page." },
  { SCR_E_CANT_STOP_WEB, "Unable to stop the Web Server." },
  { SCR_E_CANT_START_WEB, "Unable to start the Web Server." },
  { SCR_E_AIDE_TIMEOUT_STOP_FE, "Timed out waiting for aides to stop
application code." },
  { SCR_E_GET_BE_INFO, "Problem getting back end information." },
  { SCR_E_INVALID_RUN_MODE, "Invalid run mode specified." },
```

```
  { SCR_E_AUDIT_FUNC_NETVARS, "Problem getting audit function network
variables." },
  { SCR_E_BE_NAMES, "Unable to get BE_NAMES network variable." },
  { SCR_E_MALLOC_BE_ARRAY, "Unable to malloc space for BE array." },
  { SCR_E_CODE_VERSION_NOT_SET, "Code version network variable not
set." },
  { SCR_E_RUN_DIR_NOT_SET, "Run directory network variable not set." },
  { SCR_E_CODE_VERSION_MISMATCH, "Code version mismatch with
Master." },
  { SCR_E_OPEN_BIN_LOG_FILE, "Failed to open the binary data log file." },
  { SCR_E_WRITE_BIN_LOG_FILE_HEADER_SIZE, "Error writing binary
data log file header size." },
  { SCR_E_WRITE_BIN_LOG_FILE_HEADER, "Error writing binary data log
file header." },
  { SCR_E_MASTER_ID_NOT_SET, "Master ID network variable not set." },
  { SCR_E_RUN_NUMBER_NOT_SET, "Run number network variable not
set." },
  { SCR_E_VERSION_NUMBER_NOT_SET, "Version number network
variable not set." },
  { SCR_E_REDUCER_UPDATE_INTERVAL_NOT_SET, "Reducer update
interval network variable not set." },
  { SCR_E_REDUCER_HEADER_INTERVAL_NOT_SET, "Reducer header
update interval network variable not set." },
  { SCR_E_OPEN_AIDE_DATA_FILE, "Error opening aide data file." },
  { SCR_E_DATABASE_TYPE_NOT_SET, "Database type network variable
not set." },
  { SCR_E_INVALID_DATABASE_TYPE, "Invalid database type" },
  { SCR_E_AIDE_INIT_TIMEOUT, "Timed out waiting for Aides to initialize."
},
  { SCR_E_TOTAL_DISTRICT_COUNT_NOT_SET,
"TOTAL_DISTRICT_COUNT network variable not set. " },
  { SCR_E_NO_CONNECTS, "No connect network variables have been
specified." },
  { SCR_E_NO_RTE_IN_CONNECT, "No RTE was specified in a CONNECT
network variable." },
  { SCR_E_CALC_VALID_TXN_MIX, "Failed to calculate a valid transaction
mix." },
  { SCR_E_REDUCER_INIT_TIMEOUT, "Timed out waiting for Reducer to
initialize." },
  { SCR_E_LOAD_FE_TIMEOUT, "Timed out waiting for FE(s) to load." },
  { SCR_E_CONNECT_APPLICATION, "Error trying to connect to the
application (SUT)." },
  { SCR_E_SEND, "Error sending data to the application (SUT)." },
  { SCR_E_WAIT_FOR, "Error waiting for reply from application (SUT)." },
  { SCR_E_HTTP_STATUS_OFFSET, "Couldn't determine HTTP status offset."
},
  { SCR_E_FORM_TYPE_OFFSET, "Couldn't determine the form type offset."
},
  { SCR_E_WEB_PAGE_TOO_SHORT, "Received a web page that is too short
to be from our dll." },
  { SCR_E_WEB_PAGE_STATUS_CODE, "Couldn't find form status code in
web page." },
  { SCR_E_ERROR_STATUS_CODE, "Received an error page from our dll, but
couldn't parse the status code." },
  { SCR_E_ERROR_WEB_PAGE, "Received and error page from our dll." },
  { SCR_E_WRONG_WEB_PAGE, "Received a valid web page from our dll, but
it isn't the one we expected." },
  { SCR_E_AIDE_TASK_TIMEOUT, "Timed out waiting for all aides to
perform a task." },
  { SCR_E_AIDES_FAILED_TASK, "One or more aides failed to perform a
task." },
  { SCR_E_BE_CKPT_TIMEOUT, "Timed out waiting for all aides to do their
backend checkpoint init." },
  { SCR_E_BE_CKPT_FAILED, "One or more aides failed to do their backend
checkpoint init." },
  { SCR_E_AIDE_CKPT_INIT_TIMEOUT, "Timed out waiting for all aides to
do their checkpoint init." },
  { SCR_E_USER_LOGIN_TIMEOUT, "Timed out waiting for all users to
confirm login." },
  { SCR_E_USER_LOGIN_FAILED, "A user failed to log in successfully." },
  { SCR_E_LOG_DIR_NOT_SET, "Log dir network variable not set." },
  { SCR_E_CGI_SCRIPT_NAME_NOT_SET, "CGI script name network
variable not set. " },
  { SCR_E_INVALID_TXN_TYPE_REQUESTED, "An invalid transcation type
was requested." },
  { SCR_E_USER_START_FAILED, "User(s) failed to start doing transactions."
},
  { SCR_E_USER_START_TIMEOUT, "Timed out waiting for all users to start
doing transactions." },
  { SCR_E_USER_STOP_FAILED, "User(s) failed to confirm stop." },
  { SCR_E_USER_STOP_TIMEOUT, "Timed out waiting for all users to
confirm stop." },
  { SCR_E_AIDE_TIMEOUT_START_FE, "Timed out waiting for aides to start
application code." },
  { SCR_E_AIDES_FAILED_START, "Not all aides successfully started
application code." },
  { SCR_E_UNUSED_4, "Unused message 4." },
  { SCR_E_UNUSED_5, "Unused message 5." },
  { SCR_E_AIDE_CKPT_RUN_TIMEOUT, "Timed out waiting for aides to start
checkpoint loop." },
  { SCR_E_AIDE_CKPT_STOP_TIMEOUT, "Timed out waiting for aides to
stop checkpoint loop." },
  { SCR_E_WRITE_SENDERS_ID, "Failed to write sender's id to binary log
file." },
  { SCR_E_WRITE_MSG_TYPE, "Failed to write message type to binary log
file." },
  { SCR_E_WRITE_MSG_SIZE, "Failed to write message size to binary log
file." },
  { SCR_E_WRITE_MSG, "Failed to write message to binary log file." },
  { SCR_E_AIDE_EXIT_TIMEOUT, "Timed out waiting for all aides to exit." },
  { SCR_E_OPEN_C_LAST_FILE, "Unable to open file to write C_LAST
constant." },
  { SCR_E_SYNC_USER_TIMEOUT, "Timed out on delay to allow users to
catch up with in sync offset." },
  { SCR_E_MALLOC_CONNECT_ARRAY, "Unable to malloc space for the
connect array." },
  { SCR_E_MALLOC_USER_STOP_ARRAY, "Unable to malloc space for the
user stop array." },
  { SCR_E_AIDES_FAILED_STOP, "Not all aides successfully stopped
application code." },
  { SCR_E_ACTION_NOT_SET, "Action network variable not set." },
  { SCR_E_UNUSED_1, "Unused message 1." },
  { SCR_E_DELI_OFFSET, "Couldn't determine deli record offset." },
  { SCR_E_DURA_PARSE_WAREHOUSE, "Couldn't locate warehouse ID in
response page." },
  { SCR_E_DURA_PARSE_DISTRICT, "Couldn't locate district ID in response
page." },
  { SCR_E_DURA_PARSE_ORDER_ID, "Couldn't locate order ID in response
page." },
  { SCR_E_GREETING, "Failed to get the Greeting Form." },
  { SCR_E_CONNECT_ABORTED, "Asked to stop while logging in." },
  { SCR_E_MENU_BAR, "Failed to get the Menu Bar Form." },
  { SCR_E_AIDE_GET_LOG_SIZE, "Failed to get log size." },
  { SCR_E_RUN_ID_NOT_SET, "Run ID network variable not set." },
  { SCR_E_AIDE_SKIPPING_STATS, "WARNING: Unable to read file --
skipping Oracle stats." },
  { SCR_E_AIDE_SWITCH_LOG, "Failed to switch log." },
  { SCR_E_NO_VALUE, "No value found." },
  { SCR_E_NO_TYPE, "No type found." },
  { SCR_E_NO_DATA, "No data found." },
  { SCR_E_UNUSED_6, "Unused message 6." },
  { SCR_E_REDUCER_ID_NOT_SET, "REDUCER_ID network variable not
set." },
  { SCR_E_RTE_NAMES_NOT_SET, "RTE names network variable not set." },
  { SCR_E_USER_COUNT_MISMATCH, "The count of users in each
CONNECT do not sum to the TOTAL_USER_COUNT." },
  { SCR_E_LOAD_FE_FAILURE, "FE(s) failed to load correctly." },
  { SCR_E_USER_CREATE_FAILED, "The creation of TPC-C users failed." },
  { SCR_E_USER_INIT_FAILED, "User(s) failed to confirm initialization." },
  { SCR_E_USER_INIT_TIMEOUT, "Timed out waiting for all users to confirm
initialization." },
  { SCR_E_FIRST_USER_ID_NOT_SET, "FIRST_USER_ID network variable
not set." },
```

```
  { SCR_E_VALUE_MODIFIED, "Registry setting was modified." },
  { SCR_E_CANT_PARSE_GET_REG_PAGE, "Error parsing GetRegistry
response page." },
  { SCR_E_CANT_INIT_TIME_COUNTER, "Error initializing time value used
for scale calculation of tpmC." },
  { SCR_E_USER_SCRIPT_NAME_NOT_SET, "User script name not specified
in CONNECT nor is USER_SCRIPT_NAME network variable set." },
  { SCR_E_WRONG_DATA_ITEM_COUNT, "Configuration value list must
have either one value or match the number of CONNECT# statements." },
  { SCR_E_AIDE_TIMEOUT_CONFIG_FE, "Timed out waiting for all aides to
configure FEs." },
  { SCR_E_AIDES_FAILED_CONFIG, "Not all aides successfully configured
FEs." },
  { SCR_E_NOT_CORRECT_TRANS, "Did not recieve the expected transaction
response." },
  { SCR_E_INVALID_CONNECT, "The specified connection mode is invalid."
},
  { SCR_E_INVALID_DISCONNECT, "The specified disconnect mode is
invalid." },
  { SCR_E_UI_NOT_SET, "The UI network variable is either not defined or not
properly defined. " },
  { SCR_E_UI_LOAD_FAILED, "UI load failed. " },
  { SCR_E_NO_PARSE_INIT_FAILED, "Unable to initialize NewOrder parsing
function." },
  { SCR_E_DURA_PARSE_EXECUTION_STATUS, "Unable to initialize
durability parsing function." },
  { SCR_E_UI_UNLOAD_FAILED, "UI unload failed. " },
  { SCR_E_AIDE_CKPT_DISCONNECT_TIMEOUT, "Timed out waiting for
all aides to do their checkpoint disconnect." },
  { SCR_E_DISTRICT_USER_COUNT_MISMATCH, "The specified district
and user count(s) don't agree."},
  { SCR_E_REDUCER_CREATE_FAILED, "Failed to create Reducer." },
  { SCR_E_AIDE_CREATE_FAILED, "Failed to create Aides." },
  { 0, "" }
};
#else
extern scr_e_msg_t ScrErrMsgs[];
#endif /* SCR_UTIL_C */

#endif /* SCR_UTIL_H */
```

## tpcc.c

```
/*+          FILE:          TPCC.C
 *                          Microsoft TPC-C Kit Ver. 3.00.000
 *                          Audited 08/23/96          By Francois Raab
 *
 *                          Copyright Microsoft, 1996
 *                          Copyright Digital Equipment Corp., 1997
 *
 *          PURPOSE:  Main module for TPCC.DLL which is an ISAPI service
dll.
 *          Author:                Philip Durr
 *                                              philipdu@Microsoft.com
 *
 *          MODIFICATIONS:
 *
 *                          Routines substantially modified by:
 *                                  Anne Bradley              Digital
Equipment Corp.
 *                                  Bill Carr      Digital Equipment Corp.
 *
 */
/*+*************************************************************
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*************************************************************
**********-*/


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

#define TPCC_C

#include <tpccerr.h>
#include <tpccstruct.h>
#include <tpccapi.h>
#include <httpext.h>

#include <tpcc.h>
#include <web_ui.h>

/* FUNCTION: void FormatString(char *szDest, char *szPic, char *szSrc)
 *
 * PURPOSE:             This function formats a character string for inclusion in
the
 *                      HTML formatted page being constructed.
 *
 * ARGUMENTS:           char            *szDest
                Destination buffer where
 *
                formatted string is to be
 *
                placed
 *                      char            *szPic
                picture string which describes
 *                                                                              how
character value is to be
 *
                formatted.
 *                      char            *szSrc
                character string value.
 *
 * RETURNS:             None
```

```
 *
 * COMMENTS:        This functions is used to format TPC-C phone and zip
value
 *                  strings.
 *
 */

void FormatString(char *szDest, char *szPic, char *szSrc)
{
  while( *szPic )
  {
    if ( *szPic == 'X' )
    {
      if ( *szSrc )
                *szDest++ = *szSrc++;
      else
                *szDest++ = ' ';
    }
    else
      *szDest++ = *szPic;
    szPic++;
  }
  *szDest = 0;

  return;
}

/* FUNCTION: int ParseNewOrderQuery( char *pProcessedQuery[],
 *                                                  NewOrderData
*pNewOrderData )
 *
 * PURPOSE:         This function extracts and validates the new order
query
 *                  from an http command string.
 *
 * ARGUMENTS:       char        *pProcessedQuery[]    array of char*
that points to
 *                                                                    the
value of each name-value
 *                                                                    pair.
 *                  NewOrderData  *pNewOrderData      pointer to new
order data
 *
                structure
 *
 * RETURNS:         int         ERR_SUCCESS
                input data successfully parsed
 *                              error_code            reason for failure
 *
 * COMMENTS:        None
 *
 */

int ParseNewOrderQuery(char *pQueryString, NewOrderData
*pNewOrderData)
{
  char    *ptr;
  int             i;
  short   items;
  char    *pProcessedQuery[MAXNEWORDERVALS];


  PARSE_QUERY_STRING(pQueryString, MAXNEWORDERVALS,
                     newOrderStrs, pProcessedQuery);

  if ( !GetValuePtr(pProcessedQuery, DID, &ptr) )
    return ERR_NEWORDER_FORM_MISSING_DID;

  GetNumeric(ptr, &pNewOrderData->d_id);
  if(0 == pNewOrderData->d_id)
    return ERR_NEWORDER_DISTRICT_INVALID;

  if ( !GetValuePtr(pProcessedQuery, CID, &ptr) )
    return ERR_NEWORDER_CUSTOMER_KEY;

  if( !GetNumeric(ptr, &pNewOrderData->c_id))
    return ERR_NEWORDER_CUSTOMER_INVALID;

  pNewOrderData->o_all_local = 1;


  for(i=0, items=0; i<MAX_OL; i++)
  {
    if( !GetValuePtr(pProcessedQuery, i*3+IID00, &ptr))
      return ERR_NEWORDER_MISSING_IID_KEY;
    if(*ptr != '&' && *ptr)
    {
      if(!GetNumeric(ptr, &pNewOrderData->o_ol[items].ol_i_id))
                return ERR_NEWORDER_ITEMID_INVALID;

      if(!GetValuePtr(pProcessedQuery, i*3+SP00, &ptr))
                return ERR_NEWORDER_MISSING_SUPPW_KEY;
      if(!GetNumeric(ptr, &pNewOrderData->o_ol[items].ol_supply_w_id))
                return ERR_NEWORDER_SUPPW_INVALID;
      if ( pNewOrderData->o_all_local &&
                  pNewOrderData->o_ol[items].ol_supply_w_id !=
                  pNewOrderData->w_id )
                pNewOrderData->o_all_local = 0;
      if(!GetValuePtr(pProcessedQuery, i*3+QTY00, &ptr))
                return ERR_NEWORDER_MISSING_QTY_KEY;
      if(!GetNumeric(ptr, &pNewOrderData->o_ol[items].ol_quantity))
                return ERR_NEWORDER_QTY_INVALID;
      if ( pNewOrderData->o_ol[items].ol_i_id >= 1000000 ||
                  pNewOrderData->o_ol[items].ol_i_id < 1 )
                return ERR_NEWORDER_ITEMID_RANGE;
      if ( pNewOrderData->o_ol[items].ol_quantity >= 100 ||
                  pNewOrderData->o_ol[items].ol_quantity < 1 )
                return ERR_NEWORDER_QTY_RANGE;
      items++;
    }
    else
    {
      if(!GetValuePtr(pProcessedQuery, i*3+SP00, &ptr))
                return ERR_NEWORDER_MISSING_SUPPW_KEY;
      if(*ptr != '&' && *ptr)
                return ERR_NEWORDER_SUPPW_WITHOUT_ITEMID;

      if(!GetValuePtr(pProcessedQuery, i*3+QTY00, &ptr))
                return ERR_NEWORDER_MISSING_QTY_KEY;
      if(*ptr != '&' && *ptr)
                return ERR_NEWORDER_QTY_WITHOUT_ITEMID;
    }
  }
  if ( items == 0 )
    return ERR_NEWORDER_NOITEMS_ENTERED;

  pNewOrderData->o_ol_cnt = items;

  return ERR_SUCCESS;
}

/* FUNCTION: int ParseOrderStatusQuery( char *pProcessedQuery[],
 *                                                  OrderStatusData
*pOrderStatusData )
 *
 * PURPOSE:         This function extracts and validates the order status
query
 *                  from an http command string.
 *
 * ARGUMENTS:       char        *pProcessedQuery[]    array of char*
that points to
 *                                                                    the
value of each name-value
```

```
 *                                                                    pair.
 *                      OrderStatusData *pOrderStatusData pointer to new
order data
 *
structure
 *
 * RETURNS:          int          ERR_SUCCESS
                input data successfully parsed
 *                                error_code              reason for failure
 *
 * COMMENTS:         None
 *
 */
int ParseOrderStatusQuery(char *pQueryString,
                                    OrderStatusData *pOrderStatusData)
{
  char        szTmp[26];
  char   *ptr;
  char        *pSzTmp;
  char        *pProcessedQuery[MAXORDERSTATUSVALS];


  PARSE_QUERY_STRING(pQueryString, MAXORDERSTATUSVALS,
                          orderStatusStrs, pProcessedQuery);

  if ( !GetValuePtr(pProcessedQuery, DID, &ptr) )
    return ERR_ORDERSTATUS_MISSING_DID_KEY;
  if ( !GetNumeric(ptr, &pOrderStatusData->d_id) )
    return ERR_ORDERSTATUS_DID_INVALID;

  if ( !GetValuePtr(pProcessedQuery, CID, &ptr) )
    return ERR_ORDERSTATUS_MISSING_CID_KEY;

  if ( *ptr == '&' || !(*ptr))
  {
    pSzTmp = szTmp;
    pOrderStatusData->c_id = INVALID_C_ID;
    if ( !GetValuePtr(pProcessedQuery, CLT_O, &ptr) )
      return ERR_ORDERSTATUS_MISSING_CLT_KEY;
    while(*ptr != '&' && *ptr)
    {
      *pSzTmp = *ptr;
      pSzTmp++;
      ptr++;
    }
    *pSzTmp = '\0';
    _strupr( szTmp );
    strcpy(pOrderStatusData->c_last, szTmp);
    if ( strlen(pOrderStatusData->c_last) > 16 )
      return ERR_ORDERSTATUS_CLT_RANGE;
  }
  else
  {
    if (!GetNumeric(ptr, &pOrderStatusData->c_id))
      return ERR_ORDERSTATUS_CID_INVALID;
    if ( !GetValuePtr(pProcessedQuery, CLT_O, &ptr) )
      return ERR_ORDERSTATUS_MISSING_CLT_KEY;
    if ( *ptr != '&' && *ptr)
      return ERR_ORDERSTATUS_CID_AND_CLT;
  }

  return ERR_SUCCESS;
}

/* FUNCTION: int ParsePaymentQuery( char *pProcessedQuery[],
 *                                                    PaymentData
*pPaymentData )
 *
 * PURPOSE:          This function extracts and validates the payment query
 *                   from an http command string.
 *
 * ARGUMENTS:        char        *pProcessedQuery[]    array of char*
that points to
 *                                                                    the
value of each name-value
 *                                                                    pair.
 *                   PaymentData  *pPaymentData        pointer to
payment data
 *
          structure
 *
 * RETURNS:          int          ERR_SUCCESS
          input data successfully parsed
 *                                error_code              reason for failure
 *
 * COMMENTS:         None
 *
 */

int ParsePaymentQuery(char *pQueryString, PaymentData *pPaymentData)
{
  char        szTmp[26];
  char        *ptr;
  char   *pPtr;
  char        *pSzTmp;
  char        *pProcessedQuery[MAXPAYMENTVALS];


  PARSE_QUERY_STRING(pQueryString, MAXPAYMENTVALS,
                          paymentStrs, pProcessedQuery);

  if ( !GetValuePtr(pProcessedQuery, DID, &ptr) )
    return ERR_PAYMENT_MISSING_DID_KEY;
  if ( !GetNumeric(ptr, &pPaymentData->d_id) )
    return ERR_PAYMENT_DISTRICT_INVALID;

  if ( !GetValuePtr(pProcessedQuery, CID, &ptr) )
    return ERR_PAYMENT_MISSING_CID_KEY;


  if(*ptr == '&' || !(*ptr))
  {
    pPaymentData->c_id = INVALID_C_ID;
    pSzTmp = szTmp;
    if ( !GetValuePtr(pProcessedQuery, CLT_P, &ptr) )
      return ERR_PAYMENT_MISSING_CLT;
    if (*ptr == '&' || !(*ptr))
      return ERR_PAYMENT_MISSING_CID_CLT;
    while(*ptr != '&' && *ptr)
    {
      *pSzTmp = *ptr;
      pSzTmp++;
      ptr++;
    }
    *pSzTmp = '\0';
    _strupr( szTmp );

    strcpy(pPaymentData->c_last, szTmp);
    if ( strlen(pPaymentData->c_last) > 16 )
      return ERR_PAYMENT_LAST_NAME_TO_LONG;
  }
  else
  {
    if (!GetNumeric(ptr, &pPaymentData->c_id))
      return ERR_PAYMENT_CUSTOMER_INVALID;
    if ( !GetValuePtr(pProcessedQuery, CLT_P, &ptr) )
      return ERR_PAYMENT_MISSING_CLT_KEY;
    if(*ptr != '&' && *ptr)
      return ERR_PAYMENT_CID_AND_CLT;
  }

  if ( !GetValuePtr(pProcessedQuery, CDI, &ptr) )
    return ERR_PAYMENT_MISSING_CDI_KEY;
```

```
 if ( !GetNumeric(ptr, &pPaymentData->c_d_id) )
  return ERR_PAYMENT_CDI_INVALID;

 if ( !GetValuePtr(pProcessedQuery, CWI, &ptr) )
  return ERR_PAYMENT_MISSING_CWI_KEY;

 if ( !GetNumeric(ptr, &pPaymentData->c_w_id) )
  return ERR_PAYMENT_CWI_INVALID;



 if ( !GetValuePtr(pProcessedQuery, HAM, &ptr) )
  return ERR_PAYMENT_MISSING_HAM_KEY;

 pPtr = ptr;
 while( *pPtr != '&' && *pPtr)
 {
  if ( *pPtr == '.' )
  {
   pPtr++;
   if ( !*pPtr )
            break;
   if ( *pPtr < '0' || *pPtr > '9' )
            return ERR_PAYMENT_HAM_INVALID;
   pPtr++;
   if ( !*pPtr )
            break;
   if ( *pPtr < '0' || *pPtr > '9' )
            return ERR_PAYMENT_HAM_INVALID;
   if ( !*pPtr )
            return ERR_PAYMENT_HAM_INVALID;
  }
  else if ( *pPtr < '0' || *pPtr > '9' )
   return ERR_PAYMENT_HAM_INVALID;
  pPtr++;
 }

 pPaymentData->h_amount = atof(ptr);
 if ( pPaymentData->h_amount >= 10000.00 || pPaymentData->h_amount < 0 )
  return ERR_PAYMENT_HAM_RANGE;

 return ERR_SUCCESS;
}
```

## tpcc.h

```
#ifndef TPCC_H
#define TPCC_H

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 *                                                                      *

**********************************************************************
**********-*/

/*+
 * Abstract: This is the header file for web_ui.c.  it contains the
 *              function prototypes for the routines that are called outside web_ui.c
 *
 * Author: A Bradley
 * Creation Date: May 1997
 *
 * Modified history:
 *
 *
 */


#if defined WEB_UI_C || defined TPCC_C

void FormatString(char *szDest, char *szPic, char *szSrc);

int ParseNewOrderQuery(char *pQueryString, NewOrderData
*pNewOrderData);
int ParsePaymentQuery(char *pQueryString, PaymentData *pPaymentData);
int ParseOrderStatusQuery(char *pQueryString,
                                        OrderStatusData *pOrderStatusData);
#endif /* defined WEB_UI_C || defined TPCC_C */

#endif /* TPCC_H */
```

## tpcc_gen.c

```
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**********************************************************
**********-*/

#include <stdio.h>
#include <math.h>
#include <string.h>
#include <time.h>
#include <stdtypes.h>

#ifdef _WIN32
# include <nt_lib.h>
#else
# include <sys/param.h>                    /* to get MAXHOSTNAMELEN */
#endif

#include <common.h>

#include <tpccstruct.h>
#include <tpccapi.h>
#include <tpccerr.h>

#include <scr_util.h>

#include <msg.h>
#include <tx_api.h>
#include <tpcc_gen.h>

/* Constants used in NURand functions */
#define C_ID_CONST 511
#define ITEM_CONST 4093


/* Values used to generate random data */
#define PCT_C_LAST 60

/* Macro to do random number functions */
#define NURand(A, x, y, C) \
    ((((random_int(0, A) | random_int(x, y)) + C) % (y-x+1)) + x)

/* Values needed to make lastnames */
const char *c_table[10] = {"BAR", "OUGHT", "ABLE", "PRI", "PRES", "ESE",
                     "ANTI", "CALLY", "ATION", "EING"};
const int c_length[10] = {3,5,4,3,4,3,4,5,5,4};

void
get_wdid( txn_context_t *pContext, int *pw_id, int *pd_id )
{
 if( BACKEND_MODE == pContext->RunMode )
 {
  *pw_id = random_int( 1, pContext->max_w_id );
  *pd_id = random_int( 1, DISTRICTS_PER_WAREHOUSE );
 }
 else
 {
  *pw_id = pContext->w_id;
  *pd_id = pContext->d_id;
 }
}

void
get_no_data( txn_context_t *pContext, pNewOrderData pNewOrder,
                    int *context )
{
 int remote_txn = 0;
 int line;

 pNewOrder->CC = (CallersContext)pContext;

 *context = NEW_ORDER_TXN;

 get_wdid( pContext, &pNewOrder->w_id, &pNewOrder->ld_id );

 pNewOrder->d_id = random_int( 1, DISTRICTS_PER_WAREHOUSE );

 pNewOrder->c_id = NURand( 1023, 1, MAX_C_ID, C_ID_CONST );

 pNewOrder->o_ol_cnt = random_int( MIN_OL, MAX_OL );
 for( line = 0; line < pNewOrder->o_ol_cnt; line++ )
 {
  /* ol_supplying warehouse is remote 1% of the time */
  if(( random_int( 0, 999 ) < 990) || ( pContext->max_w_id == 1 ))
  {
   pNewOrder->o_ol[line].ol_supply_w_id = pNewOrder->w_id;
  }
  else
  {
   remote_txn++;
   pNewOrder->o_ol[line].ol_supply_w_id =
              random_int( 1, pContext->max_w_id-1 );
   if( pNewOrder->o_ol[line].ol_supply_w_id >= pNewOrder->w_id )
   {
              pNewOrder->o_ol[line].ol_supply_w_id++;
   }
  }

  /* set last pNewOrder->o_ol[line].ol_i_id to ILLEGAL if rollback required */
  if(( line == pNewOrder->o_ol_cnt-1 ) &&
    ( random_int( 0, 999 ) < 10 ))
  {
   pNewOrder->o_ol[line].ol_i_id = ILLEGAL_ITEM;
   *context |= ILLEGAL_ITEM_TXN;
  }
  else
  {
   pNewOrder->o_ol[line].ol_i_id =
              NURand( 8191, 1, MAX_I_ID_POPULATED, ITEM_CONST );
  }

  pNewOrder->o_ol[line].ol_quantity = random_int( 1, MAX_OL_QUANTITY
);

 }          /* for loop */

 *context |= ( pNewOrder->o_ol_cnt << OL_CNT_BIT_POS );
 *context |= ( remote_txn << REMOTE_TXN_BIT_POS );

}                              /* get_no_data */

void
get_pt_data( txn_context_t *pContext, pPaymentData pPayment,
                    int *context )
{
 char                                *ptr;
 int                                 index, i1, i2, i3;

 pPayment->CC = (CallersContext)pContext;

 *context = PAYMENT_TXN;

 get_wdid( pContext, &pPayment->w_id, &pPayment->ld_id );

 pPayment->d_id = random_int( 1, DISTRICTS_PER_WAREHOUSE );

 pPayment->c_id = INVALID_C_ID;

 ptr = pPayment->c_last;
 if( random_int( 0,99 ) < PCT_C_LAST )
```

```
 {
  /* use C_LAST */
  *context |= NON_KEY_ACCESS;
  index = NURand( 255, 0, 999, pContext->CLast );
  i1 = index/100;                                   /* hundreds digit */
  i2 = ( index - i1 * 100 ) / 10;           /* tens digit */
  i3 = index - ( i1 * 100 ) - ( i2 * 10 );/* ones digit */

  memcpy( ptr, c_table[i1], c_length[i1] );
  ptr += c_length[i1];
  memcpy( ptr, c_table[i2], c_length[i2] );
  ptr += c_length[i2];
  memcpy( ptr, c_table[i3], c_length[i3] );
  ptr += c_length[i3];
  *ptr = '\0';
 }
 else
 {
  /* use c_id within [1..MAX_C_ID] */
  pPayment->c_id = NURand( 1023, 1, MAX_C_ID, C_ID_CONST );
 }

 /* 15% remote payment */
 if(( random_int( 0,999 ) < 850 ) || ( pContext->max_w_id == 1 ))
 {
  pPayment->c_w_id = pPayment->w_id;
  pPayment->c_d_id = pPayment->ld_id;
 }
 else
 {
  *context |= REMOTE_PAYMENT;
  pPayment->c_w_id = random_int( 1, pContext->max_w_id-1 );
  if( pPayment->c_w_id >= pPayment->w_id )
  {
   pPayment->c_w_id++;
  }
  pPayment->c_d_id = random_int( 1, DISTRICTS_PER_WAREHOUSE );
 }

 /* h_amount in the within [1.00..MAX_PT_AMOUNT_CENTS/100] */
 pPayment->h_amount = ((double)random_int( 100,
MAX_PT_AMOUNT_CENTS ) / 100.0);

}                               /* get_pt_data */

void
get_os_data( txn_context_t *pContext, pOrderStatusData pOrderStatus,
                int *context )
{
 char                           *ptr;
 int                            index, i1, i2, i3;

 pOrderStatus->CC = (CallersContext)pContext;

 *context = ORDER_STATUS_TXN;

 get_wdid( pContext, &pOrderStatus->w_id, &pOrderStatus->ld_id );

 pOrderStatus->d_id = random_int( 1, DISTRICTS_PER_WAREHOUSE );

 pOrderStatus->c_id = INVALID_C_ID;

 ptr = pOrderStatus->c_last;
 if( random_int( 0,99 ) < PCT_C_LAST )
 {
  /* use C_LAST */
  *context |= NON_KEY_ACCESS;
  index = NURand( 255, 0, 999, pContext->CLast );
  i1 = index/100;                                   /* hundreds digit */
  i2 = ( index - i1 * 100 ) / 10;           /* tens digit */
  i3 = index - ( i1 * 100 ) - ( i2 * 10 );/* ones digit */
  memcpy( ptr, c_table[i1], c_length[i1] );
  ptr += c_length[i1];
  memcpy( ptr, c_table[i2], c_length[i2] );
  ptr += c_length[i2];
  memcpy( ptr, c_table[i3], c_length[i3] );
  ptr += c_length[i3];
  *ptr = '\0';
 }
 else
 {
  /* use c_id within [1..MAX_C_ID] */
  pOrderStatus->c_id = NURand( 1023, 1, MAX_C_ID, C_ID_CONST );
 }

}                               /* get_os_data */

void
get_dy_data( txn_context_t *pContext, pDeliveryData pDelivery,
                int *context )
{
 pDelivery->CC = (CallersContext)pContext;

 *context = INT_DELIVERY_TXN;

 get_wdid( pContext, &pDelivery->w_id, &pDelivery->ld_id );

 /* generate o_carrier_id in the range [1..MAX_CARRIER_ID] */
 pDelivery->o_carrier_id = random_int( 1, MAX_CARRIER_ID );

 /* enter time of request */
 pDelivery->queue_time = time( NULL );

}                               /* get_dy_data */

void
get_sl_data( txn_context_t *pContext, pStockLevelData pStockLevel,
                int *context )
{
 pStockLevel->CC = (CallersContext)pContext;

 *context = STOCK_LEVEL_TXN;

 get_wdid( pContext, &pStockLevel->w_id, &pStockLevel->ld_id );

 /* generate threshold in the range
[MIN_SL_THRESHOLD..MAX_SL_THRESHOLD] */
 pStockLevel->threshold = random_int( MIN_SL_THRESHOLD,
MAX_SL_THRESHOLD );

}                               /* get_sl_data */

void
get_cp_data( txn_context_t *pContext, pCheckpointData pCheckpoint,
                int *context )
{
 pCheckpoint->CC = (CallersContext)pContext;

 *context = CHECKPOINT_TXN;

 get_wdid( pContext, &pCheckpoint->w_id, &pCheckpoint->ld_id );

 pCheckpoint->how_many = 1;
 pCheckpoint->interval = 0;

}                               /* get_cp_data */
```

## tpcc_gen.h

```
#ifndef TPCC_GEN_H
#define TPCC_GEN_H
```

```
/*+**********************************************************************
*************
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*
 *                                                                      *
 *                                                                      *

**********************************************************************
**********-*/

void get_wdid( txn_context_t *pContext, int *pw_id, int *pd_id );
void get_no_data(txn_context_t *pUdata, pNewOrderData pNewOrder, int
*context);
void get_pt_data(txn_context_t *pUdata, pPaymentData pPayment, int
*context);
void get_os_data(txn_context_t *pUdata, pOrderStatusData pOrderStatus,
                                int *context);
void get_dy_data(txn_context_t *pUdata, pDeliveryData pDelivery, int
*context);
void get_sl_data(txn_context_t *pUdata, pStockLevelData pStockLevel,
                                int *context);
void get_cp_data(txn_context_t *pUdata, pCheckpointData pCheckpoint,
                                int *context);

#endif
```

## tpcc_master.c

```
/*+**********************************************************************
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*
 *                                                                      *
 *                                                                      *

**********************************************************************
**********-*/
/*
 * Abstract: The Master script is the script responsible for timing when
 *         the users should be logged in, when they should rampup, how
 *         long their steady state is. etc...
 *
 * Author: ???
 *
 * Creation Date: ???
 *
 * Modification history:
 *
 * X-1 W. Carr 17-Jan-1997
 *    Added new format header.  Checked in code that prevents the audit
 *    scripts from running.  Added new code to pass counter reset message
 *    to all scripts as part of run-time data reduction code.
 *
 *
 *
 */


#include <math.h>
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <ctype.h>
#include <sys/stat.h>
#include <sys/types.h>
#include <time.h>

#ifdef _WIN32
# include <direct.h>
# include <nt_lib.h>
# include <windows.h>
# include <process.h>
#else
# include <dirent.h>
# include <sys/time.h>
# include <unistd.h>
#endif

#include <stdtypes.h>
#include <prte.h>
#include <common.h>

#include <tpccstruct.h>
#include <tpccapi.h>
#include <tpccerr.h>
#include <reg.h>
#include <config.h>

#include <scr_util.h>
```

```
#define NEED_MSG_NAMES
#include <msg.h>
#include <netvar.h>
#include <audit_util.h>


#ifdef _WIN32
# define MKDIR(Dir,Mode) mkdir(Dir)
  typedef int mode_t;
#else
# define MKDIR(Dir,Mode) mkdir(Dir,Mode)
#endif

#define MAX_RUN_DIR_NAME_LEN 3 /* Number padded with leading 0's */
#define LOG_DIR "logs"     /* appended to the run dir */
#define maximum(A,B) ((A) > (B) ? (A) : (B))

#define NODELAY

#define REG_KEY_STR "CONF_FE_NT_REG_KEY_"
#define REG_VALUE_STR "CONF_FE_NT_REG_VALUE_"
#define REG_TYPE_STR "CONF_FE_NT_REG_TYPE_"
#define REG_DATA_STR "CONF_FE_NT_REG_DATA_"

typedef struct _be_t
{
  char          Name[MAXHOSTNAMELEN];
  double LogSize;
  double LogUsed;
} be_t;

/* This is the master data structure.  It contains all relevent information
   for coordinating the testing. */
typedef struct _master_data_t
{
  int32                 AdminUsers;
  int32                 RequestsSent;
  int32                 ReplysReceived;
  int32                 AidesStatus;
  BOOL                  MsgTimedOut;
  double        MsgTimeout;

  char                  CgiScriptName[PATH_MAX];
  BOOL                  DoCheckpoints;
  double        CkptStartOffset;

  /* FE Info */
  int32                         RunMode;
  int32                         TpccUsers;
  int32                         NumFEs;
  int32                         NumConnects;
  connect_t             *pConnects;
  BOOL                          FERestartViaReboot;
  int32                         RestartFEs;

  double        Proximity;
  pid_t                 OsPid;
  char                  RunDir[PATH_MAX];
  int                   CheckpointInterval;
  double        WarmUpTime;
  double        SteadyStateTime;
  double        MeasurementInterval;
  double        CoolDownTime;
  int                   ReducerID;
  int32                 ReducerStatus;
  char                  ReducerScriptName[PATH_MAX];
  char                  ReducerScriptNode[MAXHOSTNAMELEN];
  char                  OutputDir[PATH_MAX];
  char                  RunNumStr[8];
  int                   VersionNum;
  long                  MasterSeed;
  char                  *pVersion; /* Holds the System Version. */
  int32                 NumBE;
  be_t                  *pBEs;
  char                  AideScriptName[PATH_MAX];

  char                  BeUname[32];
  char                  DbUname[32];
  char                  DbPassword[32];
  char                  DbName[32];
  char                  OraStatScriptPath[PATH_MAX];
  char                  CustomBeforeTestScript[PATH_MAX];
  char                  CustomAfterTestScript[PATH_MAX];


  task_data_t   BeTasksData;
} master_data_t;


/* Prototypes */
void            BinMsgHandler( void *Context, int SendersID, int Len, void *Msg
);
int32           Config( master_data_t *pContext );
int32           ConfigFEs( master_data_t *pContext );
int32           ConfigFEsSendMsg( master_data_t *pContext,
                                  config_fe_msg_t *pConfigFEMsg, char
*pDataVar );
int32           GetBeInfo(master_data_t *pContext);
void            GetFeUserCounts(master_data_t *pContext, int32 State);
void            GetSeed( master_data_t *pContext );
int32           Init( master_data_t *pContext );
int32           InitAides( master_data_t *pContext );
int32           InitFEs( master_data_t *pContext );
int32           InitReducer( master_data_t *pContext );
int32           MakeRunDir(char *DirName, char *RunDir);
int32           ParseUsersPerFE(master_data_t *pContext, char *string);
int32   PreTestHook(master_data_t *pContext);
int32           StartFEs( master_data_t *pContext );
int32           StopAides( master_data_t *pContext );
int32           StopFEs( master_data_t *pContext );
int32           StopReducer( master_data_t *pContext );
void            TellAidesTo(master_data_t *pContext, int32 Task, int32 State);
int32           TestPeriod( master_data_t *pContext );


void
main(int argc, char *argv[])
{
  master_data_t                         Context;
  master_data_t                         *pContext = &Context;
  int32                                 Status;

  /* Initialize with PRTE. */
  PRTEinit( argc, argv );

  /* Initialize. */
  if( SCR_E_SUCCESS != ( Status = Init( pContext )))
  {
    ( void ) SCRerr( Status );
    ( void ) SCRerr( SCR_E_INIT );
  }

  /* Select the proper routine for the run mode. */
  if( SCR_E_SUCCESS == Status )
  {
    switch( pContext->RunMode )
    {
    case END_TO_END_MODE:
    case BACKEND_MODE:
      Status = TestPeriod( pContext );
      break;
    case CONFIG_MODE:
      Status = Config( pContext );
      break;
```

```
  default:
    break;
  }
 }

 SCRlog( "Master: Blowing this popsicle stand." );

 PRTEexit( );
}



/*****************************************************************
***************/
/*                                                               */
/* Name: BinMsgHandler                                           */
/*                                                               */
/* Purpose: This is the message handler that gets registered with PRTE for    */
/*         processing binary messages sent to the Master.                     */
/*                                                               */
/* Inputs:                                                       */
/*        Context: Pointer to the context structure. This structure is set    */
/*                 up elsewhere, and registered with PRTE to be passed in.    */
/*        SendersID: User ID number of the user that sent us the binary       */
/*                   message.                                                 */
/*        Len: Length of the binary message in bytes.                         */
/*        Msg: Pointer to the actual data being sent.                         */
/*                                                               */
/* Outputs: None.                                                */
/*                                                               */
/*                                                               */
/* Function Value: void                                          */
/*                                                               */
/* Notes: This funtion is called on our behalf by PRTE. In order for this     */
/*        to happen, we must be inside a call to some PRTE function. If we    */
/*        are running code outside a PRTE function, PRTE will not interrupt   */
/*        us (i.e. no signal is sent). It is only when we are inside a PRTE   */
/*        function call (e.g. PRTEdelay, etc.) that PRTE will check to see if */
/*        we have a message that needs processing.                            */
/*                                                               */
/*****************************************************************
***************/
void
BinMsgHandler( void *Context, int SendersID, int Len, void *Msg )
{
 int32                          Index;
 checkpoint_status_msg_t        *pCheckpointStatusMsg;
 master_data_t                  *pContext;
 generic_msg_t                  *pMsg;
 generic_status_msg_t           *pStatusMsg;
 char                           TmpStr[256];

 /* Effectively convert void * parameters to correct types. */
 pMsg = Msg;
 pContext = Context;

 /* Process messaged based on its type. */
 switch( pMsg->Type )
 {
  case DATA_PROCESSING_LOOP_OVER:
    PRTEresume( );
    break;

  case DATA_POST_PROCESS_REPLY_MSG:
    pStatusMsg = (generic_status_msg_t *) Msg;
    if( SCR_E_SUCCESS == pStatusMsg->Status )
    {
            SCRlog( "\tTest results successfully generated." );
    }
    else
    {
            SCRlog( "\tError generating test results ( %d ).",
                    pStatusMsg->Status );
    }
    PRTEresume( );

    break;

  case AIDELOG_POST_PROCESS_REPLY_MSG:
    pStatusMsg = (generic_status_msg_t *) Msg;
    if( ERR_SUCCESS == pStatusMsg->Status )
    {
            SCRlog( "\tAide logs successfully processed." );
    }
    else
    {
            SCRlog( "\tError processing aide logs( %d ).",
                    pStatusMsg->Status );
    }
    PRTEresume_users( User_id, User_id );

    break;

  case AIDE_EXIT_REPLY_MSG:
    pStatusMsg = (generic_status_msg_t *) Msg;
    pContext->ReplysReceived++;
    if( SCR_E_SUCCESS != pStatusMsg->Status &&
            SCR_E_SUCCESS == pContext->AidesStatus )
    {
            /* Note that we've had a failure. */
            pContext->AidesStatus = pStatusMsg->Status;
    }
    if( pContext->ReplysReceived == pContext->RequestsSent )
    {
            /* We've heard back from everyone, so break ourselves out of delay.
*/
            pContext->MsgTimedOut = FALSE;
            PRTEdelay( 0.0 );
    }
    break;

  case AIDE_INIT_REPLY_MSG:
    pStatusMsg = (generic_status_msg_t *) Msg;
    if( SCR_E_SUCCESS != pStatusMsg->Status &&
            SCR_E_SUCCESS == pContext->AidesStatus )
    {
            /* Note that we've had a failure. */
            pContext->AidesStatus = pStatusMsg->Status;
    }
    pContext->ReplysReceived++;
    if( pContext->ReplysReceived == pContext->RequestsSent )
    {
            /* We've heard back from everyone, so break ourselves out of delay.
*/
            pContext->MsgTimedOut = FALSE;
            PRTEdelay( 0.0 );
    }
    break;

  case CHECKPOINT_CONNECT_REPLY_MSG:
    pCheckpointStatusMsg = (checkpoint_status_msg_t *) Msg;
    pContext->ReplysReceived++;

    if( SCR_E_SUCCESS == pCheckpointStatusMsg->Data.Status )
    {
            SCRlog( "\t\t%s - checkpoint sub-system initialized.",
                    pCheckpointStatusMsg->Data.FEName );
    }
    else
    {
            if( SCR_E_SUCCESS == pContext->AidesStatus )
            {
             pContext->AidesStatus = pCheckpointStatusMsg->Data.Status;
```

```
                }
                SCRlog( "\t\t%s - checkpoint subsystem initialization FAILED ( %d
).",
                                pCheckpointStatusMsg->Data.FEName,
                                pCheckpointStatusMsg->Data.Status );
        }

        if( pContext->ReplysReceived == pContext->RequestsSent )
        {
                /* We've heard back from everyone, so break ourselves out of delay.
*/
                pContext->MsgTimedOut = FALSE;
                PRTEdelay( 0.0 );
        }

        break;

      case CHECKPOINT_RUN_REPLY_MSG:
        pCheckpointStatusMsg = (checkpoint_status_msg_t *) Msg;
        pContext->ReplysReceived++;

        if( SCR_E_SUCCESS == pCheckpointStatusMsg->Data.Status )
        {
                SCRlog( "\t\t%s - checkpoint loop started.",
                                pCheckpointStatusMsg->Data.FEName );
        }
        else
        {
                if( SCR_E_SUCCESS == pContext->AidesStatus )
                {
                 pContext->AidesStatus = pCheckpointStatusMsg->Data.Status;
                }
                SCRlog( "\t\t%s - checkpoint loop NOT entered ( %d ).",
                                pCheckpointStatusMsg->Data.FEName,
                                pCheckpointStatusMsg->Data.Status );
        }

        if( pContext->ReplysReceived == pContext->RequestsSent )
        {
                /* We've heard back from everyone, so break ourselves out of delay.
*/
                pContext->MsgTimedOut = FALSE;
                PRTEdelay( 0.0 );
        }

        break;

      case CHECKPOINT_STOP_REPLY_MSG:
        pCheckpointStatusMsg = (checkpoint_status_msg_t *) Msg;
        pContext->ReplysReceived++;

        if( SCR_E_SUCCESS == pCheckpointStatusMsg->Data.Status )
        {
                SCRlog( "\t\t%s - checkpoint loop ran successfully.",
                                pCheckpointStatusMsg->Data.FEName );
        }
        else
        {
                if( SCR_E_SUCCESS == pContext->AidesStatus )
                {
                 pContext->AidesStatus = pCheckpointStatusMsg->Data.Status;
                }
                SCRlog( "\t\t%s - checkpoint loop FAILED ( %d ).",
                                pCheckpointStatusMsg->Data.FEName,
                                pCheckpointStatusMsg->Data.Status );
        }

        if( pContext->ReplysReceived == pContext->RequestsSent )
        {
                /* We've heard back from everyone, so break ourselves out of delay.
*/
                pContext->MsgTimedOut = FALSE;
                PRTEdelay( 0.0 );
        }

        break;

      case CHECKPOINT_DISCONNECT_REPLY_MSG:
        pCheckpointStatusMsg = (checkpoint_status_msg_t *) Msg;
        pContext->ReplysReceived++;

        if( SCR_E_SUCCESS == pCheckpointStatusMsg->Data.Status )
        {
                SCRlog( "\t\t%s - checkpoint sub-system shutdown.",
                                pCheckpointStatusMsg->Data.FEName );
        }
        else
        {
                if( SCR_E_SUCCESS == pContext->AidesStatus )
                {
                 pContext->AidesStatus = pCheckpointStatusMsg->Data.Status;
                }
                SCRlog( "\t\t%s - checkpoint subsystem shutdown FAILED ( %d ).",
                                pCheckpointStatusMsg->Data.FEName,
                                pCheckpointStatusMsg->Data.Status );
        }

        if( pContext->ReplysReceived == pContext->RequestsSent )
        {
                /* We've heard back from everyone, so break ourselves out of delay.
*/
                pContext->MsgTimedOut = FALSE;
                PRTEdelay( 0.0 );
        }

        break;

      case CONFIG_FE_REPLY_MSG:
        pStatusMsg = (generic_status_msg_t *) Msg;
        pContext->ReplysReceived++;
        if( SCR_E_VALUE_MODIFIED == pStatusMsg->Status )
        {
                for( Index = 0; Index < pContext->NumConnects; Index++ )
                {
                 if( SendersID == pContext->pConnects[Index].AideID )
                 {
                  pContext->pConnects[Index].ConfMod = TRUE;
                  break;
                 }
                }
        }
        else if( SCR_E_SUCCESS != pStatusMsg->Status &&
                        SCR_E_SUCCESS == pContext->AidesStatus )
        {
                /* Note that we've had a failure. */
                pContext->AidesStatus = pStatusMsg->Status;
        }
        if( pContext->ReplysReceived == pContext->RequestsSent )
        {
                /* We've heard back from everyone, so break ourselves out of delay.
*/
                pContext->MsgTimedOut = FALSE;
                PRTEdelay( 0.0 );
        }
        break;

      case ORA_SWITCHLOG_REPLY_MSG:
      case GET_LOGSIZE_REPLY_MSG:
      case ORA_DOSTATS_REPLY_MSG:
      case DO_CUSTOM_SCRIPT_REPLY_MSG:
      case INIT_AUDIT_TABLE_REPLY_MSG:
      case BE_CKPTDATA_REPLY_MSG:
        pStatusMsg = (generic_status_msg_t *) Msg;
        if( SCR_E_SUCCESS != pStatusMsg->Status &&
```

```
                SCR_E_SUCCESS == pContext->AidesStatus )
    {
                /* Note that we've had a failure. */
                pContext->AidesStatus = pStatusMsg->Status;
    }
    pContext->ReplysReceived++;
    if( pContext->ReplysReceived == pContext->RequestsSent )
    {
                /* We've heard back from everyone, so break ourselves out of delay.
*/
                pContext->MsgTimedOut = FALSE;
                PRTEdelay( 0.0 );
    }
    break;

   case START_FE_REPLY_MSG:
    pStatusMsg = (generic_status_msg_t *) Msg;
    pContext->ReplysReceived++;
    if( SCR_E_SUCCESS != pStatusMsg->Status &&
                SCR_E_SUCCESS == pContext->AidesStatus )
    {
                /* Note that we've had a failure. */
                pContext->AidesStatus = pStatusMsg->Status;
    }
    if( pContext->ReplysReceived == pContext->RequestsSent )
    {
                /* We've heard back from everyone, so break ourselves out of delay.
*/
                pContext->MsgTimedOut = FALSE;
                PRTEdelay( 0.0 );
    }
    break;

   case STOP_FE_REPLY_MSG:
    pStatusMsg = (generic_status_msg_t *) Msg;
    pContext->ReplysReceived++;
    if( SCR_E_SUCCESS != pStatusMsg->Status &&
                SCR_E_SUCCESS == pContext->AidesStatus )
    {
                /* Note that we've had a failure. */
                pContext->AidesStatus = pStatusMsg->Status;
    }
    if( pContext->ReplysReceived == pContext->RequestsSent )
    {
                /* We've heard back from everyone, so break ourselves out of delay.
*/
                pContext->MsgTimedOut = FALSE;
                PRTEdelay( 0.0 );
    }
    break;

   case REDUCER_INIT_REPLY_MSG:
    pStatusMsg = (generic_status_msg_t *) Msg;
    pContext->ReducerStatus = pStatusMsg->Status;
    pContext->MsgTimedOut = FALSE;
    PRTEdelay( 0.0 );
    break;

   case USER_LOGIN_REPLY_MSG:
   case USER_START_REPLY_MSG:
   case USER_STOP_REPLY_MSG:
    pStatusMsg = (generic_status_msg_t *) Msg;
    pContext->ReducerStatus = pStatusMsg->Status;
    PRTEresume( );
    break;

   case LOAD_FE_REPLY_MSG:
    pStatusMsg = (generic_status_msg_t *) Msg;
    pContext->ReplysReceived++;
    if( SCR_E_SUCCESS != pStatusMsg->Status &&
                SCR_E_SUCCESS == pContext->AidesStatus )
    {
                /* Note that we've had a failure. */
                pContext->AidesStatus = pStatusMsg->Status;
    }
    if( pContext->ReplysReceived == pContext->RequestsSent )
    {
                /* We've heard back from everyone, so break ourselves out of delay.
*/
                pContext->MsgTimedOut = FALSE;
                PRTEdelay( 0.0 );
    }
    break;

   default:
    sprintf( TmpStr, "Master received unknown user message type: %d",
                    pMsg->Type );
    SCRlog( TmpStr );
  }
}



int32
Config( master_data_t *pContext )
{
  char                          *pTmpStr;
  int32                         Status;
  char                          TmpStr[256];

  Status = SCR_E_SUCCESS;

  SCRlog( "\n\n\n\t\t\t\t\t..START OF CONFIG..\n\n" );

  /* Lie about a reducer existing for the aides will initialize. */
  ITOA( 0, TmpStr, pTmpStr );
  PRTEset_network_variable( "REDUCER_ID", TmpStr );

  if( SCR_E_SUCCESS == Status )
  {
   Status = InitAides( pContext );
  }

  if( SCR_E_SUCCESS == Status )
  {
   Status = ConfigFEs( pContext );
  }

  if( SCR_E_SUCCESS == Status )
  {
   Status = StopAides( pContext );
  }

  SCRlog( "\n\n\n\n\t\t\t\t\t..END OF CONFIG..\n\n\n" );

  return( Status );
}


/*****************************************************************
***************/
/*                                                               */
/* Name: ConfigFEs                                               */
/*                                                               */
/* Purpose: This function causes the FEs to be configed.         */
/*                                                               */
/* Inputs:                                                       */
/*                                                               */
/* Outputs:                                                      */
/*                                                               */
/* Function Value:                                               */
/*                                                               */
/* Notes:                                                        */
/*                                                               */
```

```
/*****************************************************************
***************/
int32
ConfigFEs( master_data_t *pContext )
{
 int                                Code;
 int32                              Index;
 char                               NetVarName[50];
 int32                              NetVarNum;
 char                               *pTmp;
 char                               *pValue;
 config_fe_msg_t          ConfigFEMsg;
 int32                              Status;

 /* Check if we have any FEs to configure. */
 if( 0 == pContext->NumFEs )
 {
  return( SCR_E_SUCCESS );
 }

 /* Initialize stuff. */
 for( Index = 0; Index < pContext->NumConnects; Index++ )
 {
  if( ! pContext->pConnects[Index].ConfConn )
  {
   continue;
  }
  pContext->pConnects[Index].ConfMod = FALSE;
  SCRlog( "\tChecking configuration of %s.",
                pContext->pConnects[Index].FEName );
 }

 /* All the known FE parameters go into the same key, get them by name. */
 strcpy( ConfigFEMsg.Data.Key, TPCC_CLASS );
 strcpy( ConfigFEMsg.Data.Type, "string" );

 for( Code = FFE_C_BASE + 1; Code <= FFE_C_MAX_PARAM; Code++ )
 {
  /* Get the configuration value name in order to get its data */
  pValue = ConfigCodeToStr( Code );
  strcpy( ConfigFEMsg.Data.Value, pValue );

  /* Now collect data and send messages. */
  Status = ConfigFEsSendMsg( pContext, &ConfigFEMsg, pValue );
  if( SCR_E_SUCCESS != Status )
  {
   return( Status );
  }
 }

 /* In order to set a registry entry, you must have the key, value, type */
 /* and data. This code assumes that these pieces of info are grouped    */
 /* in sets of predetermined network variables. So we'll keep setting    */
 /* entries as long as we keep finding the next set.                     */
 NetVarNum = 1;
 sprintf( NetVarName, "%s%d", REG_KEY_STR, NetVarNum );
 while( NULL != (pTmp = PRTEget_network_variable( NetVarName )))
 {
  /* We got a key back, so the rest of this set should also be there. */
  /* So save the key, and get the rest of the set.                    */
  strcpy( ConfigFEMsg.Data.Key, pTmp );

  /* Get the value. */
  sprintf( NetVarName, "%s%d", REG_VALUE_STR, NetVarNum );
  if( NULL == (pTmp = PRTEget_network_variable( NetVarName )))
  {
   /* We have an error here. */
   SCRlog( "Getting network variable: %s", ConfigFEMsg.Data.Value );
   return( SCRerr( SCR_E_NO_VALUE ));
  }
  else
  {
   strcpy( ConfigFEMsg.Data.Value, pTmp );
  }

  /* Get the type. */
  sprintf( NetVarName, "%s%d", REG_TYPE_STR, NetVarNum );
  if( NULL == (pTmp = PRTEget_network_variable( NetVarName )))
  {
   /* We have an error here. */
   SCRlog( "Getting network variable: %s", ConfigFEMsg.Data.Type );
   return( SCRerr( SCR_E_NO_TYPE ));
  }
  else
  {
   strcpy( ConfigFEMsg.Data.Type, pTmp );
  }

  /* Now collect data and send messages. */
  sprintf( NetVarName, "%s%d", REG_DATA_STR, NetVarNum );
  Status = ConfigFEsSendMsg( pContext, &ConfigFEMsg, NetVarName );
  if( SCR_E_SUCCESS != Status )
  {
   return( Status );
  }

  /* Move on to the next entry set. */
  NetVarNum++;
  sprintf( NetVarName, "%s%d", REG_KEY_STR, NetVarNum );
 } /* while */

 /* Check if any of the FEs need to be restarted. */
 Status = SCR_E_SUCCESS;
 for( Index = 0; Index < pContext->NumConnects; Index++ )
 {
  if( ! pContext->pConnects[Index].ConfConn )
  {
   continue;
  }
  if( pContext->pConnects[Index].ConfMod )
  {
   Status = SCR_E_VALUE_MODIFIED;
   SCRlog( "\tSuccessfully modified configuration of %s.",
                pContext->pConnects[Index].FEName );
  }
  else
  {
   SCRlog( "\tSuccessfully checked configuration of %s.",
                pContext->pConnects[Index].FEName );
  }
 }

 if( SCR_E_VALUE_MODIFIED != Status && SCR_E_SUCCESS != Status )
 {
  SCRlog( "\tFailed to configure the FEs. Pausing.\n" );
  PRTEpause();
 }

 /* Check if FEs should be restarted. */
 if(( FE_RESTART_ALWAYS == pContext->RestartFEs ) ||
    ( FE_RESTART_MODIFIED == pContext->RestartFEs &&
      SCR_E_VALUE_MODIFIED == Status ))
 {
  if( SCR_E_SUCCESS != ( Status = StopFEs( pContext )))
  {
   SCRlog( "\tFailed to stop the FEs. Pausing.\n" );
   PRTEpause();
  }
  if( SCR_E_SUCCESS != ( Status = StartFEs( pContext )))
  {
   SCRlog( "\tFailed to start the FEs. Pausing.\n" );
   PRTEpause();
  }
 }
```

```
  else
  {
   /* Clear the potential MODIFIED status. */
   Status = SCR_E_SUCCESS;
  }

  return( Status );
}


int32
ConfigFEsSendMsg( master_data_t *pContext, config_fe_msg_t
*pConfigFEMsg,
                  char *pDataVar )
{
  int                   Count;
  int32                 Index;
  char                  *pTmp;
  int32                 Status;

  Status = SCR_E_SUCCESS;
  if( NULL == (pTmp = PRTEget_network_variable( pDataVar )))
  {
   /* We have an error here. */
   SCRlog( "Getting network variable: %s", pDataVar );
   return( SCRerr( SCR_E_NO_DATA ));
  }

  /* Check for correct number of data values. */
  Count = SCR_count_elements( pTmp );
  if( 1 != Count && pContext->NumFEs != Count )
  {
   SCRlog( "Parsing: %s %s", pDataVar, pTmp );
   return( SCRerr( SCR_E_WRONG_DATA_ITEM_COUNT ));
  }

  /* send  reg_msg_t to each aide */
  pContext->RequestsSent = 0;
  pContext->ReplysReceived = 0;
  pContext->AidesStatus = SCR_E_SUCCESS;
  pContext->MsgTimedOut = TRUE;
  pConfigFEMsg->Type = CONFIG_FE_REQUEST_MSG;
  for( Index = 0; Index < pContext->NumConnects; Index++ )
  {
   if( ! pContext->pConnects[Index].ConfConn )
   {
    continue;
   }
   if( 1 == Count )
   {
    /* Always get the first element.  Use the element routine to   */
    /* eliminate any quoting problems.
               */
    (void)SCR_next_list_element( pTmp, pConfigFEMsg->Data.Data );
   }
   else
   {
    /* Get the next element. */
    pTmp = SCR_next_list_element( pTmp, pConfigFEMsg->Data.Data );
   }
   strcpy( pConfigFEMsg->Data.FEName, pContext-
>pConnects[Index].FEName );
   PRTEmessage_to_user_binary( sizeof( *pConfigFEMsg ), pConfigFEMsg,
                                                pContext-
>pConnects[Index].AideID,
                                                pContext-
>pConnects[Index].AideID );
   pContext->RequestsSent++;
  }

  PRTEdelay( pContext->MsgTimeout );

  if( pContext->MsgTimedOut )
  {
   Status = SCRerr( SCR_E_AIDE_TIMEOUT_CONFIG_FE );
   SCRlog( "\tPausing...\n" );
   PRTEpause( );
  }

  if( SCR_E_SUCCESS != pContext->AidesStatus )
  {
   Status = SCRerr( pContext->AidesStatus );
   Status = SCRerr( SCR_E_AIDES_FAILED_CONFIG );
  }

  return( Status );
}


int32
GetBeInfo( master_data_t *pContext )
{
  char          *List;
  char          *pTmpChar;
  char          ElementString[32];
  int32         BeIndex;

  /* Get the number of FEs we're dealing with, so we can allocate structures.*/
  if( NULL == ( List = PRTEget_network_variable( "BE_NAMES" )))
  {
   return( SCRerr( SCR_E_BE_NAMES ));
  }

  pContext->NumBE = SCR_count_elements(List);

  /* Now we now how many BEs there are, so we can allocate space. */
  if( NULL == ( pContext->pBEs =
                        ( be_t * ) malloc( pContext->NumBE * sizeof( be_t ))))
  {
   return( SCRerr( SCR_E_MALLOC_BE_ARRAY ));
  }

  SCRlog( "\tThe following BEs will be used." );
  pTmpChar = List;
  BeIndex = 0;
  while( pTmpChar = SCR_next_list_element( pTmpChar, ElementString ))
  {
   strcpy( pContext->pBEs[BeIndex].Name, ElementString );
   SCRlog( "\t\t%s", pContext->pBEs[BeIndex].Name );
   BeIndex++;
  }

  return( SCR_E_SUCCESS );
}



void
GetSeed(master_data_t *pContext)
{

  char temp_string[128];
  struct timeval current_time;
  FILE   *SeedFile;
  char   SeedFileName[256];  /* some max file name size. dj. */

  /* Get the seed value. */
  SCR_getnet_long("SEED",SEED_DEFAULT,&pContext->MasterSeed);
  if (0 == pContext->MasterSeed)
  {
   gettimeofday( &current_time, NULL);
   pContext->MasterSeed = pContext->OsPid * current_time.tv_sec;
  }
```

```
 /* Announce seed value to PRTE community. */
 sprintf(temp_string,"%ld",pContext->MasterSeed);
 PRTEset_network_variable("SEED",temp_string);

 /* Open audit file to record seed. */
 sprintf(SeedFileName, "%sm%sseed.v%d", pContext->RunDir,
                 pContext->RunNumStr, pContext->VersionNum);
 if (NULL == (SeedFile = fopen(SeedFileName,"w")))
 {
  SCRlog( "Master: Failed to open seed file." );
 }
 else
 {
  /* Write seed out to audit file in the run directory. */
  fprintf(SeedFile, "%s", temp_string);
  fclose(SeedFile);
 }

 /* Log seed to console and private log file. */
 SCRlog( "\tSeed = %ld\n", pContext->MasterSeed );
}




/*************************************************************
 * Init()                                    *
 *                                           *
 * Inputs:  None                                *
 *                                           *
 * Output:  None                                *
 *                                           *
 * Written by:  Tareef Kawaf  (Feb. 1995)                *
 *                                           *
 * Dependencies: None.                             *
 *                                           *
 * Description:                                 *
 *  Init() will retrieve the value of all                *
 * network variables that would affect the execution of this  *
 * test, as seen by the master.                        *
 *                                           *
 *                                           *
 *************************************************************/


int32
Init( master_data_t *pContext )
{
 int32                       CLast;
 double                      CkptProximAddOffset;
 double                      CkptsPerInterval;
 FILE                        *Fd;
 char                        FileName[PATH_MAX];
 char                        IDString[7];
 int                         Index;
 int32                       RunId;
 int32                       Status;
 struct timeval              TimeStamp;
 char                        TmpStr[256]; /* arbitrary length */


 /* Announce that we're initializing. */
 SCRlog( "Master: Initializing.\n" );

 /* Initialize context to zero. */
 memset( pContext, 0, sizeof( *pContext ));

 /* Set the software version for this build.  NOTE we should confirm this */
 /* is the same version as PRTE!                        */
 pContext->pVersion = VERSION; /* Get System Version from compile time. */
 SCRlog( "\tSoftware Version = %s\n", pContext->pVersion );

 PRTEset_network_variable("TPCC_SCRIPTS_VERSION", pContext-
>pVersion);

 /* Get the operating system process id. */
 pContext->OsPid = getpid();
 SCRlog( "\tOS PID = %d", pContext->OsPid );

 /* Announce the PRTE user id. */
 SCRlog( "\tMaster PRTE User ID = %d\n", User_id );

 /* Make sure we flush stuff as we write it out. */
 Flush_log = TRUE;

 /* /Get the test results directory, and create a run directory under it. */
 SCR_getnet_string( "TEST_RESULTS_DIR",
TEST_RESULTS_DIR_DEFAULT,
                        pContext->OutputDir );

 /* Make the run directory, log directory and announce them to the PRTE */
 /* community.                                    */
 if( -1 == ( RunId = MakeRunDir( pContext->OutputDir, pContext->RunDir )))
 {
  return( SCRerr( SCR_E_MAKING_RUN_DIR ));
 }

 sprintf( TmpStr, "%d", RunId );
 PRTEset_network_variable( "RUN_ID", TmpStr );

 /* We now have enough to build up the log file name and path. This means */
 /* master can now play in the asci world.                */
 strcpy( Log_path, pContext->RunDir );
 strcpy( Log_name, "master.log" );

 /* Master doesn't connect to any SUTs, so all we only need to enable  */
 /* PRTEto_log calls.
                        */
 Logging_type = ( SCRIPT_SPECIFIC_LOGGING );

 SCRlog( "\tLogFile = %s%s\n", Log_path, Log_name );

 /* Register binary message handler with PRTE. */
 PRTEcatch_message_binary( BinMsgHandler, pContext );

 /* Master is now ready to play in the binary message world, so go ahead and */
 /* announce his user id to the PRTE community.           */
 sprintf( IDString, "%d", User_id );
 PRTEset_network_variable( "MASTER_ID", IDString );

 /* Get the test run number. */
 SCR_getnet_string( "RUN_NUMBER", RUN_NUMBER_DEFAULT,
                        pContext->RunNumStr );
 SCRlog( "\tRunNumber = %s.", pContext->RunNumStr );

 /* Get the test version number. */
 SCR_getnet_int( "VERSION_NUMBER", VERSION_NUMBER_DEFAULT,
                        &pContext->VersionNum );
 SCRlog( "\tVersionNumber = %d\n", pContext->VersionNum );

 /* Get timing lengths. */
 SCR_getnet_double( "WARMUP_TIME", WARMUP_TIME_DEFAULT,
                        &pContext->WarmUpTime );
 if( 0 < pContext->WarmUpTime )
 {
  SCRlog( "\tWarmup = %7.2f", pContext->WarmUpTime );
 }

 SCR_getnet_double( "STEADY_STATE_TIME",
STEADY_STATE_TIME_DEFAULT,
                        &pContext->SteadyStateTime );
 if( 0 < pContext->SteadyStateTime )
 {
  SCRlog( "\tSteady State Time = %7.2f", pContext->SteadyStateTime );
```

```
  }

  SCR_getnet_double( "MEASUREMENT_INTERVAL",
MEASUREMENT_INTERVAL_DEFAULT,
                              &pContext->MeasurementInterval );
  if( 0 < pContext->MeasurementInterval )
  {
   SCRlog( "\tMeasurement Interval= %7.2f", pContext->MeasurementInterval );
  }

  SCR_getnet_double( "COOLDOWN_TIME",
COOLDOWN_TIME_DEFAULT,
                              &pContext->CoolDownTime );
  if( 0 < pContext->CoolDownTime )
  {
   SCRlog( "\tCooldown = %7.2f\n", pContext->CoolDownTime );
  }

  /* Get the message timeout value. */
  SCR_getnet_double( "MSG_TIMEOUT", MSG_TIMEOUT_DEFAULT,
                               &( pContext->MsgTimeout ));
  SCRlog( "\tMessage Timeout = %5.2f\n", pContext->MsgTimeout );

  /* Set the seed. Requires RunDir, RunNumStr, RunVer. */
  GetSeed( pContext );

  /* Check out the value for C_LAST.  Users are the ones who need this, */
  /* but we don't want all of them printing it's value out, so master                */
  /* does it. Also, master logs it to a file in the run directory.      */
  SCR_getnet_int( "C_LAST", C_LAST_DEFAULT, &CLast );
  SCRlog( "\tC_LAST = %d\n", CLast );
  sprintf( FileName, "%srte%sclast.v%d", pContext->RunDir,
                pContext->RunNumStr, pContext->VersionNum );
  if( NULL == (Fd = fopen( FileName, "w" )))
  {
   ( void ) SCRerr( SCR_E_OPEN_C_LAST_FILE );
  }
  else
  {
   gettimeofday( &TimeStamp, NULL );
   fprintf( Fd, "Date: %s\n\n", ctime( &TimeStamp.tv_sec ));
   fprintf( Fd, "C_LAST constant = %d.\n", CLast );
   fclose( Fd );
  }

  /* Get RTE info */
  Status = GetConnectInfo( pContext->RunMode, &pContext->TpccUsers,
                                        &pContext->NumFEs, &pContext-
>AdminUsers,
                                        &pContext->NumConnects, &pContext-
>pConnects );
  if( SCR_E_SUCCESS != Status )
  {
   SCRlog( "Error ( %d ) getting CONNECT information.", Status );
   return( Status );
  }

  /* Get the run mode. */
  SCR_getnet_int( "RUN_MODE", RUN_MODE_DEFAULT,
                              &pContext->RunMode );
  switch( pContext->RunMode )
  {
   case END_TO_END_MODE:
    SCRlog( "\tRunning in end-to-end mode.\n" );
    break;
   case BACKEND_MODE:
    SCRlog( "\tRunning in rte based backend run (C') mode.\n" );
    break;
   case CONFIG_MODE:
    SCRlog( "\tRunning in config mode.\n" );
    break;
   default:
    SCRlog( "RunMode = %d", pContext->RunMode );
    return( SCRerr( SCR_E_INVALID_RUN_MODE ));
    break;
  }

  SCRlog( "\tConnects." );
#define CONNECT_TABLE_HEADER_FORMAT "\t  %-12s %-12s %-5s %-5s
%5s %s"
#define CONNECT_TABLE_ENTRY_FORMAT  "\t  %-12s %-12s %-5s %-5s
%5d %s"
  SCRlog( CONNECT_TABLE_HEADER_FORMAT,
                "RTE", "FE", "Conf.", "Admin", "Users", "Script");
  for( Index = 0; Index < pContext->NumConnects; Index++ )
  {
   SCRlog( CONNECT_TABLE_ENTRY_FORMAT,
                (pContext->pConnects)[Index].RTEName,
                (pContext->pConnects)[Index].FEName,
                (pContext->pConnects)[Index].ConfConn ? "  T" : "  F",
                (pContext->pConnects)[Index].AdminConn ? "  T" : "  F",
                (pContext->pConnects)[Index].Ucnt,
                (pContext->pConnects)[Index].Script );
  }
  SCRlog( "\tTotal TPC-C Users = %d.\n", pContext->TpccUsers );
  SCRlog( "\tTotal FE Count = %d.\n", pContext->NumFEs );
  SCRlog( "\tTotal Admin Users = %d.\n", pContext->AdminUsers );

  /* How to handle FEs after reconfig. */
  SCR_getnet_bool( "FE_RESTART_VIA_REBOOT",
FE_RESTART_VIA_REBOOT_DEFAULT,
                              &pContext->FERestartViaReboot );
  SCR_getnet_int( "FE_RESTART_MODE",
FE_RESTART_MODE_DEFAULT,
                              &pContext->RestartFEs );

  /* Get support user info. */
  SCR_getnet_string( "ADMIN_SCRIPT_NAME",
ADMIN_SCRIPT_NAME_DEFAULT,
                              pContext->AideScriptName );
  SCRlog( "\tAide Script Name = %s.", pContext->AideScriptName );

  SCR_getnet_string( "REDUCER_SCRIPT_NAME",
REDUCER_SCRIPT_NAME_DEFAULT,
                              pContext->ReducerScriptName );
  SCRlog( "\tReducer Script Name = %s.", pContext->ReducerScriptName );
  SCR_getnet_string( "REDUCER_SCRIPT_NODE",
REDUCER_SCRIPT_NODE_DEFAULT,
                              pContext->ReducerScriptNode );
  SCRlog( "\tReducer Script Node = %s.", pContext->ReducerScriptNode );

  /* Get the user dll name. We don't print out the name of the dll here */
  /* because the reducer will print out all the dll info.                */
  SCR_getnet_string( "CGI_SCRIPT_NAME",
CGI_SCRIPT_NAME_DEFAULT,
                              pContext->CgiScriptName );

  if( 0 < pContext->AdminUsers )
  {
   /* Get the checkpoint settings. */
   SCR_getnet_int( "CHECKPOINT_INTERVAL",
CHECKPOINT_INTERVAL_DEFAULT,
                              &pContext->CheckpointInterval );

   SCRlog( "\tCheckpoint Interval = %d", pContext->CheckpointInterval );


   if( 0 < pContext->CheckpointInterval )
   {
    SCR_getnet_double( "CKPT_PROXIMITY_ADDITIONAL_OFFSET",

CKPT_PROXIMITY_ADDITIONAL_OFFSET_DEFAULT,
                                        &CkptProximAddOffset );
```

```
    /* Verify that the checkpoints will be legal with regard to the */
    /* benchmark specification (v3.3.2 Sec. 5.5.2.2).               */

    /* Checkpoint interval must be less than or equal to 1800 seconds. */
    if( pContext->CheckpointInterval > 1800 )
    {
            return( SCRerr( SCR_E_CKPT_INT_TOO_LONG ));
    }

    /* Checkpoint interval must be less than or equal to measurement int. */
    if( pContext->CheckpointInterval > pContext->MeasurementInterval )
    {
            return( SCRerr(
SCR_E_CKPT_INT_GREATER_THAN_MEASUREMENT_INT ));
    }

    /* If checkpoint is less than measurement interval, measurement */
    /* interval must be integral multiple of checkpoint interval.   */
    if( (pContext->CheckpointInterval < pContext->MeasurementInterval) &&
            ( (int32) pContext->MeasurementInterval %
              pContext->CheckpointInterval != 0 ))
    {
            return( SCRerr(
SCR_E_MEASUREMENT_NOT_INTEGRAL_MULTIPLE ));
    }

    /* If there are fewer than 4 checkpoints in the measurement interval */
    /* then guard zones must be observed.                                 */
    CkptsPerInterval = ceil( pContext->MeasurementInterval /
                                        pContext->CheckpointInterval );
    if( 4 > CkptsPerInterval )
    {
            pContext->Proximity = (pContext->MeasurementInterval *
                                        (2 / (CkptsPerInterval+3))) / 2;
    }

    /* Now that we know the requested values are legal by the spec. make */
    /* sure the values are legal for this implementation.  Specifically, */
    /* make sure the warm up period is long enough to support the       */
    /* requested checkpoint interval.                                   */
    if( 0 >= (pContext->CkptStartOffset = pContext->WarmUpTime +
                        pContext->Proximity + CkptProximAddOffset -
                        pContext->CheckpointInterval))
    {
            return( SCRerr( SCR_E_WARMUP_TOO_SHORT ));
    }

    /* Since we've made it through all our checks, we can do checkpoints. */
    pContext->DoCheckpoints = TRUE;
    if( (0 < pContext->Proximity) && (0 < CkptProximAddOffset) )
    {
            SCRlog( "\tProximity = %7.2f",
                        pContext->Proximity );
            SCRlog( "\tAdditional Proximity Offset = %7.2f",
                        CkptProximAddOffset );
            SCRlog( "\tTotal Checkpoint Offset = %7.2f\n",
                        pContext->Proximity + CkptProximAddOffset );
    }
    else if( 0 < pContext->Proximity )
    {
            SCRlog( "\tProximity = %7.2f\n",
                        pContext->Proximity );
    }
    else if( 0 < CkptProximAddOffset )
    {
            SCRlog( "\tCheckpoint Offset = %7.2f\n",
                        CkptProximAddOffset );
    }
   }
   else
   {
    SCRlog( "Master: Checkpoints will not be done." );
   }
  }

  /* If we're not going all the way to a real database, then there is    */
  /* no point in doing any of this.
                */
  if( 0 < pContext->AdminUsers )
  {
   SCRlog( "\tAudit utilities will be run." );

   /* Get all the BE info we're going to need. */
   if( SCR_E_SUCCESS != ( Status = GetBeInfo( pContext )))
   {
    ( void ) SCRerr( SCR_E_GET_BE_INFO );
    return( Status );
   }

   Status = UTILGetAuditFunctionNetworkVariables( &pContext->BeTasksData
);
   if( SCR_E_SUCCESS != Status )
   {
    SCRlog( "Error getting audit function net vars." );
    return( Status );
   }
   else
   {
    SCRlog( "\t\tDatabase type is %s", pContext->BeTasksData.DbTypeStr );
   }
  }

  return( SCR_E_SUCCESS );
} /* End of Init */



int32
InitAides( master_data_t *pContext )
{
  int32                         AideID;
  int32                         Index;
  int32                         Status;

  Status = SCR_E_SUCCESS;

  if( 0 < pContext->NumFEs || 0 < pContext->AdminUsers )
  {
   SCRlog( "\tAides being created and initialized.\n\n" );

   pContext->RequestsSent = 0;
   pContext->ReplysReceived = 0;
   pContext->AidesStatus = SCR_E_SUCCESS;
   pContext->MsgTimedOut = FALSE;

   for( Index = 0; Index < pContext->NumConnects; Index++ )
   {
    if( ! pContext->pConnects[Index].ConfConn &&
                ! pContext->pConnects[Index].AdminConn )
    {
            pContext->pConnects[Index].AideID = 0;
            continue;
    }
    AideID = PRTEexecute_script( pContext->AideScriptName,
                                                pContext-
>pConnects[Index].RTEName,
                                                1, pContext-
>pConnects[Index].FEName, 0.0 );
    if( -1 == AideID )
    {
            Status = SCRerr( SCR_E_AIDE_CREATE_FAILED );
            SCRlog( "\tPausing.\n" );
            PRTEpause();
            return( Status );
```

```
    }

    PRTEstart_users( AideID, AideID );

    /* Keep track of the aide's ID */
    pContext->pConnects[Index].AideID = AideID;
    pContext->RequestsSent++;
   }

   pContext->MsgTimedOut = TRUE;
   PRTEdelay( pContext->MsgTimeout );
   SCRlog( "Master: Resuming.\n" );

   if( pContext->MsgTimedOut )
   {
    /* We timed out waiting to hear from the aides. */
    Status = SCRerr( SCR_E_AIDE_INIT_TIMEOUT );
    SCRlog( "\tPausing indefinitely....\n\n" );
    PRTEpause();
   }

   if( SCR_E_SUCCESS != pContext->AidesStatus )
   {
    Status = SCRerr( pContext->AidesStatus );
    SCRlog( "\tNot all aides initialized correctly. Pausing.\n" );
    PRTEpause();
   }
   else
   {
    SCRlog( "\tAides successfully initialized.\n" );
   }
  }

  return( Status );
}


/*****************************************************************
***************/
/*                                                               */
/* Name: InitFEs                                                 */
/*                                                               */
/* Purpose: This function causes the application code to be loaded in the FE. */
/*                                                               */
/* Inputs:                                                       */
/*                                                               */
/* Outputs:                                                      */
/*                                                               */
/* Function Value:                                               */
/*                                                               */
/* Notes:                                                        */
/*                                                               */
/*****************************************************************
***************/
int32
InitFEs( master_data_t *pContext )
{
  int32                                 Index;
  load_fe_msg_t                         LoadFEMsg;
  int32                                 Status;

  /* Check if we have any FEs to start. */
  if( 0 == pContext->NumFEs )
  {
   return( SCR_E_SUCCESS );
  }

  /* Get the timeout value to use when loading the user dll. */
  SCR_getnet_int( "LOAD_FE_TIMEOUT",
LOAD_FE_TIMEOUT_DEFAULT,
                  &LoadFEMsg.Data.Timeout );
  SCRlog( "\tFE(s) being loaded.  FE Load Timeout = %d\n",
                  LoadFEMsg.Data.Timeout );

  LoadFEMsg.Type = LOAD_FE_REQUEST_MSG;

  pContext->RequestsSent = 0;
  pContext->ReplysReceived = 0;
  pContext->AidesStatus = SCR_E_SUCCESS;
  pContext->MsgTimedOut = TRUE;

  for( Index = 0; Index < pContext->NumConnects; Index++)
  {
   if( ! pContext->pConnects[Index].ConfConn )
   {
    continue;
   }

   strcpy( LoadFEMsg.Data.FEName, pContext->pConnects[Index].FEName );
#pragma message ("FIXME: the cgi script (dll) name is possibly different.  This
code should parse a comma separated list?  Not here, but where the
CgiScriptName is originally loaded.")
   strcpy( LoadFEMsg.Data.CgiScriptName, pContext->CgiScriptName );

   PRTEmessage_to_user_binary( sizeof( LoadFEMsg ), &LoadFEMsg,
                                                    pContext-
>pConnects[Index].AideID,
                                                    pContext-
>pConnects[Index].AideID );
   pContext->RequestsSent++;
  }

  PRTEdelay( LoadFEMsg.Data.Timeout );

  Status = SCR_E_SUCCESS;
  if( pContext->MsgTimedOut )
  {
   /* We timed out waiting to hear from the aide(s). */
   Status = SCRerr( SCR_E_LOAD_FE_TIMEOUT );
  }
  else if( SCR_E_SUCCESS != pContext->AidesStatus )
  {
   Status = SCRerr( pContext->AidesStatus );
   Status = SCRerr( SCR_E_LOAD_FE_FAILURE );
  }
  else
  {
   SCRlog( "\tFE(s) successfully loaded.\n" );
  }

  if( SCR_E_SUCCESS != Status )
  {
   SCRlog( "\tFailed to load FEs' application code. Pausing.\n" );
   PRTEpause();
  }

  return( Status );
}


int32
InitReducer( master_data_t *pContext )
{
  int32                                 Status;

  Status = SCR_E_SUCCESS;

  /* Tell reducer to initialize. We'll resume ourselves from in the    */
  /* binary message handler once we hear back from reducer.            */
  SCRlog( "\tReducer being created.\n\n" );

  pContext->ReducerStatus = SCR_E_SUCCESS;
  pContext->MsgTimedOut = FALSE;
```

```
 pContext->ReducerID = PRTEexecute_script( pContext->ReducerScriptName,
                                                        pContext-
>ReducerScriptNode,
                                                        1, "", 0.0 );
 if( -1 == pContext->ReducerID )
 {
  Status = SCRerr( SCR_E_REDUCER_CREATE_FAILED );
  SCRlog( "\tPausing.\n" );
  PRTEpause();
 }
 else
 {
  SCRlog( "\tReducer being told to initialize.\n\n" );
  PRTEstart_users( pContext->ReducerID, pContext->ReducerID );

  pContext->MsgTimedOut = TRUE;
  PRTEdelay( pContext->MsgTimeout );
  SCRlog( "Master: Resuming.\n" );
 }

 if( pContext->MsgTimedOut )
 {
  /* We timed out waiting to hear from the reducer. */
  Status = SCRerr( SCR_E_REDUCER_INIT_TIMEOUT );
  SCRlog( "\tPausing.\n" );
  PRTEpause();
 }

 if( SCR_E_SUCCESS != pContext->ReducerStatus )
 {
  SCRlog( "\tReducer failed to initialize correctly. Pausing.\n" );
  PRTEpause();
 }
 else
 {
  SCRlog( "\tReducer successfully initialized.\n" );
 }

 return( Status );
}



/*****************************************************************
***************/
/*                                                               */
/* Name: MakeRunDir                                              */
/*                                                               */
/* Purpose: This function creates the run results directory.     */
/*                                                               */
/* Inputs:                                                       */
/*        DirName: Pointer to the parent directory where there run directory */
/*                 should be created.                            */
/*                                                               */
/* Outputs: Returns the run-dir number, or -1, there was an error */
/*                                                               */
/*                                                               */
/* Function Value: a char * to a memory location where the name of the newly
*/
/*                 created directory is (i.e. a null terminated string).  */
/*                                                               */
/* Notes:                                                        */
/*                                                               */
/*****************************************************************
***************/



int32
MakeRunDir(char *DirName, char *RunDir)
{
#ifdef _WIN32
 HANDLE                  find_handle = INVALID_HANDLE_VALUE;
 WIN32_FIND_DATA  find_data;
#else
 DIR          *pDir;
 struct dirent *Entry;
#endif
 char         *c;
 char                    FormatStr[MAX_RUN_DIR_NAME_LEN + 3];   /* +
3 is for %0 d/. */
 int          MaxDir=0;
 int          NewDir=0;
 int          Len;
 mode_t       Mode = 0770;

 /* Make sure we got something for input. */
 if( NULL == DirName )
  return -1;

 /* Now open the directory, read all entries, and find the current max. */
 /* In the WIN32 version, things are based on a group of files, in the  */
 /* Unix version, things are based on a directory.                      */
#ifdef _WIN32
 strcpy(RunDir, DirName);
 strcat(RunDir,"/*");
 find_handle = FindFirstFile(( LPTSTR )RunDir, &find_data );
 if( INVALID_HANDLE_VALUE == find_handle )
  return -1;

 do
 {
  c = find_data.cFileName;
  while( (*c != '\0') && ('0' <= *c) && (*c <= '9') )
  {
   c++;
  }

  if ( '\0' == *c)
  {
   MaxDir = maximum(MaxDir, atoi(find_data.cFileName));
  }
 } while( FindNextFile( find_handle, &find_data ));

 (void)FindClose( find_handle );
#else
 if (NULL == (pDir = opendir(DirName)))
 {
  return -1;
 }

 /* Check each entry in the directory. */
 for (Entry = readdir(pDir); Entry != NULL; Entry = readdir(pDir))
 {
  /* Make sure the name is all numbers. */
  c = Entry->d_name;
  while( (c != '\0') && ('0' <= *c) && (*c <= '9') )
  {
   c++;
  }

  if ( '\0' == *c)
  {
   MaxDir = maximum(MaxDir, atoi(Entry->d_name));
  }
 }

 closedir(pDir);
#endif

 /* The next dir will be "1 more" than the max found. */
 NewDir = MaxDir + 1;

 /* Move the parent directory name into the run directory. */
```

```
 strcpy(RunDir,DirName);

 /* Make sure we end with a directory seperator. */
 Len = strlen(RunDir);
 if ('/' != RunDir[Len])
 {
  RunDir[Len++] = '/';
 }

 /* NOTE: The value of 3 is hardcoded below.  This allows up to 999 run */
 /* directories which should be reasonable enough for anyone. Also note */
 /* that we need to bump the value of Len, so that it continues to      */
 /* point to the end of the full name.                                  */
 sprintf(FormatStr,"%%0%dd/", MAX_RUN_DIR_NAME_LEN);
 sprintf(&RunDir[Len], FormatStr, NewDir);
 Len += 4;   /* Size of field above plus "/" */

 /* Now actually make the run directory. */
 if ( -1 == MKDIR(RunDir, Mode) )
 {
  return -1;
 }
 SCRlog("\tRun Dir = %s", RunDir);
 PRTEset_network_variable("RUN_DIR", RunDir);

 /* Now temporarily add the log dir to the run dir, make the log dir, and */
 /* then remove the log portion of the path so we're just left with run   */
 /* dir again.                                                            */
 strcat(RunDir, LOG_DIR);
 if (-1 == MKDIR(RunDir, Mode))
 {
  return -1;
 }
 PRTEset_network_variable("LOG_DIR", RunDir);
 RunDir[Len] = '\0';

 return NewDir;
}


/*****************************************************************
***************/
/*                                                               */
/* Name: StartFEs                                                */
/*                                                               */
/* Purpose: This function causes the FEs to be started.          */
/*                                                               */
/* Inputs:                                                       */
/*                                                               */
/* Outputs:                                                      */
/*                                                               */
/* Function Value:                                               */
/*                                                               */
/* Notes:                                                        */
/*                                                               */
/*****************************************************************
***************/
int32
StartFEs( master_data_t *pContext )
{
 int32                  Index;
 start_fe_msg_t         StartFEMsg;
 start_fe_msg_t         *pStartFEMsg = &StartFEMsg;
 double                 StartTimeout;
 int32                  Status;

 Status = SCR_E_SUCCESS;
 if( 0 == pContext->NumFEs )
 {
  return( SCR_E_SUCCESS );
 }

#pragma message ("FIXME: Should there be a separate start timeout as network
variable?")
 StartTimeout = pContext->MsgTimeout;

 pContext->RequestsSent = 0;
 pContext->ReplysReceived = 0;
 pContext->AidesStatus = SCR_E_SUCCESS;
 pContext->MsgTimedOut = TRUE;
 pStartFEMsg->Type = START_FE_REQUEST_MSG;
 pStartFEMsg->Data.Timeout = StartTimeout;
 for( Index = 0; Index < pContext->NumConnects; Index++ )
 {
  if( ! pContext->pConnects[Index].ConfConn )
  {
   continue;
  }
  else if( FE_RESTART_ALWAYS != pContext->RestartFEs &&
           ! pContext->pConnects[Index].ConfMod )
  {
   continue;
  }
  strcpy( pStartFEMsg->Data.FEName, pContext->pConnects[Index].FEName
);
  PRTEmessage_to_user_binary( sizeof( *pStartFEMsg ), pStartFEMsg,
                              pContext-
>pConnects[Index].AideID,
                              pContext-
>pConnects[Index].AideID );
  pContext->RequestsSent++;
  SCRlog( "\tStarting %s.", pContext->pConnects[Index].FEName );
 }

 /* Now wait for replies. */
 if( 0 == pContext->RequestsSent )
 {
  return( SCR_E_SUCCESS );
 }

 /* Wait as long as the Aides do to start FEs plus the msg timeout. */
 PRTEdelay( StartTimeout + pContext->MsgTimeout );

 if( pContext->MsgTimedOut )
 {
  Status = SCRerr( SCR_E_AIDE_TIMEOUT_START_FE );
  SCRlog( "Pausing...\n" );
  PRTEpause( );
 }

 if( SCR_E_SUCCESS != pContext->AidesStatus )
 {
  Status = SCRerr( pContext->AidesStatus );
  Status = SCRerr( SCR_E_AIDES_FAILED_START );
 }
 else
 {
  for( Index = 0; Index < pContext->NumConnects; Index++ )
  {
   if( ! pContext->pConnects[Index].ConfConn )
   {
            continue;
   }
   else if( FE_RESTART_ALWAYS != pContext->RestartFEs &&
            ! pContext->pConnects[Index].ConfMod )
   {
            continue;
   }
   SCRlog( "\tSuccessfully started %s.",
            pContext->pConnects[Index].FEName );
  }
 }

 return( Status );
```

```
}



int32
StopAides( master_data_t *pContext )
{
  generic_msg_t                 GenericMsg;
  int32                         Index;
  int32                         Status;

  Status = SCR_E_SUCCESS;

  if( 0 < pContext->NumFEs || 0 < pContext->AdminUsers )
  {
    SCRlog( "\tAides being told to exit." );
    pContext->RequestsSent = 0;
    GenericMsg.Type = AIDE_EXIT_REQUEST_MSG;
    pContext->ReplysReceived = 0;
    pContext->AidesStatus = SCR_E_SUCCESS;
    pContext->MsgTimedOut = TRUE;

    for( Index = 0; Index < pContext->NumConnects; Index++ )
    {
      if( ! pContext->pConnects[Index].ConfConn )
      {
                continue;
      }
      PRTEmessage_to_user_binary( sizeof( GenericMsg ), &GenericMsg,
                                                        pContext-
>pConnects[Index].AideID,
                                                        pContext-
>pConnects[Index].AideID );
      pContext->RequestsSent++;
    }

    PRTEdelay( pContext->MsgTimeout );

    if( pContext->MsgTimedOut )
    {
      Status = SCRerr( SCR_E_AIDE_EXIT_TIMEOUT );
    }

    if( SCR_E_SUCCESS != pContext->AidesStatus )
    {
      Status = SCRerr( pContext->AidesStatus );
      SCRlog( "Not all aides exited successfully." );
    }
    else
    {
      SCRlog( "\t%d Aides exited successfully.\n", pContext->ReplysReceived );
    }
  }

  return( Status );
}


/*****************************************************************
***************/
/*                                                               */
/* Name: StopFEs                                                 */
/*                                                               */
/* Purpose: This function causes the FEs to be stopped.          */
/*                                                               */
/* Inputs:                                                       */
/*                                                               */
/* Outputs:                                                      */
/*                                                               */
/* Function Value:                                               */
/*                                                               */
/* Notes:                                                        */
/*                                                               */
/*****************************************************************
***************/
int32
StopFEs( master_data_t *pContext )
{
  int32                         Index;
  stop_fe_msg_t                 StopFEMsg;
  stop_fe_msg_t                 *pStopFEMsg = &StopFEMsg;
  double                StopTimeout;
  int32                         Status;

  Status = SCR_E_SUCCESS;
  if( 0 == pContext->NumFEs )
  {
    return( SCR_E_SUCCESS );
  }

#pragma message ("FIXME: Should there be a separate stop timeout as network
variable?")
  StopTimeout = pContext->MsgTimeout;

  pContext->RequestsSent = 0;
  pContext->ReplysReceived = 0;
  pContext->AidesStatus = SCR_E_SUCCESS;
  pContext->MsgTimedOut = TRUE;
  pStopFEMsg->Type = STOP_FE_REQUEST_MSG;
  pStopFEMsg->Data.Timeout = StopTimeout;
  pStopFEMsg->Data.Reboot = pContext->FERestartViaReboot;
  for( Index = 0; Index < pContext->NumConnects; Index++ )
  {
    if( ! pContext->pConnects[Index].ConfConn )
    {
      continue;
    }
    else if( FE_RESTART_ALWAYS != pContext->RestartFEs &&
                  ! pContext->pConnects[Index].ConfMod )
    {
      continue;
    }
    strcpy( pStopFEMsg->Data.FEName, pContext->pConnects[Index].FEName );
    PRTEmessage_to_user_binary( sizeof( *pStopFEMsg ), pStopFEMsg,
                                                        pContext-
>pConnects[Index].AideID,
                                                        pContext-
>pConnects[Index].AideID );
    pContext->RequestsSent++;
    SCRlog( "\tStoping %s.", pContext->pConnects[Index].FEName );
  }

  /* Now wait for replies. */
  if( 0 == pContext->RequestsSent )
  {
    return( SCR_E_SUCCESS );
  }

  /* Wait as long as the Aides do to stop FEs plus the msg timeout. */
  PRTEdelay( StopTimeout + pContext->MsgTimeout );

  if( pContext->MsgTimedOut )
  {
    Status = SCRerr( SCR_E_AIDE_TIMEOUT_STOP_FE );
    SCRlog( "Pausing...\n" );
    PRTEpause( );
  }

  if( SCR_E_SUCCESS != pContext->AidesStatus )
  {
    Status = SCRerr( pContext->AidesStatus );
    Status = SCRerr( SCR_E_AIDES_FAILED_STOP );
  }
  else
```

```
 {
  for( Index = 0; Index < pContext->NumConnects; Index++ )
  {
   if( ! pContext->pConnects[Index].ConfConn )
   {
            continue;
   }
   else if( FE_RESTART_ALWAYS != pContext->RestartFEs &&
             ! pContext->pConnects[Index].ConfMod )
   {
            continue;
   }
   SCRlog( "\tSuccessfully stopped %s.",
             pContext->pConnects[Index].FEName );
  }
 }

 return( Status );
}


int32
StopReducer( master_data_t *pContext )
{
 /* Nothing to be done here. */
 return( SCR_E_SUCCESS );
}



void
TellAidesTo( master_data_t *pContext, int32 Task, int32 State )
{
 int32 BeIndex;
 int32 Index;
 generic_dotask_msg_t SendMsg;


 /* Check to see if any aides are configured */
 if (pContext->AdminUsers == 0)
  return;


 SCRlog( "\t%d aides being told to %s.", pContext->AdminUsers,
MsgNames[Task]);
 SendMsg.Type = Task;
 SendMsg.Data.State = State;

 pContext->RequestsSent = 0;
 pContext->ReplysReceived = 0;
 pContext->AidesStatus = SCR_E_SUCCESS;
 pContext->MsgTimedOut = TRUE;

 for( Index = 0, BeIndex = 0; Index < pContext->NumConnects; Index++ )
 {
  if( ! pContext->pConnects[Index].AdminConn )
  {
   continue;
  }
  SendMsg.Data.HostId = BeIndex + 1;
  strcpy( SendMsg.Data.SutName, pContext->pBEs[BeIndex].Name );
  PRTEmessage_to_user_binary( sizeof( SendMsg ), &SendMsg,
                                                pContext-
>pConnects[Index].AideID,
                                                pContext-
>pConnects[Index].AideID );
   pContext->RequestsSent++;
   BeIndex++;
 }

 PRTEdelay( pContext->MsgTimeout );

 if( pContext->MsgTimedOut )
 {
  SCRlog( "\tTimed out waiting for %d aides to %s.",
            ( pContext->RequestsSent - pContext->ReplysReceived ),
            MsgNames[Task] );
  SCRlog( "\tPausing.\n\n" );
  PRTEpause();
 }
 else if( SCR_E_SUCCESS != pContext->AidesStatus )
 {
  ( void )SCRerr( pContext->AidesStatus );
  SCRlog( "\tAides failed to %s.", MsgNames[Task] );
  SCRlog( "\tPausing.\n\n" );
  PRTEpause();
 }
 else
 {
  SCRlog( "\t%d aides successfully did %s.\n", pContext->AdminUsers,
            MsgNames[Task]);
 }

 return;
}


int32
TestPeriod( master_data_t *pContext )
{
 checkpoint_connect_msg_t       CheckpointConnect;
 checkpoint_run_msg_t           CheckpointRun;
 checkpoint_disconnect_msg_t    CheckpointDisconnect;
 generic_msg_t                          GenericMsg;
 int32                                  Index;
 measurement_info_msg_t         Measurement;
 double                         TimeStamp;
 double                         TimeStamp2;
 double                         DelayTime;
 double                         StartTime;
 int32                                  Status;


 SCRlog( "\n\n\n\t\t\t\t\t..START OF TEST..\n\n" );

 /* Tell reducer to initialize. */
 Status = InitReducer( pContext );

 /* Tell any aides to initialize. */
 Status = InitAides( pContext );

 /* Configure the FEs */
 Status = ConfigFEs( pContext );

 /* Make sure the user application is loaded on all FEs. */
 Status = InitFEs( pContext );

 /* If Checkpoints requested then do Back-end Checkpoint stuff */
 if( pContext->DoCheckpoints )
 {
  TellAidesTo( pContext, BE_CKPTDATA_REQUEST_MSG, BEFORE );
 }

 /* For Oracle, do switch logfile.  If stats requested, do stats startup
   script, too */
 if( pContext->BeTasksData.DbType == DB_TYPE_ORACLE )
 {
  TellAidesTo( pContext, ORA_SWITCHLOG_REQUEST_MSG, BEFORE );

  if( '\0' != pContext->BeTasksData.OraStatScriptPath[0] )
  {
   TellAidesTo( pContext, ORA_DOSTATS_REQUEST_MSG, BEFORE );
  }
 }
```

```
 /* If GetAllAuditFiles specified -- get the log size info */
 if( pContext->BeTasksData.GetAllAuditFiles )
 {
  TellAidesTo( pContext, INIT_AUDIT_TABLE_REQUEST_MSG, BEFORE
);
  TellAidesTo( pContext, GET_LOGSIZE_REQUEST_MSG, BEFORE );
 }

 /* If custom script specified -- go do it */
 if( '\0' != pContext->BeTasksData.CustomBeforeTestScript[0] )
 {
  TellAidesTo( pContext, DO_CUSTOM_SCRIPT_REQUEST_MSG, BEFORE
);
 }

 /* Tell the reducer to log in users. */
 SCRlog("\tPausing while users log in.\n\n");
 pContext->ReducerStatus = SCR_E_SUCCESS;
 PRTEresume_users( pContext->ReducerID, pContext->ReducerID );
 PRTEpause();


 SCRlog("Master: Resuming.\n");

 if( SCR_E_SUCCESS != pContext->ReducerStatus )
 {
  SCRlog( "\tUsers failed to log in successfully. Pausing.\n" );
  PRTEpause();
 }
 else
 {
  SCRlog( "\tAll users logged in successfully.\n" );
 }

 /* If we're doing checkpoints, have the aides init checkpoint stuff. */
 if( pContext->DoCheckpoints )
 {
  SCRlog( "\t%d Aides initializing checkpoint sub-systems.",
                pContext->AdminUsers );
  CheckpointConnect.Type = CHECKPOINT_CONNECT_REQUEST_MSG;
  strcpy( CheckpointConnect.Data.Dll, pContext->CgiScriptName );
  pContext->RequestsSent = 0;
  pContext->ReplysReceived = 0;
  pContext->AidesStatus = SCR_E_SUCCESS;
  pContext->MsgTimedOut = TRUE;

  for( Index = 0; Index < pContext->NumConnects; Index++ )
  {
   if( ! pContext->pConnects[Index].AdminConn )
   {
            continue;
   }
   strcpy( CheckpointConnect.Data.FEName, pContext-
>pConnects[Index].FEName);
   PRTEmessage_to_user_binary( sizeof( CheckpointConnect ),
                                                &CheckpointConnect,
                                                pContext-
>pConnects[Index].AideID,
                                                pContext-
>pConnects[Index].AideID );
   pContext->RequestsSent++;
  }

  PRTEdelay( pContext->MsgTimeout );

  if( pContext->MsgTimedOut )
  {
   ( void ) SCRerr( SCR_E_AIDE_CKPT_INIT_TIMEOUT );
   SCRlog( "Pausing indefinitely...\n\n" );
   PRTEpause();
  }

  if( SCR_E_SUCCESS != pContext->AidesStatus )
  {
   Status = SCRerr( pContext->AidesStatus );
   SCRlog( "Not all aides did checkpoint initialization successfully." );
   SCRlog( "Pausing...\n\n" );
   PRTEpause();
  }

  SCRlog( "\t%d Aides successfully initialized checkpoint sub-systems.\n",
            pContext->ReplysReceived );
 }

 /* Tell the reducer to resume users for transactions. */
 SCRlog("\tPausing while users start doing transactions.\n\n");
 pContext->ReducerStatus = SCR_E_SUCCESS;
 PRTEresume_users( pContext->ReducerID, pContext->ReducerID );
 PRTEpause();


 SCRlog("Master: Resuming.\n");

 if( SCR_E_SUCCESS != pContext->ReducerStatus )
 {
  SCRlog( "\tUsers failed to resume successfully. Pausing.\n" );
  PRTEpause();
 }
 else
 {
  SCRlog( "\tAll users starting transactions successfully.\n" );
 }

 /* Warmup */
 TimeStamp = PRTEtimer_begin( "x" );
 PRTEtimer_cancel();

 SCRlog( "\n\n\n\n\t\t\t\tStart of Warmup\n\n");

 /* If we're running checkpoints, have the aides start doing them. */
 if( pContext->DoCheckpoints )
 {
  SCRlog( "\t%d Aides starting checkpoint loop.",
            pContext->AdminUsers );

  /* Calculate when the checkpoints should start. This is done by finding */
  /* whent the checkpoint during the start of measurement needs to start  */
  /* and back calculating when to start the first one which is during     */
  /* warmup.                                                              */
  CheckpointRun.Type = CHECKPOINT_RUN_REQUEST_MSG;
  StartTime = TimeStamp + pContext->CkptStartOffset;
  CheckpointRun.Data.StartTime = StartTime;
  CheckpointRun.Data.Interval = pContext->CheckpointInterval;
  strcpy( CheckpointRun.Data.Dll, pContext->CgiScriptName );

  pContext->RequestsSent = 0;
  pContext->ReplysReceived = 0;
  pContext->AidesStatus = SCR_E_SUCCESS;
  pContext->MsgTimedOut = TRUE;

  for( Index = 0; Index < pContext->NumConnects; Index++ )
  {
   if( ! pContext->pConnects[Index].AdminConn )
   {
            continue;
   }
   strcpy( CheckpointRun.Data.FEName, pContext->pConnects[Index].FEName
);
   PRTEmessage_to_user_binary( sizeof( CheckpointRun ), &CheckpointRun,
                                                pContext-
>pConnects[Index].AideID,
                                                pContext-
>pConnects[Index].AideID );
```

```
    pContext->RequestsSent++;
   }

   PRTEdelay( pContext->MsgTimeout );

   if( pContext->MsgTimedOut )
   {
    ( void ) SCRerr( SCR_E_AIDE_CKPT_RUN_TIMEOUT );
    SCRlog( "Pausing indefinitely...\n\n" );
    PRTEpause();
   }
   else if( SCR_E_SUCCESS != pContext->AidesStatus )
   {
    Status = SCRerr( pContext->AidesStatus );
    SCRlog( "Not all aides entered checkpoint loop.." );
    SCRlog( "Pausing...\n\n" );
    PRTEpause();
   }
   else
   {
    SCRlog( "\t%d Aides successfully entered checkpoint loop.\n",
                pContext->ReplysReceived );
   }
  }

  /* Now that we're done, find out how much time is left in warmup, and */
  /* sleep for that time.                                               */
  TimeStamp2 = PRTEtimer_begin( "x" );
  PRTEtimer_cancel();
  DelayTime = pContext->WarmUpTime - (TimeStamp2 - TimeStamp);

  PRTEdelay( DelayTime );

  /* Measurement */
  TimeStamp = PRTEtimer_begin( "x" );
  PRTEtimer_cancel();

  SCRlog( "\n\n\n\n\t\t\t\t\tStart of Measurement\n\n" );

  Measurement.Type = MEASUREMENT_INFO_MSG;
  Measurement.Data.Length = pContext->SteadyStateTime;
  Measurement.Data.StartTime = TimeStamp;
  PRTEmessage_to_user_binary(sizeof(Measurement), &Measurement,
                                        pContext->ReducerID, pContext-
>ReducerID);

  TimeStamp2 = PRTEtimer_begin( "x" );
  PRTEtimer_cancel();
  DelayTime = pContext->SteadyStateTime - (TimeStamp2 - TimeStamp);
  PRTEdelay( DelayTime );


  /* Cooldown */
  TimeStamp = PRTEtimer_begin( "x" );
  PRTEtimer_cancel();

  SCRlog( "\n\n\n\n\t\t\t\t\tStart of Cooldown" );

  TimeStamp2 = PRTEtimer_begin( "x" );
  PRTEtimer_cancel();
  DelayTime = pContext->CoolDownTime - (TimeStamp2 - TimeStamp);
  PRTEdelay( DelayTime );

  SCRlog( "\n\n\n\n\t\t\t\t\tEnd of Cooldown\n\n");

  /* If we were doing checkpoints, have the aides stop now. */
  if( pContext->DoCheckpoints )
  {
   SCRlog( "\t%d Aides stopping checkpoint loop.",
                                        pContext->AdminUsers );

   GenericMsg.Type = CHECKPOINT_STOP_REQUEST_MSG;
   pContext->RequestsSent = 0;
   pContext->ReplysReceived = 0;
   pContext->AidesStatus = SCR_E_SUCCESS;
   pContext->MsgTimedOut = TRUE;

   for( Index = 0; Index < pContext->NumConnects; Index++ )
   {
    if( ! pContext->pConnects[Index].AdminConn )
    {
            continue;
    }
    PRTEmessage_to_user_binary( sizeof( GenericMsg ), &GenericMsg,
                                                pContext-
>pConnects[Index].AideID,
                                                pContext-
>pConnects[Index].AideID );
    pContext->RequestsSent++;
   }

   PRTEdelay( pContext->MsgTimeout );

   if( pContext->MsgTimedOut )
   {
    ( void ) SCRerr( SCR_E_AIDE_CKPT_STOP_TIMEOUT );
    SCRlog( "Pausing indefinitely...\n\n" );
    PRTEpause();
   }

   if( SCR_E_SUCCESS != pContext->AidesStatus )
   {
    Status = SCRerr( pContext->AidesStatus );
    SCRlog( "Not all aides successfully ran checkpoint loop." );
    SCRlog( "Pausing...\n\n" );
    PRTEpause();
   }

   SCRlog( "\t%d Aides successfully ran checkpoint loop.\n",
                pContext->ReplysReceived );

  }

  /* Break reducer out of his "infinite process data" loop. */
  PRTEstop_users( pContext->ReducerID, pContext->ReducerID );
  PRTEpause();

  /* Tell the reducer to stop users. */
  SCRlog("\tPausing while users stop doing transactions.\n\n");
  pContext->ReducerStatus = SCR_E_SUCCESS;
  PRTEresume_users( pContext->ReducerID, pContext->ReducerID );
  PRTEpause();

  SCRlog("Master: Resuming.\n");

  if( SCR_E_SUCCESS != pContext->ReducerStatus )
  {
   SCRlog( "\tUsers failed to stop successfully. Pausing.\n" );
   PRTEpause();
  }
  else
  {
   SCRlog( "\tAll users successfully stopped doing transactions.\n" );
  }


  /* If we're doing checkpoints, have the aides disconnect checkpoint stuff. */
  if( pContext->DoCheckpoints )
  {
   SCRlog( "\t%d Aides disconnecting checkpoint sub-systems.",
                pContext->AdminUsers );
   CheckpointDisconnect.Type =
CHECKPOINT_DISCONNECT_REQUEST_MSG;
```

```
  strcpy( CheckpointDisconnect.Data.Dll, pContext->CgiScriptName );
  pContext->RequestsSent = 0;
  pContext->ReplysReceived = 0;
  pContext->AidesStatus = SCR_E_SUCCESS;
  pContext->MsgTimedOut = TRUE;

  for( Index = 0; Index < pContext->NumConnects; Index++ )
  {
   if( ! pContext->pConnects[Index].AdminConn )
   {
            continue;
   }
   strcpy( CheckpointDisconnect.Data.FEName,
                pContext->pConnects[Index].FEName );
   PRTEmessage_to_user_binary( sizeof( CheckpointDisconnect ),
                                                &CheckpointDisconnect,
                                                pContext-
>pConnects[Index].AideID,
                                                pContext-
>pConnects[Index].AideID );
   pContext->RequestsSent++;
  }

  PRTEdelay( pContext->MsgTimeout );

  if( pContext->MsgTimedOut )
  {
   ( void ) SCRerr( SCR_E_AIDE_CKPT_DISCONNECT_TIMEOUT );
   SCRlog( "Pausing indefinitely...\n\n" );
   PRTEpause();
  }

  if( SCR_E_SUCCESS != pContext->AidesStatus )
  {
   Status = SCRerr( pContext->AidesStatus );
   SCRlog( "Not all aides did checkpoint disconnect successfully." );
   SCRlog( "Pausing...\n\n" );
   PRTEpause();
  }

  SCRlog( "\t%d Aides successfully disconnected checkpoint sub-systems.\n",
            pContext->ReplysReceived );
 }

 /* Tell the reducer to post process data. */
 SCRlog("\tPost process binary logfile.\n\n");

 pContext->ReducerStatus = SCR_E_SUCCESS;
 PRTEresume_users( pContext->ReducerID, pContext->ReducerID );
 PRTEpause();

 SCRlog("Master: Resuming.\n");


 /* Do post-test back-end functions */


 /* If Checkpoints requested then do Back-end Checkpoint stuff */
 if( pContext->DoCheckpoints )
 {
  TellAidesTo( pContext, BE_CKPTDATA_REQUEST_MSG, AFTER );
 }


 /* For Oracle, do switch logfile.  If stats requested, do stats end
   script, too */

 /* If GetAllAuditFiles specified -- get the log size info */
 if( pContext->BeTasksData.GetAllAuditFiles )
 {
  TellAidesTo( pContext, GET_LOGSIZE_REQUEST_MSG, AFTER );
 }

 if( pContext->BeTasksData.DbType == DB_TYPE_ORACLE )
 {
  if( pContext->BeTasksData.OraStatScriptPath[0] )
    TellAidesTo( pContext, ORA_DOSTATS_REQUEST_MSG, AFTER );

  TellAidesTo( pContext, ORA_SWITCHLOG_REQUEST_MSG, AFTER );
 }


 /* If custom script specified -- go do it */
 if( pContext->BeTasksData.CustomAfterTestScript[0] )
   TellAidesTo( pContext, DO_CUSTOM_SCRIPT_REQUEST_MSG, AFTER
);

 /* Tell the reducer to post process data. */
 SCRlog("\tPost process aide logfiles.\n\n");

 pContext->ReducerStatus = SCR_E_SUCCESS;
 PRTEresume_users( pContext->ReducerID, pContext->ReducerID );
 PRTEpause();

 SCRlog("Master: Resuming.\n");


 /* Tell any aides to exit. */
 Status = StopAides( pContext );

 Status = StopReducer( pContext );

 free( pContext->pConnects );

 SCRlog( "\n\n\n\n\t\t\t\t..END OF TEST..\n\n\n" );

#pragma message ("FIXME: This routine needs to keep a running track of the
status of all operations.")
 return( Status );
}
```

## tpcc_user.c

```
/*+**********************************************************************
*************
 *                                                                      *
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*****************************************************************
**********-*/


/* This script is the main script for each tpcc user. It
   handles communications with other scripts, control
   of the transaction mix and initialiazion and shutdown of
   of each user.  It calls routines in tpcc_gen.c to
   get the actual data for each transaction.
*/

#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <sys/types.h>
#include <sys/stat.h>
#include <errno.h>
#ifdef _WIN32
# include <nt_lib.h>
# include <time.h>
#endif

#include <stdtypes.h>
#include <prte.h>
#include <common.h>

#include <tpccstruct.h>
#include <tpccapi.h>
#include <tpccerr.h>
#include <transpool.h>
#include <config.h>

#include <scr_util.h>

#include <msg.h>
#include <netvar.h>
#include <tx_api.h>

/* Maximum values set for strings and such */
#define MAXSTRINGSIZE   4096

typedef struct _user_context_t {
  long                                  myseed;
  char                                  *Version;
  txn_context_t                         TxnContext;
} user_context_t;

/* Prototypes */
void BinMsgHandler(void *Context, int SendersID, int Len, void *Msg);
void DisconnectExit(user_context_t *pContext, int status, int Disconnect);
int  Init(user_context_t *pContext);

/* globals variables */

void
main(int argc, char *argv[])
{
  generic_status_msg_t    StatusMsg;
  user_login_reply_msg_t LoginMsg;
  user_context_t          Context;
  user_context_t          *pContext = &Context;

  /* Init PRTE */
  PRTEinit(argc,argv);

  /* Register binary message handler with PRTE. */
  /* This must be done before the user pauses so he can wake himself in */
  /* response to a transaction message.                          */
  PRTEcatch_message_binary(BinMsgHandler, pContext);

  /* Initialize transaction timing records. */
  pContext->TxnContext.TxnTiming.Data.MenuStart = 0.0;
  pContext->TxnContext.TxnTiming.Data.MenuResponse = 0.0;
  pContext->TxnContext.TxnTiming.Data.TxnStart = 0.0;
  pContext->TxnContext.TxnTiming.Data.TxnResponse = 0.0;

  /* Let the reducer know we are initialized. */
  pContext->TxnContext.ReducerID =
   atoi( PRTEwait_for_network_variable( "REDUCER_ID" ));
  StatusMsg.Status = SCR_E_SUCCESS;
  StatusMsg.Type = USER_INIT_REPLY_MSG;
  PRTEmessage_to_user_binary( sizeof( StatusMsg ), &StatusMsg,
                                        pContext->TxnContext.ReducerID,
                                        pContext->TxnContext.ReducerID );

  /* Wait to be told to continue */
  PRTEpause( );

  LoginMsg.Type = USER_LOGIN_REPLY_MSG;

  /* Get variables to figure out what to do */
  if( SCR_E_SUCCESS != ( LoginMsg.Status = Init( pContext )))
  {
    /* Exit, but don't need to disconnect since we haven't connected yet. */
    PRTEmessage_to_user_binary( sizeof( LoginMsg ), &LoginMsg,
                                                        pContext-
>TxnContext.ReducerID,
                                                        pContext-
>TxnContext.ReducerID );
    DisconnectExit ( pContext, LoginMsg.Status, FALSE );
  }

  if( SCR_E_SUCCESS != ( LoginMsg.Status = StartupTxn( &pContext-
>TxnContext )))
  {
    /* Disconnect application and exit. */
    PRTEmessage_to_user_binary( sizeof( LoginMsg ), &LoginMsg,
                                                        pContext-
>TxnContext.ReducerID,
                                                        pContext-
>TxnContext.ReducerID );
    DisconnectExit( pContext, LoginMsg.Status, FALSE );
  }

  /* Connect to the SUT and database*/
  LoginMsg.Status = ConnectTxn( &pContext->TxnContext,
CONNECT_TRANS,
                                                        &LoginMsg.Data );
  if( SCR_E_SUCCESS != LoginMsg.Status )
  {
    /* Disconnect application and exit. */
    PRTEmessage_to_user_binary( sizeof( LoginMsg ), &LoginMsg,
                                                        pContext-
>TxnContext.ReducerID,
                                                        pContext-
>TxnContext.ReducerID );
    DisconnectExit( pContext, LoginMsg.Status, FALSE );
  }

  LoginMsg.Status = SCR_E_SUCCESS;

  PRTEmessage_to_user_binary( sizeof(LoginMsg), &LoginMsg,
                                        pContext->TxnContext.ReducerID,
                                        pContext->TxnContext.ReducerID );

  /* Now execute the transaction loop. */
  StatusMsg.Status = DequeueExecLoopTxn( &pContext->TxnContext );

  /* We're done doing transactions either because the test is over, or */
```

```
 /* because we encountered and error. In either event, disconnect the */
 /* application and exit.                                             */
 DisconnectExit( pContext, StatusMsg.Status, TRUE );
}




/*****************************************************************
***************/
/*                                                               */
/* Name: BinMsgHandler                                           */
/*                                                               */
/* Purpose: This is the message handler that gets registered with PRTE for    */
/*        processing binary messages sent to the User.           */
/*                                                               */
/* Inputs:                                                       */
/*       Context: Pointer to the context structure. This structure is set   */
/*             up elsewhere, and registered with PRTE to be passed in.   */
/*       SendersID: User ID number of the user that sent us the binary      */
/*             message.                                          */
/*       Len: Length of the binary message in bytes.             */
/*       Msg: Pointer to the actual data being sent.             */
/*                                                               */
/* Outputs: This routine records the data sent into the user and uses it to   */
/*        define the next transaction.                           */
/*                                                               */
/* Function Value: void                                          */
/*                                                               */
/* Notes: This funtion is called on our behalf by PRTE. In order for this     */
/*       to happen, we must be inside a call to some PRTE function. If we    */
/*       are running code outside a PRTE function, PRTE will not interrupt   */
/*       us (i.e. no signal is sent). It is only when we are inside a PRTE   */
/*      function call (e.g. PRTEdelay, etc.) that PRTE will check to see if  */
/*      we have a message that needs processing.                 */
/*                                                               */
/*****************************************************************
***************/
void
BinMsgHandler( void *Context, int SendersID, int Len, void *Msg )
{
 user_context_t             *pContext;

 /* NOTE: These structures are prone to possible bugs if the user sending  */
 /* the message is on one platform with one type of structure padding      */
 /* rule, and the receiver is on another platform with a different padding */
 /* rule.                                                 */
 generic_msg_t                          *pMsg;
 start_msg_t                            *pStartMsg;
 txn_msg_t                  *pTxnMsg;

 /* Effectively convert void * parameters to correct types. */
 pMsg = Msg;
 pContext = Context;

 /* Process messaged based on its type. */
 switch( pMsg->Type ) {
  case USER_LOGIN_REQUEST_MSG:
   PRTEresume( );
   break;

  case USER_START_REQUEST_MSG:
   pStartMsg = Msg;
   EnqueueTxn( &pContext->TxnContext, TXN_CACHE_SIZE, &pStartMsg-
>Data[0] );
   break;

  case TXN_MSG:
   pTxnMsg = Msg;
   EnqueueTxn( &pContext->TxnContext, 1, &pTxnMsg->Data );
   break;

  case USER_STOP_REQUEST_MSG:
   PRTEstop( );
   PRTEdelay( 0.0 );
   break;

  default:
   SCRlog( "User: Received unknown message type: %d", *pMsg );
 }
}


void
DisconnectExit(user_context_t *pContext, int Status, int Disconnect)
{
 user_exit_msg_t          ExitMsg;
 char                                   tmp_buf[128];
 int                                    LocStatus;

 /* Disconnect from any application if told to. */
 if ( TRUE == Disconnect )
 {
  LocStatus = DisconnectTxn( &pContext->TxnContext,
DISCONNECT_TRANS );
  if( SCR_E_SUCCESS != LocStatus )
  {
   SCRerr( LocStatus );
   SCRlog( "User %d: Failed to disconnect from application.", User_id );
  }
 }

 LocStatus = ShutdownTxn( &pContext->TxnContext );
 if( SCR_E_SUCCESS != LocStatus )
 {
  SCRerr( LocStatus );
  SCRlog( "User %d: Failed to shutdown application.", User_id );
 }

 /* Make sure we get our log file flushed out by turning on flushing, */
 /* and sending a final message.                                      */
 Flush_log = TRUE;
 if (Status == SCR_E_SUCCESS)
 {
  sprintf(tmp_buf,"User %d: Exited gracefully as a swan.", User_id);
  PRTEto_log(110, tmp_buf);
 }
 else
 {
  SCRlog( "User %d: Exited with fatal error (%d).", User_id, Status );
  SCRerr( Status );
 }

 /* Log our exit status with the reducer. */
  ExitMsg.Type = USER_EXIT_MSG;
  ExitMsg.Data.Status = Status;
  ExitMsg.Data.ExitTime = PRTEtimer_begin ( "x" );
  PRTEtimer_cancel();
  PRTEmessage_to_user_binary( sizeof(ExitMsg), &ExitMsg,
                                                        pContext-
>TxnContext.ReducerID,
                                                        pContext-
>TxnContext.ReducerID );

 PRTEexit();
}



int
Init( user_context_t *pContext )
{
```

```
  char temp_string[128];
  char *pNetVarStr;
  char *master_seed;
  int  temp_int;

  /* Get the log file and logging type set up. It is important to do this */
  /* first because we need these in place for PRTEto_log calls to work.   */

  /* LOG_DIR is a network variable set by master. */
  SCR_getnet_string("LOG_DIR", LOG_DIR_DEFAULT, temp_string);
  if ('\0' == temp_string[0] )
  {
   return( SCRerr( SCR_E_LOG_DIR_NOT_SET ));
  }
  else
  {
   strcpy (Log_path, temp_string);
   strcpy (Err_path, temp_string);
  }

  /* The error log name is built based on the user id. */
  sprintf(temp_string, "user_%d.err",User_id);
  strcpy (Err_name, temp_string);

  /* The log name is built based on the user id. */
  sprintf(temp_string, "user_%d.log",User_id);
  strcpy (Log_name, temp_string);

  /* Get/set the logging type.  Logging_type is a bit mask.            */
  /* Its values are defined in prte.h.                                 */
  SCR_getnet_int("TPCC_USER_LOG_TYPE",
TPCC_USER_LOG_TYPE_DEFAULT,
                                &Logging_type);
  Logging_type |= (USER_SUT_DATA_LOGGING);

  /* Set our version based on compile command line defined constant. */
  pContext->Version = VERSION;

  /* Verify our version with the master's. */
  pNetVarStr = PRTEget_network_variable("TPCC_SCRIPTS_VERSION");
  if( NULL == pNetVarStr )
  {
   /* The required network variable was not set. */
   return( SCRerr( SCR_E_CODE_VERSION_NOT_SET ));
  }
  else if( STRING_MATCH != strcmp( pContext->Version, pNetVarStr ))
  {
   SCRlog( "User code version = %s, Master code version = %s.",
                pContext->Version, pNetVarStr );
   return( SCRerr( SCR_E_CODE_VERSION_MISMATCH ));
  }


  /* Get/set the flush log type. */
  SCR_getnet_int("TPCC_USER_FLUSH_LOG",
TPCC_USER_FLUSH_LOG_DEFAULT,
                                &Flush_log);

  /* Find out if we're running in RTE run mode. */
  SCR_getnet_int( "RUN_MODE", RUN_MODE_DEFAULT,
                                 &pContext->TxnContext.RunMode );

  /* Get the cgi script name. */
  SCR_getnet_string( "CGI_SCRIPT_NAME",
CGI_SCRIPT_NAME_DEFAULT,
                                  pContext->TxnContext.CgiScriptName );
  if( '\0' == *pContext->TxnContext.CgiScriptName )
  {
   return( SCRerr( SCR_E_CGI_SCRIPT_NAME_NOT_SET ));
  }

  /* Get the seed from the master (or input file) and make it unique for each */
  /* user  - then initialize the random functions.  Force the seed to be odd. */
  master_seed = PRTEwait_for_network_variable("SEED");
  pContext->myseed = ( atol( master_seed ) * User_id * 2000 ) + 1;

  PRTErandomize(((unsigned) pContext->myseed % 100)); /* seed PRTE
random */
  srand48(pContext->myseed);                        /* seeds the rand48 random
function */

  /* Find out if we're running a durability test. */
  SCR_getnet_bool( "DURABILITY_LOGGING",
DURABILITY_LOGGING_DEFAULT,
                                &pContext->TxnContext.DurabilityLogging );

  /* Calculate the w_id and d_id for this User */
  pNetVarStr = PRTEget_network_variable( "FIRST_USER_ID" );
  if( NULL == pNetVarStr )
  {
   return( SCRerr( SCR_E_FIRST_USER_ID_NOT_SET ));
  }

  temp_int = User_id - atoi( pNetVarStr );
  pContext->TxnContext.w_id = ( temp_int / 10 ) + 1;
  pContext->TxnContext.d_id = ( temp_int % 10 ) + 1;

  /* Get the value we should use for C_LAST. */
  SCR_getnet_int( "C_LAST", C_LAST_DEFAULT, &( pContext-
>TxnContext.CLast ));

  return( SCR_E_SUCCESS );
}
```

# Appendix D

## Binary Feedback Optimization

This audit utilized a post-link optimization tool called spike on the sybase binary. Spike can process binaries linked on TRU64 UNIX (formerly Digital UNIX) Version 4.0 or later. Profile information was collected using pixie.

The following commands document the spike optimization process on the sybase executable by profiling a run of the program, then applying the spike -fb command to use the feedback information in the .Addrs and .Counts files:

```
% pixie -pids dataserver
% dataserver.pixie
% prof -pixie -merge dataserver.Counts dataserver dataserver.Addrs
% spike dataserver -fb dataserver -o dataserver.opt
```

# Compaq Tru64 UNIX Tunable Parameters

# Back-End Server

```
########################################

/etc/sysconfigtab

########################################


#
#
*****************************************************************
*
# *                                                             *
# *   Copyright Compaq Computer Corporation, 2000               *
# *                                                             *
# *   The software contained on this media  is  proprietary  to   *
# *   and  embodies  the  confidential  technology  of  Compaq    *
# *   Computer Corporation.  Possession, use,  duplication  or    *
# *   dissemination of the software and media is authorized only  *
# *   pursuant to a valid written license from Compaq Computer    *
# *   Corporation.                                                *
# *                                                             *
# *   RESTRICTED RIGHTS LEGEND   Use, duplication, or disclosure  *
# *   by the U.S. Government is subject to restrictions  as  set  *
# *   forth in Subparagraph (c)(1)(ii)  of  DFARS  252.227-7013,  *
# *   or  in  FAR 52.227-19, as applicable.                       *
# *                                                             *
#
*****************************************************************
*
#
# HISTORY
#
# (c) Copyright 1990, 1991, 1992, 1993 OPEN SOFTWARE FOUNDATION,
INC.
# ALL RIGHTS RESERVED
#
#
# OSF/1 1.2

#
#
# The supported method of changing the information in this
# file (sysconfigtab) is by using the sysconfigdb command.
#
# If you insist upon changing this file by direct editing,
# then it would be advisable to add new information at the end
# rather than the beginning or middle of the file, in order
# to reduce confusion during installation and reconciliation
# of user changes and update changes.
#
# See the appropriate documentation such as the release notes
# for the new version being installed as well as the appropriate
# reference pages.
#



rt:
        aio-max-num = 12288
        aio-max-retry = 2
        aio-task-max-num = 1024

net:
        netisrthreads = 1

vfs:
        bufpages = 4000



generic:
                memberid = 0
                new_vers_high = 1441151880877834240
                new_vers_low = 15092




vm:
                dump_user_pte_pages = 1
                gh-chunks = 8000
                new_wire_method = 1
                replicate_user_text = 1
                swapdevice = /dev/disk/dsk0b
                vm-swap-eager = 0
        contig-malloc-percent = 1
        private-text = 1
        vm-maxvas = 326279215104
        vm-syswiredpercent = 95
        vm_mapentries = 4000
        vm_pagemax = 524288



ipc:
                msg_max = 32768
                msg_mnb = 16384
                msg_mni = 256
                msg_tql = 40
                sem_aem = 32768
                sem_mni = 1024
                sem_msl = 2000
                sem_opm = 2000
                sem_ume = 2000
                sem_vmx = 320000
                shm-min = 1
                shm_max = 33957085184
                shm_mni = 1024
```

```
        shm_seg = 512
        ssm_threshold = 0


proc:
        give_boost = 0
        max-proc-per-user = 4096
        max_threads_per_user = 4096
        per_proc_address_space = 326279215104
        per_proc_data_size = 326279215104
    max-per-proc-address-space = 326279215104
    max-per-proc-data-size = 326279215104
    max-per-proc-stack-size = 326279215104


pcount:
        Subsystem_Description = pcount device driver
        Module_Config_Name = pcount
        Module_Type = Dynamic
        Device_Char_Major = ANY
        Device_Char_Minor = 0
        Device_Char_Files = pcount0


/usr/sys/conf/CLIPPER

####################################


ident                   "CLIPPER"

options                 UERF
options                 OSF
options                 _LMF_
options                 BIN_COMPAT
options                 COMPAT_43
options                 MACH
options                 MACH_IPC_TCACHE
options                 MACH_IPC_WWA
options                 MACH_IPC_XXXHACK
options                 BUFCACHE_STATS
options                 INOCACHE_STATS
options                 STAT_TIME
options                 VAGUE_STATS
options                 UFS
options                 NFS
options                 AUTOFS
options                 NFS_SERVER
options                 STRKINFO
options                 STREAMS
options                 LDTTY
options                 RPTY
options                 INET
options                 UIPC
options                 SYSV_COFF
options                 QUOTA
options                 LABELS
options     SL
options SNMPINFO
options                 DLI
options                 BSD_TTY
options     BPARM
options                 FFM_FS
options                 DLB
options     PROCFS

#
# Standard options.
#
options                 UNIX_LOCKS
options                 SER_COMPAT
options                 RT_PREEMPT
options                 RT_SCHED
options                 RT_SCHED_RQ
options                 RT_PML
options                 RT_TIMER
options                 RT_SEM
options                 RT_CSEM
options                 RT_IPC
#
makeoptions             CDEBUGOPTS="-g3"
makeoptions             CCOMPRESS="-compress"
makeoptions             PROFOPTS="-DPROFILING -DPROFTYPE=4"
makeoptions             LOADADDR="fffffc0000230000"
#
# Special options (see configuring the kernel chapter
# in the Guide to System Administration)
#
cpu                     "DEC6600"
machine                 alpha

config                  vmunix      swap generic

bus         i2o0    at *
controller  i2o_bs0 at i2o0   slot  0
device disk ri0     at i2o_bs0 drive   0
bus         i2o1    at *
controller  i2o_bs1 at i2o1   slot  0
device disk ri128   at i2o_bs1 drive   128
bus         i2o2    at *
controller  i2o_bs2 at i2o2   slot  0
device disk ri256   at i2o_bs2 drive   256
bus         i2o3    at *
controller  i2o_bs3 at i2o3   slot  0
device disk ri384   at i2o_bs3 drive   384
bus         i2o4    at *
controller  i2o_bs4 at i2o4   slot  0
device disk ri512   at i2o_bs4 drive   512
bus         i2o5    at *
controller  i2o_bs5 at i2o5   slot  0
device disk ri641   at i2o_bs5 drive   641
bus         i2o6    at *
controller  i2o_bs6 at i2o6   slot  0
device disk ri768   at i2o_bs6 drive   768
bus         i2o7    at *
controller  i2o_bs7 at i2o7   slot  0
device disk ri896   at i2o_bs7 drive   896
bus         i2o8    at *
controller  i2o_bs8 at i2o8   slot  0
device disk ri1024  at i2o_bs8 drive   1024
bus         isa0    at *
callout after_c "../bin/mkdata isa"
bus         usb0    at *


#
# Static Driver Definitions
#
config_driver ata
config_driver fdi
config_driver lp
config_driver ace
config_driver gpc
config_driver tu
config_driver scsi
config_driver itpsa
config_driver pci
callout after_c "../bin/mkdata pci"

#
# Pseudodevice Definitions (see configuring the
# kernel chapter in the Guide to System Administration)
#
pseudo-device           lsm         1
```

```
pseudo-device           lsm_vmted  0
pseudo-device           sysv_hab
pseudo-device           svid_three_hab
pseudo-device           svr_four_hab
pseudo-device           soe_two_hab
pseudo-device           rt_hab
pseudo-device           ether
pseudo-device           loop
pseudo-device           ws
```

## Sybase Tunable Parameters

```
#################################################################
#############
#
#                       Configuration File for the Sybase SQL Server
#
#                       Please read the System Administration Guide (SAG)
#                       before changing any of the values in this file.
#
#################################################################
#############


[Configuration Options]

[General Information]

[Backup/Recovery]
        recovery interval in minutes = 32767
        print recovery information = DEFAULT
        tape retention in days = DEFAULT

[Cache Manager]
        number of oam trips = DEFAULT
        number of index trips = DEFAULT
        procedure cache percent = 1
        memory alignment boundary = DEFAULT
        global async prefetch limit = 0
        global cache partition number  = DEFAULT

[Named Cache:c_customer]
        cache size = 5050M
        cache status = mixed cache
        cache replacement policy = DEFAULT
        local cache partition number = 4

[2K I/O Buffer Pool]
        pool size = 5050M
        wash size = 40960 K
        local async prefetch limit = 0

[Named Cache:c_customer_index]
        cache size = 850M
        cache status = mixed cache
        cache replacement policy = relaxed LRU replacement
        local cache partition number = 4

[2K I/O Buffer Pool]
        pool size = 850M
        wash size = 2048 K
        local async prefetch limit = 0

[Named Cache:c_log]
        cache size = 30M
        cache status = log only
        cache replacement policy = relaxed LRU replacement
        local cache partition number = 1

[2K I/O Buffer Pool]
        pool size = 10M
        wash size = 512 K
        local async prefetch limit = 0

[8K I/O Buffer Pool]
        pool size = 20M
        wash size = 2048 K
        local async prefetch limit = 0

[Named Cache:c_no_ol]
        cache size = 700M
        cache status = mixed cache
        cache replacement policy = DEFAULT
        local cache partition number = 4

[2K I/O Buffer Pool]
        pool size = 700M
        wash size = 1024 K
        local async prefetch limit = 0

[Named Cache:c_non_customer_index]
        cache size = 1050M
        cache status = mixed cache
        cache replacement policy = DEFAULT
        local cache partition number = 4

[2K I/O Buffer Pool]
        pool size = 1050M
        wash size = 2048 K
        local async prefetch limit = 0

[Named Cache:c_ol_index]
        cache size = 600M
        cache status = mixed cache
        cache replacement policy = DEFAULT
        local cache partition number = 4

[2K I/O Buffer Pool]
        pool size = 600M
        wash size = 2048 K
        local async prefetch limit = 0

[Named Cache:c_orders]
        cache size = 900M
        cache status = mixed cache
        cache replacement policy = DEFAULT
        local cache partition number = 4

[2K I/O Buffer Pool]
        pool size = 675M
        wash size = 2048 K
        local async prefetch limit = 0

[16K I/O Buffer Pool]
        pool size = 225M
        wash size = 2048 K
        local async prefetch limit = 0

[Named Cache:c_stock]
        cache size = 18050M
        cache status = mixed cache
        cache replacement policy = DEFAULT
        local cache partition number = 4

[2K I/O Buffer Pool]
        pool size = 18050M
        wash size = 9000M
        local async prefetch limit = 0

[Named Cache:c_stock_index]
```

```
        cache size = 760M
        cache status = mixed cache
        cache replacement policy = relaxed LRU replacement
        local cache partition number = 4

[2K I/O Buffer Pool]
        pool size = 760M
        wash size = 512 K
        local async prefetch limit = 0

[Named Cache:c_tinyhot]
        cache size = 90M
        cache status = mixed cache
        cache replacement policy = relaxed LRU replacement
        local cache partition number = 1

[2K I/O Buffer Pool]
        pool size = 90M
        wash size = 256 K
        local async prefetch limit = 0

[Named Cache:default data cache]
        cache size = 40M
        cache status = default data cache
        cache replacement policy = DEFAULT
        local cache partition number = 1

[2K I/O Buffer Pool]
        pool size = 40M
        wash size = 256 K
        local async prefetch limit = 0

[Meta-Data Caches]
        number of open databases = DEFAULT
        number of open objects = DEFAULT
        open object spinlock ratio = DEFAULT
        number of open indexes = DEFAULT
        open index hash spinlock ratio = DEFAULT
        open index spinlock ratio = DEFAULT

[Disk I/O]
        disk i/o structures = DEFAULT
        page utilization percent = DEFAULT
        number of devices = 83
        disable disk mirroring = DEFAULT
        disable character set conversions = DEFAULT
        enable unicode conversions = DEFAULT
        size of unilib cache = DEFAULT

[Network Communication]
        default network packet size = DEFAULT
        max network packet size = 4096
        remote server pre-read packets = DEFAULT
        number of remote connections = DEFAULT
        number of remote logins = DEFAULT
        number of remote sites = DEFAULT
        max number network listeners = DEFAULT
        tcp no delay = DEFAULT
        allow sendmsg = DEFAULT
        syb_sendmsg port number = DEFAULT

[O/S Resources]
        max async i/os per engine = 716
        max async i/os per server = 716

[Parallel Query]
        number of worker processes = DEFAULT
        memory per worker process = DEFAULT
        max parallel degree = DEFAULT
        max scan parallel degree = DEFAULT

[Physical Resources]

[Physical Memory]
        total memory = 16128000
        additional network memory = 4915200
        shared memory starting address = DEFAULT
        max SQL text monitored = DEFAULT

[Processors]
        max online engines = 4
        min online engines = DEFAULT

[SQL Server Administration]
        default database size = DEFAULT
        identity burning set factor = DEFAULT
        allow nested triggers = DEFAULT
        allow updates to system tables = 1
        print deadlock information = DEFAULT
        default fill factor percent = DEFAULT
        default exp_row_size percent = DEFAULT
        number of mailboxes = DEFAULT
        number of messages = DEFAULT
        number of alarms = DEFAULT
        number of pre-allocated extents = DEFAULT
        event buffers per engine = DEFAULT
        cpu accounting flush interval = DEFAULT
        i/o accounting flush interval = DEFAULT
        sql server clock tick length = DEFAULT
        runnable process search count = DEFAULT
        i/o polling process count = DEFAULT
        time slice = DEFAULT
        deadlock retries = DEFAULT
        cpu grace time = DEFAULT
        number of sort buffers = 0
        number of large i/o buffers = DEFAULT
        size of auto identity column = DEFAULT
        identity grab size = DEFAULT
        page lock promotion HWM = DEFAULT
        page lock promotion LWM = DEFAULT
        page lock promotion PCT = DEFAULT
        housekeeper free write percent = 0
        enable housekeeper GC = DEFAULT
        partition groups = DEFAULT
        partition spinlock ratio = DEFAULT
        allow resource limits = DEFAULT
        number of aux scan descriptors = DEFAULT
        SQL Perfmon Integration = DEFAULT
        allow backward scans = DEFAULT
        row lock promotion HWM = DEFAULT
        row lock promotion LWM = DEFAULT
        row lock promotion PCT = DEFAULT
        license information = DEFAULT
        enable sort-merge join and JTC = DEFAULT
        abstract plan load = DEFAULT
        abstract plan dump = DEFAULT
        abstract plan replace = DEFAULT
        abstract plan cache = DEFAULT
        text prefetch size = DEFAULT

[User Environment]
        number of user connections = 300
        stack size = DEFAULT
        stack guard size = DEFAULT
        permission cache entries = DEFAULT
        user log cache size = 4096
        user log cache spinlock ratio = 10
        enable HA = DEFAULT
        enable DTM = DEFAULT
        allow remote access = DEFAULT
        lock shared memory = DEFAULT
        allow sql server async i/o = DEFAULT

[Lock Manager]
```

```
        number of locks = 40000
        deadlock checking period = DEFAULT
        freelock transfer block size = DEFAULT
        max engine freelocks = 50
        lock spinlock ratio = DEFAULT
        lock address spinlock ratio = DEFAULT
        lock table spinlock ratio = DEFAULT
        lock hashtable size = DEFAULT
        lock scheme = DEFAULT
        lock wait period = DEFAULT
        read committed with lock = DEFAULT

[Security Related]
        systemwide password expiration = DEFAULT
        audit queue size = DEFAULT
        curread change w/ open cursors = DEFAULT
        allow procedure grouping = DEFAULT
        select on syscomments.text = DEFAULT
        auditing = DEFAULT
        current audit table = DEFAULT
        suspend audit when device full = DEFAULT
        max roles enabled per user = DEFAULT
        check password for digit = DEFAULT
        minimum password length = DEFAULT
        maximum failed logins = DEFAULT
        unified login required = DEFAULT
        use security services = DEFAULT
        msg confidentiality reqd = DEFAULT
        msg integrity reqd = DEFAULT
        dtm detach timeout period = DEFAULT
        secure default login = DEFAULT

[Extended Stored Procedure]
        esp unload dll = DEFAULT
        esp execution priority = DEFAULT
        esp execution stacksize = DEFAULT
        xp_cmdshell context = DEFAULT
        start mail session = DEFAULT

[Error Log]
        event logging = DEFAULT
        log audit logon success = DEFAULT
        log audit logon failure = DEFAULT
        event log computer name = DEFAULT

[Rep Agent Thread Administration]
        enable rep agent threads = DEFAULT

[Component Integration Services]
        enable cis = DEFAULT
        cis connect timeout = DEFAULT
        cis bulk insert batch size = DEFAULT
        max cis remote connections = DEFAULT
        max cis remote servers = DEFAULT
        cis packet size = DEFAULT
        cis cursor rows = DEFAULT
        cis rpc handling = DEFAULT

[Java Services]
        enable java = DEFAULT
        size of process object heap = DEFAULT
        size of shared class heap = DEFAULT
        size of global fixed heap = DEFAULT

[DTM Administration]
        enable xact coordination = DEFAULT
        xact coordination interval = DEFAULT
        number of dtx participants = DEFAULT
        strict dtm enforcement = DEFAULT
        txn to pss ratio = DEFAULT
        dtm lock timeout period = DEFAULT

[Diagnostics]
        dump on conditions = DEFAULT
        maximum dump conditions = DEFAULT
        number of ccbs = DEFAULT
        caps per ccb = DEFAULT
        average cap size = DEFAULT

[Monitoring]
        Q diagnostics active = DEFAULT
        sql text pipe active = DEFAULT
        sql text pipe max messages = DEFAULT
        plan text pipe active = DEFAULT
        plan text pipe max messages = DEFAULT
        statement pipe active = DEFAULT
        statement pipe max messages = DEFAULT
        errorlog pipe active = DEFAULT
        errorlog pipe max messages = DEFAULT
        deadlock pipe active = DEFAULT
        deadlock pipe max messages = DEFAULT
        wait event timing = DEFAULT
        process wait events = DEFAULT
        object lockwait timing = DEFAULT
        SQL batch capture = DEFAULT
        statement statistics active = DEFAULT
        per object statistics active = DEFAULT
```

init_server.sh

```
#!/bin/sh -f


isql -Usa -P <<- EOF

use tpcc
go

dbcc tune(maxwritedes, 10)
go

dbcc tune("doneinproc", 0)
go

dbcc tune("cleanup", 0)
go


set rowcount 1
go

select * from stock
go

select * from customer
go

select * from order_line
go

select * from orders
go

select * from new_order
go

set rowcount 0
go

dbcc iosize(tpcc, district, 16)
go

dbcc iosize(tpcc, warehouse, 16)
```

```
go

dbcc iosize(tpcc, item, 16)
go

dbcc iosize(tpcc, history, 16)
go

exec sp_logiosize "8"
go

select count(*) from warehouse(index warehouse prefetch 16 lru)
go

select count(*) from district(index district prefetch 16 lru)
go

select count(*) from item(index item prefetch 16 lru)
go

set rowcount 1
go

select * from history
go

dbcc tune(elcsize,128)
go

dbcc tune(des_bind, 5, warehouse)
dbcc tune(des_bind, 5, district)
dbcc tune(des_bind, 5, item)
dbcc tune(des_bind, 5, stock)
dbcc tune(des_bind, 5, order_line)
dbcc tune(des_bind, 5, orders)
dbcc tune(des_bind, 5, new_order)
dbcc tune(des_bind, 5, customer)
dbcc tune(des_bind, 5, history)

dbcc tune(des_bind, 5, neworder_local)
dbcc tune(des_bind, 5, neworder_remote)
dbcc tune(des_bind, 5, payment_byid)
dbcc tune(des_bind, 5, payment_byname)
dbcc tune(des_bind, 5, order_status_byid)
dbcc tune(des_bind, 5, order_status_byname)
dbcc tune(des_bind, 5, delivery)
dbcc tune(des_bind, 5, stock_level)

go


dbcc traceoff(-1)
go

EOF
```

# Appendix E

# Auditor Attestation

Benchmark Sponsor: Dave Stanley
Compaq Computer
110 Spit Brook Road
ZKO2-3/M31
Nashua NH, 03062

April 2, 2001

I verified the performance of the following configuration:

Platform: **Compaq AlphaServer ES40 Model 6/833 c/s**

Operating system: **Compaq Tru64 UNIX V5.1**

Database Manager: **Sybase Adaptive Server Enterprise 12.0.0.3**

Transaction Manager: **Application Optimizer WNT Server Edition**

The performance was measured according to the requirements of the TPC-C Benchmark. The results were:

| CPU's Speed | Memory | Disks | NewOrder 90% Response Time | **tpmC** |
|---|---|---|---|---|
| Server: **AlphaServer ES40 Model 6/833** | | | | |
| 4 x Alphachip 21264 (833 MHz) | 32 GB (8 MB cache per cpu ) | 104 x 9.1 GB 86 x 18.2 GB | 0.548 Seconds | **37,274** |
| Two Clients: **Compaq ProLiant 1600** (Specification for each) | | | | |
| 1 x Pentium III (600 MHz) | 640 MB | 1 x 18.2 GB | n/a | n/a |

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

- The database records were the proper size
- The database was properly scaled and populated
- The required ACID properties were met
- The transactions were correctly implemented
- Input data was generated according to the specified percentages
- The transaction cycle times included the required keying and think times
- The reported response times were correctly measured.
- All 90% response times were under the specified maximums

- At least 90% of all delivery transactions met the 80 Second completion time limit
- The reported measurement interval was 120 minutes (7200 seconds)
- The reported measurement interval was representative of steady state conditions
- Four checkpoints were taken during the reported measurement interval
- The repeatability of the measured performance was verified
- The 180 day storage requirement was correctly computed
- The system pricing was verified for major components and maintenance

Additional Audit Notes:

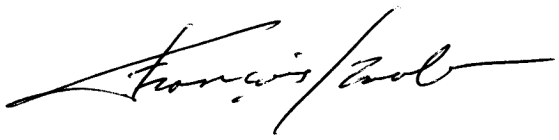
1 - The two client systems Compaq ProLiant 1600 600Mhz used in the test were substituted with two Compaq ProLiant ML350 1.0Ghz in the configuration pricing, as the 1600 are no longer orderable. The two ML350 were configured with the same number of PCI slots and were priced with the same amount of memory as the tested 1600's.

2 - The application program used a threshold of 99 instead of 91 to replenish the Stock table. A review of the application code indicated that this number did not have an effect on the number of updates to the Stock table.

It is my opinion that the above did not have any significant effect on the reported performance.

This benchmark was originally conducted in February 2001 under the TPC-C Version 3. It is now upgraded to TPC-C Version 5 in accordance with the rules defined by the TPC.

Respectfully Yours,



François Raab
President

# Appendix F

## Price Quotations

April 3, 2001 Quote No: 131800.1

Maria Lopez

Compaq Computer Corp.

| SERVER HARDWARE: | Part Num. | Unit Cost | Qty | |
|---|---|---|---|---|
| Compaq AS ES40 833 Model 2 4MB | DA-64CAA-FA | 64,411.00 | 1 | $64,411 |
| ES40 Tower Enclosure Kit | BA61M-MT | 350.00 | 1 | $350 |
| ES40 SMP CPU, 833MHZ, UNIX | KN610-CB | 11,550.00 | 3 | $34,650 |
| ES40 4GB Memory Option | MS610-FA | 35,840.00 | 7 | $250,880 |
| ES40 Power Supply | H7906-A9 | 875.00 | 2 | $1,750 |
| 3 CHANNEL LVD RAID CONTROLLER | DS-KZPCC-CE | 2,799.00 | 9 | $25,191 |
| Dual Port Ultra Wide SCSI PCI Adapter | ITI-4280UE | 575.00 | 1 | $575 |
| Ultra 68VHD 10M Cable Assbly | BN37A-03 | 98.00 | 34 | $3,332 |
| Star Lite Storage Shelfs | DS-SL13R-BA | 2,466.00 | 14 | $34,524 |
| 12/24GB 4mm DAT 5.25" HH | TLZ10-LB | 637.00 | 1 | $637 |
| *3Yr 24x7/4HR ES40 M2 TWR/DRW* | *FM-4Q724-36* | *10,264.00* | *1* | *$10,264* |
| VT510,WHITE,NORTH AMER,NO KEY | VT510-DA | 427.00 | 1 | $427 |
| US/CANADA W95 KYBD WHITE | PCXLA-NA | 18.00 | 1 | $18 |
| 18 GB 10000RPM Drive | 3R-A0585-AA | 615.00 | 96 | $59,040 |
| 9.1GB 10000RPM Drive | 3R-A0584-AA | 403.00 | 115 | $46,345 |
| 17-03212-05 8MP-8MP Patch Cable | BN25G-07 | 6.00 | 3 | $18 |
| **SUBTOTAL SERVER HARDWARE:** | | | | **$532,412** |
| **SERVER SOFTWARE:** | | | | |
| *3YR AS ES40 UNIX BRZ+24X7* | *FM-62UNS-36* | *2,673.00* | *1* | *$2,673* |
| *3YR AS ES40 UNIX SMP* | *FM-62USM-36* | *670.00* | *3* | *$2,010* |
| cVISN MC MG MUL SYS 1 LIC | QM-MQDAA-BA | 697.00 | 1 | $697 |
| CVISN MUL CDRM KIT | QA-5FVAB-H8 | 67.00 | 1 | $67 |
| Tru 64 UNIX CDROM | QA-MT4AA-H8 | 277.00 | 1 | $277 |
| **SERVER SOFTWARE SUBTOTAL:** | | | | **$5,724** |
| **TOTAL SERVER:** | | | | **$538,136** |
| **CLIENT HARDWARE:** | | | | |
| Compaq ProLiant ML350 1.0GHz | 160247-001 | 2,199.00 | 2 | $4,398 |
| *3YR 24X7/4HR Entry 300 SVR* | *FM-EL724-36* | *600.00* | *2* | *$1,200* |
| Pentium III P1000-256K Processor Option | 207068-B21 | 1,799.00 | 2 | $3,598 |
| 512MB SDRAM DIMM Memory Option | 128279-B21 | 1,434.00 | 2 | $2,868 |
| ProLiant ML350 Hot Plug Drive Cage | 161275-B21 | 459.00 | 2 | $918 |
| 18.2GB Wide Ultra3 Drive | 142673-B22 | 666.00 | 2 | $1,332 |
| Ethernet Dual Channel | 338456-B21 | 299.00 | 8 | $2,392 |
| NC3132 Dual 10/100 Module | 338456-B22 | 238.00 | 8 | $1,904 |
| 256MB SDRAM DIMM Memory Option | 313616-B21 | 690.00 | 4 | $2,760 |
| Presario MV740 Monitor | 153724-001 | 365.00 | 4 | $1,460 |
| **CLENT HARDWARE SUBTOTAL:** | | | | **$22,830** |

| | | | | |
|---|---|---|---|---|
| **CLIENT SOFTWARE:** | | | | |
| Application Optimizer WNT Server Edition | QB-641AA-SA | 315.00 | 4 | $1,260 |
| *Application Optimizer WNT Server Service* | *QT-641AA-XA* | *58.00* | *5* | *$1,160* |
| **CLIENT SOFTWARE SUBTOTAL:** | | | | **$2,420** |
| **TOTAL CLIENT:** | | | | **$25,250** |
| **CONFIGURATION TOTAL:** | | | | **$563,386** |

The Compaq AlphaServer ES40 carries a three (3) year, 7x24/4HR response warranty. The storage have a three (3) year on-site, 4-hour, 5-day per week response with a three (3) year return to manufacture warranty. All other products carry a standard warranty of three (3) years on-site; 4-hour x 5-days per week.
30% Discount based on total dollar volume: Server Hardware and Software
20'% Discount based on total dollar volume: FM part numbers.

Traditional Compaq Intel Based Client Hardware Priced at US1plus%

Valid: This quote is valid for 60days from date
Terms: TBD
Delivery: 15 Days ARO
Shipping: FOB Origin
Warranty: Manufactures New Equipment
Installation: Included

Sincerely,

Philip K. Nolan
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(201)-666-0956 fax
phil@icssolutions.com

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Compaq Computer Corporation
***Attn: Maria Lopez***
Phone (603) 884-0030
Fax (603) 884-6082

Date: 2/23/2001

***Sales Quote***

| QTY | ITEM # | DESCRIPTION | UNIT | TOTAL |
|---|---|---|---|---|
| 3 | DEH3552 | ETHERFAST 8 PORT 100BASE-TX HUB | $108.00 | $324.00 |
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***Thank you for your consideration.***

***Sincerely,***

***Robert Rumsby (Ext: 20529)***
***Corporate Account Executive***
***dc***