Bull
Escala PL1660R
Using
AIX 5L Version 5.3
and
Oracle Database 10g Enterprise Edition

TPC Benchmark ^{TM} C
Full Disclosure Report

First Edition

December 16, 2007

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BULL / ORACLE	**Bull Escala PL1660R**	**TPC-C Rev. 5.8**
		Report Date: December 16, 2007

Total System Cost	**TPC-C Throughput**	**Price/Performance**	**Availability Date**
1,419,019USD	**404,462.54**	**$3.51 USD**	**December 16, 2007**

Processor Chips/Cores/Threads	**Database Manager**	**Operating System**	**Other Software**	**No. Users**
2/4/8 Power6 4.7GHz	Oracle Database 10g Enterprise Edition	AIX 5L V5.3	Microsoft Visual C++ Microsoft COM+	321,280

SUT

16 Clients
IBM System x346
3.2GHz Intel ® Xeon ™
2x2MB L2 Cache
2GB Memory
1 36GB Internal Drive
2 Integrated 10/100/1000 Ethernet

Bull Escala PL1660R
2x 4.7 GHz POWER6 ™
Dual-core processor chips
2x32MB L3 Cache
192GB Memory
1 Internal SAS DASD Controller
2 73.4GB Internal SAS Drives
5 IBM 4Gb dual -port FC Adapters
1 Dual port 10/100/1000 Ethernet Adapters

Storage
5 IBM TotalStorage DS4800
52 EXP810 Storage Expansion
780 36.4GB 15K RPM Drives

System Components	**Server**		**Each of the 16 clients**	
	Quantity	**Description**	**Quantity**	**Description**
Processor Chips/Cores/Threads	2/4/8	4.7GHz POWER6™	2/2/4	3.2GHz , 800MHz bus speed, 2MB L2 cache Xeon Processor
Memory	6	32GB	4	512 MB
Disk Controllers	1 5 5	Integrated SAS 4Gb Dual-port FC Adapters IBM System Storage DS4800	1	Ultra320 SCSI
Disk Drives	780 2	36.4GB 15K RPM 4Gb FC 73.4GB 15K RPM SAS	1	36 GB
Total Storage		25,603 GB		576 GB
Terminals	1	System Console	1	System Console

BULL
Escala PL1660R

TPC-C Rev. 5.9

Report Date: December 16, 2007

Description	MI Part Number	Brand	Pricing	Unit Price	Quantity	Extended Price	3-year Maint. Price
Server Hardware							
ESCALA NODE PL1660R (BASE DRAWER)	CPSG068-0000	Bull	1	23 737	1	23 737	3 620
INDICATOR SYSTEM PL1660R PACKAGE	PKHG032-0000	Bull	1	0	1	0	
4.7GHZ P6, 2-CORE PROCESSOR CARD, 0-CORE ACTIVE	CPUG158-0D00	Bull	1	11 500	2	23 000	10 653
PROCESSOR POWER REGULATOR	REFG008-0000	Bull	1	1 500	3	4 500	
ACTIVATION OF 1GB DDR2 POWER6 MEMORY	CPKG437-0000	Bull	1	1 515	192	290 880	
ONE PROC.ACTIVATION FOR 2-CORE&4.7 (P6)	CPKG440-0000	Bull	1	23 000	4	92 000	20 065
EXPANSION PCI-X I/O DRAWER	DRWG100-0000	Bull	1	6 090	1	6 090	4 241
73 GB SAS DISK DRIVE (1"/15KRPM)	MSUG251-0000	Bull	1	659	2	1 318	
2X- 1GB VIRTUAL ETHERNET (RJ45) AND 2 SYSTEM PORT	DCIG012-0000	Bull	1	399	1	399	
4GB/S FIBRE CHANNEL PCI-X ADAPTER 2-PORT	DCCG196-0000	Bull	1	2 500	5	12 500	
2-PORT 10/100/1000 BASE-TX ETHERNET PCI-E ADAPT.	DCCG200-0000	Bull	1	699	1	699	
GX DUAL PORT - 12X HCA	DCCG204-0000	Bull	1	1 499	1	1 499	
IDE SLIMLINE DVD-ROM DRIVE	CDRG032-0000	Bull	1	275	1	275	
RACK 36U (BLACK) WITH ONE PDU - 12 OUTLETS	RCKG018-0000	Bull	1	4 190	1	4 190	1 588
POWER SUPPLY TYPE EU	PSKG004-0002	Bull	1	0	1	0	
17" FLAT PANEL MONITOR	DMUG024-1000	Bull	1	890	1	890	
FULL WIDTH QUIET TOUCH KEYBOARD - USB, FRENCH	KBUG009-000F	Bull	1	100	1	100	
ADDITIONAL POWER DISTRIBUTION UNIT - SINGLE PHASE	PSSG053-0000	Bull	1	1 000	1	1 000	
0/32GB (4X8GB) DDR2, 400MHZ, POD, 0GB ACTIVE	CMMG276-0D00	Bull	1	26 886	6	161 316	
MEDIA ENCLOSURE AND BACK PLANE	CKTG306-0000	Bull	1	185	1	185	
KIT CABLES/FIRST EXPANSION DRAWER	CKTG308-0000	Bull	1	515	1	515	
I/O DRAWER MOUNTING ENCLOSURE (TWO POSITIONS)	CKTG309-0000	Bull	1	525	1	525	
OPERATOR PANEL	CKTG310-0000	Bull	1	199	1	199	
DESKSIDE HMC W/O MONITOR/KEYBOARD	CSKG018-0000	Bull	1	1 860	1	1 860	1 422
POWER CORD PDU/WALL (4.3M), 24A IEC309, 32A PLUG	CBLG234-1700	Bull	1	240	2	480	
POWER CORD (14-FOOT) - DRAWER TO PDU	CBLG240-1700	Bull	1	15	4	60	
ADVANCED POWER VIRTUALIZATION (PER CPU)	CPFG055-0000	Bull	1	1 310	4	5 240	
					Subtotal	**633 457**	**41 588**
Storage							
DS4800 Disk System Model 82	1815-82A	IBM	2	53995	5	269 975	
DS4800 8-Storage Partitions	8870	IBM	2	10000	5	50 000	
(22R4255) DS4800 AIX Host Kit	7711	IBM	2	7000	5	35 000	
DS4000 EXP810 Enclosure	1812-81A	IBM	2	6000	52	312 000	
36GB/15K Drive 4Gb FC disks	5412	IBM	2	892	780	695 760	
Short Wave SFP	2410	IBM	2	998	52	51 896	
Fiber Cable 25m	5625	IBM	2	189	10	1 890	
Fiber Cable 1m	5601	IBM	2	79	104	8 216	
3 Year Warranty Service Upgrade 1812-81A 24x7x4		IBM	2	960	52		49 920
3 Year Warranty Service Upgrade 1815-82A 24x7x4		IBM	2	3200	5		16 000
					Subtotal	**1 424 737**	**65 920**
Server Software							
AIX 5.3 (media only)	UTSG191-VK00	Bull	1	50	1	50	
AIX Software per Processor	EXSG295-VF00	Bull	1	1 225	4	4 900	
Software Maintenance for AIX, 3 Year	SBYG014-IN01	Bull	1	2 274	4		9 096
Partition Load Manager SW Maint: 3 year	SBYG051-IN00	Bull	1	60	4		240
VIO Software Maintanance (3Y)	SBYG050-IN00	Bull	1	405	4		1 620
Initial Installation PL1660R	GMHG141-0000	Bull	1	500	1		500
C for AIX user Lic+SW maint 12 MO	CLGG043-VA01	Bull	1	1 080	1	1 080	
C for AIX user annual SW maint renewal	SBYG031-IN00	Bull	1	210	2		420
Oracle Database 10g Enterprise Edition, Per Processor, Unlimited Users, 3		Oracle	3	20 000	3	60 000	
Oracle Database Server Support Package for 3 years		Oracle	3	2 000	3		6 000
					Subtotal	**66 030**	**17 876**
Client Hardware							
Base or packages: x346 Base w/3.2GHz,DVD,IO,POWER	8840AC1	IBM	2	1803	16	28 848	9 600
Additional processors: Additional 3.2GHz 800MHz 2MB L2	1356	IBM	2	699	16	11 184	
Memory: 512MB DDR-II SDRAM DIMM	541	IBM	2	135	64	8 640	
36GB 15K Hot Swap SCSI	5168	IBM	2	249	16	3 984	
NetBAY S2 42U Standard Rack Cabinet	93074RX	IBM	2	1489	4	5 956	
Optical 3-Button Mouse - USB	40K9201	IBM	2	19	1	19	
Preferred Pro Full Size PS/2 Keyboard	40K9584	IBM	2	29	1	29	
IBM C117 17" CRT Monitor	49387NU	IBM	2	149	1	149	
					Subtotal	**58 809**	**9 600**

	BULL Escala PL1660R				TPC-C Rev. 5.9	
					Report Date: December 16, 2007	
Description	**MI Part Number**	**Brand**	**Pricing**	**Unit Price**	**Quantity**	**Extended Price**	**3-year Maint. Price**
Third party Hardware/Software							
Visual C++ Standard Edition	254-00170	Microsoft	4	250	1	250	
Microsoft Windows 2003 Server	P73-00295	Microsoft	4	719	16	11 504	
Microsoft Problem Resolution Services		Microsoft	4	245	1	245	245
3Com Baseline Switch 2824 24-port unmanaged Gigabit	512294	3Com	1	411	3	1 232	
					Subtotal	**13 231**	**245**
					TOTAL	**2 196 264**	**135 229**
				Oracle Discount			**-6 600**
				IBM Discount			**-649 482**
				Bull Discount			**-256 392**

Notes:

Pricing: 1-Bull 2-IBM 3-Oracle 4-Microsoft

Audited by Francois Raab of InfoSizing (www.sizing.com)

Three-Year Cost of Ownership:	**$1 419 019**
tpmC Rating:	**404462**
$ / tpmC:	**3,51**

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 reflects 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.

Numerical Quantities Summary for the Bull Escala PL1660R

MQTH, computed Maximum Qualified Throughput: 404,462.54 tpmC

Response Times (in seconds)	90^{th} %	Average	Maximum
New Order	0.69	0.34	15.02
Payment	0.68	0.33	6.39
Order-Status	0.69	0.34	5.67
Delivery (interactive)	0.10	0.10	4.91
Delivery (deferred)	0.03	0.02	0.4
Stock-Level	0.68	0.33	7.74
Menu	0.10	0.10	8.26

Response time delay added for emulated components 0.1 seconds

Transaction Mix, in percent of total transactions	Percent
New Order	44.96%
Payment	43.01%
Order-Status	4.00%
Delivery	4.00%
Stock-Level	4.00%

Keying/Think Times (in seconds)	Min.	Average	Max.
New Order	18.00/0.01	18.01/12.01	18.04/120.10
Payment	3.00/0.01	3.01/12.01	3.04/120.10
Order-Status	2.00/0.01	2.01/10.02	2.03/100.10
Delivery	2.00/0.01	2.01/5.01	2.03/50.10
Stock-Level	2.00/0.01	2.01/5.01	2.03/50.10

Test Duration	
Ramp-up Time	1 hour 2 minutes
Measurement interval	2 hours 00 minutes
Transactions during measurement interval (all types)	107,950,507
Ramp-down time	15 minutes

Checkpoints

Number of checkpoints	4
Checkpoint interval	28.05 minutes

Table of Content

Preface 10
0 General Items 11
0.1. Application Code Disclosure 11
0.2. Benchmark Sponsor 11
0.3. Parameter Settings 11
0.4. Configuration Diagrams 11
1 Clause 1: Logical Data Base Design Related Items 13
1.1. Table Definitions 13
1.2. Database Organization 13
1.3. Insert and/or Delete Operations 13
1.4. Horizontal or Vertical Partitioning 13
2 Clause 2: Transaction and Terminal Profiles Related Items 14
2.1. Verification for the Random Number Generator 14
2.2. Input/Output Screens 14
2.3. Priced Terminal Features 14
2.4. Presentation Managers 14
2.5. Home and Remote Order-lines 14
2.6. New-Order Rollback Transactions 14
2.7. Number of Items per Order 15
2.8. Home and Remote Payment Transactions 15
2.9. Non-Primary Key Transactions 15
2.10. Skipped Delivery Transactions 15
2.11. Mix of Transaction Types 15
2.12. Queuing Mechanism of Delivery 16
3 Clause 3: Transaction and System Properties 17
3.1. Atomicity Requirements 17
3.1.1. Atomicity of Completed Transaction 17
3.1.2. Atomicity of Aborted Transactions 17
3.2. Consistency Requirements 17
3.3. Isolation Requirements 18
3.4. Durability Requirements 18
3.4.1. Permanent Unrecoverable Failure of any Single Durable Medium 18
4 Clause 4: Scaling and Data Base Population Related Items 20
4.1. Cardinality of Tables 20
4.2. Distribution of Tables and Logs 20
4.3. Data Base Model Implemented 22
4.4. Partitions/Replications Mapping 22
4.5. 60 Day Space Calculation 23
5 Clause 5: Performance Metrics and Response Time Related Items 24
5.1. Response Times 24
5.2. Keying and Think Times 24
5.3. Response Time Frequency Distribution 25
5.4. Performance Curve for Response Time versus Throughput 28
5.5. Think Time Frequency Distribution 28
5.6. Throughput versus Elapsed Time 29
5.7. Steady State Determination 29
5.8. Work Performed During Steady State 29
5.8.1. Transaction Flow 29
5.8.2. Database Transaction 30
5.8.3. Checkpoints 30
5.9. Measurement Interval 31
6 Clause 6: SUT, Driver, and Communication Definition Related Items 32
6.1. RTE Availability 32
6.2. Measurement Interval 32
6.3. Functionality and Performance of Emulated Components 32

6.4. Network Bandwidth ... 32
6.5. Operator Intervention ... 32
7 Clause 7: Pricing Related Items ... 33
7.1. Hardware and Programs Used ... 33
7.2. Three Year Cost of System Configuration ... 33
7.3. Availability Dates ... 34
7.4. Statement of tpmC and Price/Performance ... 34
8 Clause 9: Audit Related Items ... 35
Appendix - A: Client Server Code ... 39
A.1 Client/Terminal Handler Code ... 39
A.2 Transaction Code ... 81
Appendix - B: Tunable Parameters ... 114
B.1 Database Parameters ... 114
B.2 Transaction Monitor Parameters ... 114
B.3 AIX Parameters ... 116
Appendix - C: Database Setup Code ... 119
C.1 Database Creation Scripts ... 119
C.2 SQL Creation Scripts ... 125
C.3 Data Generation Code ... 130
Appendix - D: Pricing Information ... 151

Abstract

This report documents the full disclosure information required by the TPC Benchmark™ C Standard Specification Revision 5.9 dated June, 2007, for measurements on the Bull Escala PL1660R. The software used on Bull Escala PL1660R includes AIX 5L Version 5.3 operating system, Oracle 10g database manager. Microsoft COM+ is used as transaction manager.

Bull Escala PL1660R

Company Name	**System Name**	**Data Base Software**	**Operating System Software**
Bull SAS	Escala PL1660R	Oracle Database 10g Enterprise Edition	AIX 5L Version 5.3

Total System Cost	**TPC-C Throughput**	**Price/Performance**
• Hardware • Software • 3 Years Maintenance	Sustained maximum throughput of system running TPC-C expressed in transactions per minute	Total system cost/tpmC
$1,419,019 USD	404,462.54	$3.51 USD

Preface

TPC Benchmark™ C Standard Specification was developed by the Transaction Processing Performance Council (TPC). It was released on August 13, 1992 and updated with revision 5.9 in June 2007.

This is the full disclosure report for benchmark testing of the Bull Escala PL1660R and Oracle 10g according to the TPC Benchmark™ C Standard Specification.

TPC Benchmark™ C exercises the system components necessary to perform tasks associated with that class of on-line transaction processing (OLTP) environments emphasizing a mixture of read-only and update intensive transactions. This is a complex OLTP application environment exercising a breadth of system components associated by such environments 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
- Data bases consisting of many tables with a wide variety of sizes, attributes, and relationships
- Contention on data access and update

This benchmark defines four on-line transactions and one deferred transaction, intended to emulate functions that are common to many OLTP applications. However, this benchmark does not reflect the entire range of OLTP requirements. The extent to which a customer can achieve the results reported by a vendor is highly dependent on how closely TPC-C approximates the customer application. The relative performance of systems derived from this benchmark does not necessarily hold for other workloads or environments. Extrapolations to any other environment are not recommended.

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

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.

0 General Items

0.1. Application Code Disclosure

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 System p application code for the five TPC Benchmark™ C transactions. Appendix D contains the terminal functions and layouts.

0.2. Benchmark Sponsor

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

This benchmark was sponsored by **Bull SAS.**

0.3. Parameter Settings

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

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

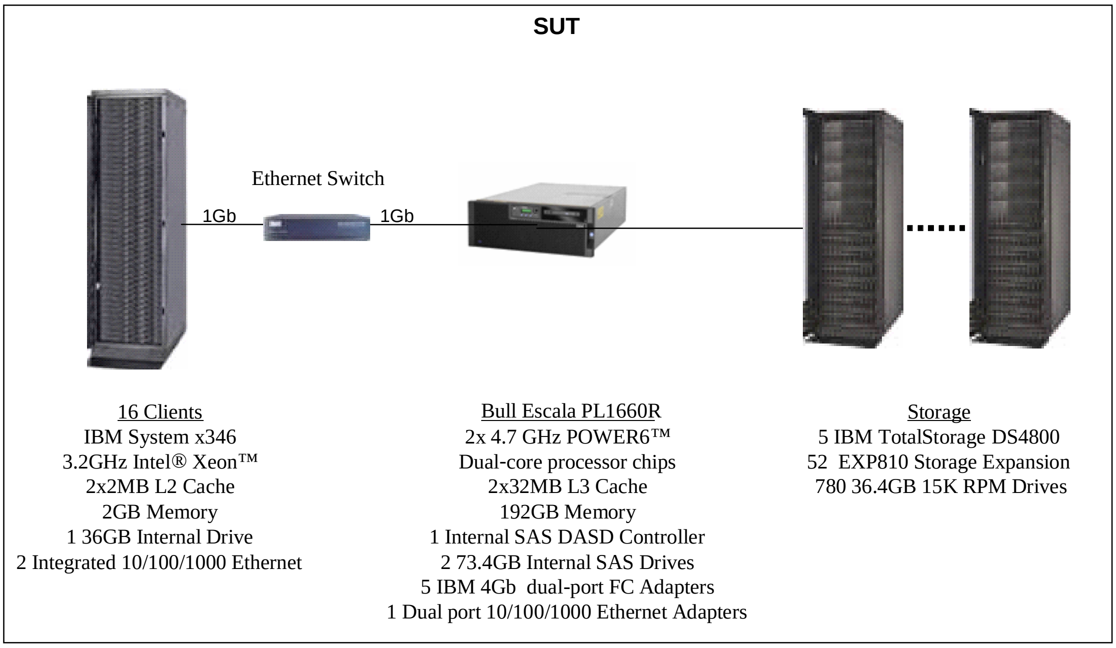
Appendix B contains the system, data base, and application parameters changed from their default values used in these TPC Benchmark™ C tests.

0.4. Configuration Diagrams

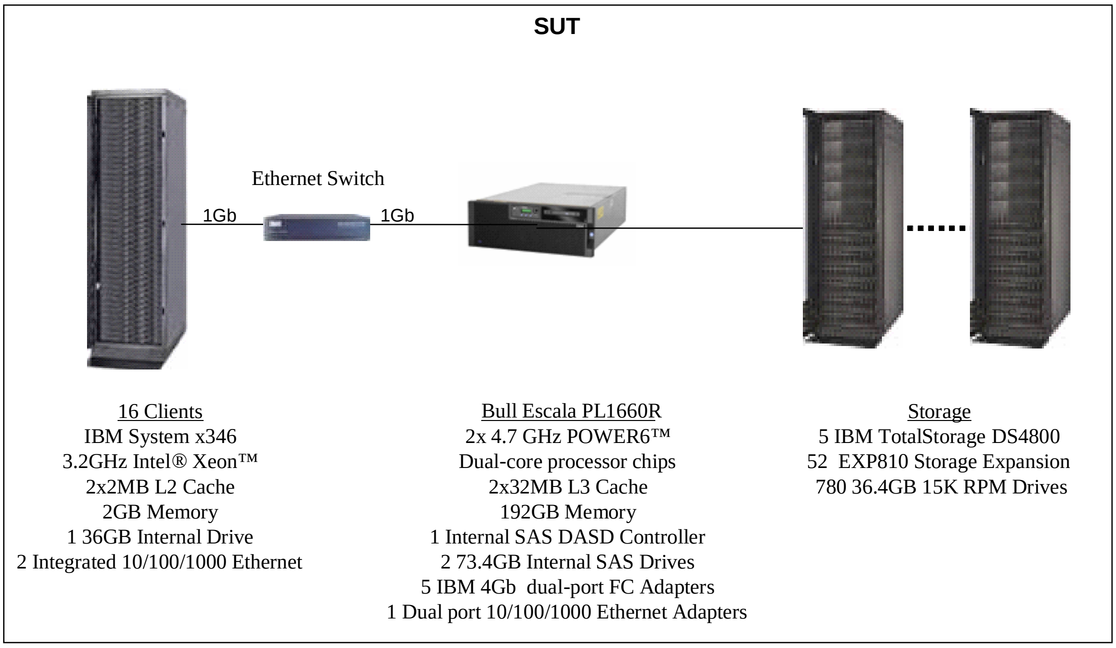
Diagrams of both measured and priced configurations must be provided, accompanied by a description of the differences. This includes, but is not limited to:

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

Bull Escala PL1660R Benchmark Configuration



Bull Escala PL1660R Priced Configuration



1 Clause 1: Logical Data Base Design Related Items

1.1. Table Definitions

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

Appendix C contains the table definitions and the database load programs used to build the data base.

1.2. Database Organization

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

Physical space was allocated to Oracle Database on the server disks according to the details provided in Appendix C.

1.3. Insert and/or Delete Operations

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

There were no restrictions on insert and/or delete operations to any of the tables. The space required for an additional five percent of the initial table cardinality was allocated to Oracle 10g and priced as static space.

1.4. Horizontal or Vertical Partitioning

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

Partitioning was not used for any of the measurement reported in this full disclosure.

2 Clause 2: Transaction and Terminal Profiles Related Items

2.1. Verification for the Random Number Generator

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

The srandom(), getpid() and gettimeofday() functions are used to produce unique random seeds for each driver. The drivers use these seeds to seed the srand(), srandom() and srand48() functions. Random numbers are produced using wrappers around the standard system random number generators.

The negative exponential distribution uses the following function to generate the distribution. This function has the property of producing a negative exponential curve with a specified average and a maximum value 4 times the average.

```
const double RANDOM_4_Z = 0.89837799236185
const double RANDOM_4_K = 0.97249842407114
double neg_exp_4(double average {
        return – average * (1/RANDOM_4_Z * log (1 – RANDOM_4_K * drand48()))};
}
```

The seeds for each user were captured and verified by the auditor to be unique. In addition, the contents of the database were systematically searched and randomly sampled by the auditor for patterns that would indicate the random number generator had affected any kind of a discernible pattern; none were found.

2.2. Input/Output Screens

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

The screen layouts are presented in HTML 1.0 web pages. Clauses 2.4.3, 2.5.3, 2.6.3, 2.7.3, and 2.8.3 of the TPC-C specifications were used as guidelines for html character placement.

2.3. Priced Terminal Features

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

The emulated workstations, IBM System x336, are commercially available and support all of the requirements in Clause 2.2.2.4.

2.4. Presentation Managers

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

The workstations did not involve screen presentations, message bundling or local storage of TPC-C rows. All screen processing was handled by the client system. All data manipulation was handled by the server system.

2.5. Home and Remote Order-lines

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

Table 2-1 shows the percentage of home and remote transactions that occurred during the measurement period for the New-Order transactions.

2.6. New-Order Rollback Transactions

The percentage of New-Order transactions that were rolled back as a result of an illegal item number must be disclosed.

Table 2-1 shows the percentage of New-Order transactions that were rolled back due to an illegal item being entered.

2.7. Number of Items per Order

The number of items per order entered by New-Order transactions must be disclosed.

Table 2-1 show the average number of items ordered per New-Order transaction.

2.8. Home and Remote Payment Transactions

The percentage of home and remote Payment transactions must be disclosed.

Table 2-1 shows the percentage of home and remote transactions that occurred during the measurement period for the Payment transactions.

2.9. Non-Primary Key Transactions

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

Table 2-1 shows the percentage of non-primary key accesses to the data base by the Payment and Order-Status transactions.

2.10. Skipped Delivery Transactions

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

Table 2-1 shows the percentage of Delivery transactions missed due to a shortage of supply of rows in the NEW-ORDER table.

2.11. Mix of Transaction Types

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

Table 2-1 shows the mix percentage for each of the transaction types executed by the SUT.

New Order	Bull Escala PL1660R
Percentage of Home order lines	99%
Percentage of Remote order lines	1%
Percentage of Rolled Back Transactions	0.99%
Average Number of Items per order	9.99
Payment	
Percentage of Home transactions	85.02%
Percentage of Remote transactions	14.98%
Non-Primary Key Access	
Percentage of Payment using C_LAST	60.00%
Percentage of Order-Status using C_LAST	59.99%
Delivery	
Delivery transactions skipped	0
Transaction Mix	
New-Order	44.96%
Payment	43.01%
Order-Status	4.00%
Delivery	4.00%
Stock-Level	4.00%

Table 2-1: Numerical Quantities for Transaction and Terminal Profiles

2.12. Queuing Mechanism of Delivery

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

The Delivery transaction was submitted to an ISAPI queue that is separate from the COM+ queue that the other transactions used. This queue is serviced by a variable amount of threads that are separate from the worker threads inside the web server. Web server threads are able to complete the on-line part of the Delivery transaction and immediately return successful queuing responses to the drivers. The threads servicing the queue are responsible for completing the deferred part of the transaction asynchronously.

3 Clause 3: Transaction and System Properties

The results of the ACID test must be disclosed along with a description of how the ACID requirements were met.

All ACID tests were conducted according to specification.

3.1. Atomicity Requirements

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

3.1.1. Atomicity of Completed Transaction

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

The following steps were performed to verify the Atomicity of completed transactions.

1. The balance, BALANCE_1, was retrieved from the CUSTOMER table for a random Customer, District and Warehouse combination.
2. The Payment transaction was executed and committed for the Customer, District, and Warehouse combination used in step 1.
3. The balance, BALANCE_2, was retrieved again for the Customer, District, and Warehouse combination used in step 1 and step 2. It was verified that BALANCE_1 was greater than BALANCE_2 by the amount of the Payment transaction.

3.1.2. Atomicity of Aborted Transactions

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

The following steps were performed to verify the Atomicity of the aborted Payment transaction:

1. The Payment application code was implemented with scripts that allowed the transaction to be rolled back rather than committed.
2. The balance, BALANCE_3, was retrieved from the Customer table for the same Customer, District, and Warehouse combination used in the completed Payment transaction Atomicity test.
3. The Payment transaction was executed for the Customer, District and Warehouse used in step 2. Rather than commit the transaction, the transaction was rolled back.
4. The balance, BALANCE_4 was retrieved again for the Customer, District, and Warehouse combination used in step 2. It was verified that BALANCE_4 was equal to BALANCE_3, demonstrating that there were no remaining effects of the rolled back Payment transaction.

3.2. Consistency Requirements

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

Verify that the data base is initially consistent by verifying that it meets the consistency conditions defined in Clauses 3.3.2.1 to 3.3.2.4. Describe the steps used to do this in sufficient detail so that the steps are independently repeatable.

The specification defines 12 consistency conditions of which the following four are required to be explicitly demonstrated:

1. The sum of balances (d_ytd) for all Districts within a specific Warehouse is equal to the balance (w_ytd) of that Warehouse.
2. For each District within a Warehouse, the next available Order ID (d_next_o_id) minus one is equal to the most recent Order ID [max(o_id)] for the Order table associated with the preceeding District and Warehouse.

Additionally, that same relationship exists for the most recent Order ID [max(o_id)] for the New Order table associated with the same District and Warehouse. Those relationships can be illustrated as follows:

d_next_o_id – 1 = max(o_id) = max(no_o_id)

where (d_w_id = o_w_id = no_w_id) and (d_id = o_d_id = no_d_id)

3. For each District within a Warehouse, the value of the most recent Order ID [max(no_o_id)] minus the first Order ID [min(no_o_id)] plus one, for the New Order table associated with the District and Warehouse equals the number of rows in that New Order table. That relationship can be illustrated as follows:

   max(no_o_id) – min(no_o_id) + 1 = number of rows in New Order for the Warehouse/District

4. For each District within a Warehouse, the sum of Order Line counts [sum(o_ol_cnt)] for the Order table associated with the District equals the number of rows in the Order Line table associated with the same District. That relationship can be illustrated as follows:

   sum(o_ol_cnt) = number of rows in the Order Line table for the Warehouse/District

An RTE driven run was executed against a freshly loaded database. After the run the 4 consistency conditions defined above were tested using a script to issue queries to the database. All queries showed that the database was still in a consistent state.

3.3. Isolation Requirements

Operations of concurrent data base transactions must yield results which are indistinguishable from the results which would be obtained by forcing each transaction to be serially executed to completion in some order.

The benchmark specification defines nine tests to demonstrate the property of transaction isolation. The tests, described in Clauses 3.4.2.1 – 3.4.2.9 were all successfully executed using a series of scripts. Case A was observed during the execution of Isolation Tests 7-9.

3.4. Durability Requirements

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

3.4.1. Permanent Unrecoverable Failure of any Single Durable Medium

Permanent irrecoverable failure of any single durable medium containing TPC-C data base tables or recovery log data.

Failure of Log Disk and Log Cache:

This test was conducted on a fully scaled database. The following steps were performed successfully.

1. The current count of the total number of orders was determined by the sum of D_NEXT_O_ID of all rows in the DISTRICT table giving SUM_1.
2. A full load test was started and allowed to run for over 10 minutes.
3. One of the disks containing the transaction log was removed. Since the disk was RAID-5 (mirrored & striped), Oracle 10g Server continued to process the transactions successfully.
4. The test continued for at least another 5 minutes.
5. Since write cache mirroring was enabled for the log device, one of the Fibre Channel controllers, which holds one copy of the mirrored cache, was removed. There was a brief pause in I/O while the failover to the remaining log controller occurred. The controller detected a mirror-out-of-sync condition and deactivated write-back cache.
6. The run continued without write-back cache.
7. The system was subsequently shut down.

8. The disk from step 3 was replaced.
9. The system was powered back on and Oracle 10g Server was allowed to recover.
10. Step 1 was performed returning the value for SUM_2. It was verified that SUM_2 was greater than SUM_1 plus the completed New_Order transactions recorded by the RTE. The additional transactions found in the database were attributed to in-flight activity at the time of the failure.

Failure of Durable Medium Containing TPC-C Database Tables:

The following steps were successfully performed to demonstrate Durability against the failure of a disk unit with database tables:

1. The contents of the database were backed up in full.
2. The current count of the total number of orders was determined by the sum of D_NEXT_O_ID of all rows in the DISTRICT table giving SUM_1.
3. A scaled-down test was started with about 20% of the full load.
4. A disk containing the TPCC table was removed causing Oracle 10g Server to report numerous errors when attempting to access that device
5. The disk was powered back on and the full database was restored from the backup copy in step 1.
6. Oracle 10g Server was restarted and the transactions in the log were applied to the database.
7. Step 2 was performed returning SUM_2. It was verified that SUM_2 was greater than SUM_1 plus the completed New_Order transactions recorded by the RTE. The additional transactions found in the database were attributed to in-flight activity at the time of the failure.
8. Consistency condition 3 was verified.

Instantaneous Interruption and Memory Failure:

The following steps were conducted on a fully scaled database:

1. The current count of the total number of orders was determined by the sum of D_NEXT_O_ID of all rows in the DISTRICT table giving SUM_1.
2. A full load test was started and allowed to run for over 10 minutes.
3. The system was powered off, which removed power from all system components, including memory.
4. The system was powered back on and Oracle 10g Server recovered.
5. Step 1 was performed returning SUM_2. It was verified that SUM_2 was greater than SUM_1 plus the completed New_Order transactions recorded by the RTE. The additional transactions found in the database were attributed to in-flight activity at the time of the failure
6. Consistency condition 3 was verified.

4 Clause 4: Scaling and Data Base Population Related Items

4.1. Cardinality of Tables

The cardinality (e.g., the number of rows) of each table, as it existed at the start of the benchmark run, must be disclosed.

Table 4-1 portrays the TPC Benchmark™ C defined tables and the number of rows for each table as they were built initially.

All tables are based on 36,000 warehouses, the number of active warehouses during the benchmark was 32,128.

Table Name	Number of Rows
Warehouse	32,128
District	360,000
Customer	1,080,000,000
History	1,080,000,000
Order	1,080,000,000
New Order	324,000,000
Order Line	10,800,358,664
Stock	3,600,000,000
Item	100,000

Table 4-1: Initial Cardinality of Tables

4.2. Distribution of Tables and Logs

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

The system is configured with 24 RAID0 for the tables and 4 RAID5 for the log.

For the tables, each RAID0 (hdisk) is configured with 30x 36.4GB disks. Stock, customer, and index for customer2 uses raw hdisk spread across all 24 arrays and the rest of the tables are in logical volumes. Each dual adapter has 6 disks and each LV is apread across 3 disks. Each customer disk has a capacity of 15990Mb. Each stock disk has a capacity of 8070MB and each customer index2 has a capacity of 16140Mb.

For the log, four RAID5 arrays are configured with 15 x 36.4GB disk each with a total formatted capacity of 1870.2GB. There are four Logical Volume (LV) with 1 storage controller. The controller has 4 logical disk (hdisks) and the log LV is striped across the four hdisks.

Rack	Array #/VG	Datafile
1	Array1	Cust_0_[0-2],stok_0_[0-1,68-68], r1a1
1	Array2	Cust_0_[3-5],stok_0_[3,4,69-71], r1a2
1	Array3	Cust_0_[6-8],stok_0_[5-7,72-74], r1a3
1	Array4	Cust_0_[910],stok_0_[8-10,75-77], icust2, r1a4

Rack	Array #/VG	Datafile
1	Array5	Cust_0[11-13],stok_0_[1-13,78-80],r1a5
1	Array6	Cust_0_[14-16] ,stok_0_14-16,81-83], r1a6
1	Rack1Vg1(r1a1,r1a4,r1a2]	Hist_0_0,ordr_0_[0,1], ware_0_0, icust20,temp_0_[0]
1	Rack1vg2(r1a3,r1a5,r1a6)	Hist_0_1,ordr_0_[2,3,4],icust10, iordr_0_20,system_1
2	Array1	Cust_0_[17-19],stok_0_[17-18,96-97],r2a1
2	Array2	Cust_0_[20-22],stok_0_[19-21,84-86],r2a2
2	Array3	Cust_0_[23-25],stok_0_[22-24,87-89], r2a3
2	Array4	Cust_0_[26-27],stok_0_[25-27,90-92],icust2_0_1,r2a4
2	Array5	Cust_0_[28-30],stok_0_[28-30,93-95], r2a5
2	Array6	Cust_0_[31-33],stok_0_[31-33,98-100], r2a6
2	Rack2vg1(r2a1,r2a4,r2a2)	Hist_0_2,ordr_0_[5,6],icust_0_21, aux_0, dist_0_0
2	Rack2vg2(r2a3,r2a5,r2a6)	Hist_0_3,ordr_0_[7,8,9],undo_0,iordr_0_21
3	Array1	Cust_0_[34-36],stok_0_[34-35,101-102], r3a1
3	Array2	Cust_0_[37-39],stok_0_[36-38,103-105],r3a2
3	Array3	Cust_0_[40-42],stok_0_[39-41,106-108], r3a3
3	Array4	Cust_0_[43-44],stok_0_[42-44,109-111],icust2_0_2,r3a4
3	Array5	Cust_0_[45-47],stok_0_[45-47,112-114], r3a5
3	Array6	Cust_0_[48-50],stok_0_[48-50,115-117], r3a6
3	Rack3vg1(r3a1,r3a4,r3a2)	Hist_0_4,ordr_0_[10,11]],icust_0_22,istok_0_0,iitem_0_0, sp_0,sp_1
3	Rack3vg2(r3a3,r3a5,r3a6)	ordr_0_[12,13,14],nord_0_0, iordr_0_23, control_001
4	Array1	Cust_0_[51-53],stok_0_[51-52,118-119],r4a1
4	Array2	Cust_0_[54-56],stok_0_[53-55,120-122],r4a2
4	Array3	Cust_0_[57-59],stok_0_[56-58,123-125], r4a3
4	Array4	Cust_0_[60-62],stok_0_[59-60,126-127],icust2_0_3,r4a4
4	Array5	Cust_0_[63-65],stok_0_[61-63,128-130], r4a5
4	Array6	Cust_0_[66-68],stok_0_[64-66,131-133], r4a6
4	Rack4vg1(r4a1,r4a4,r4a2)	Hist_0_5,iware_0_0, ordr_0_[15,16],icust_0_23,istok_0_0

Rack	Array #/VG	Datafile
4	Rack4vg2(r4a3,r4a5,r4a6)	Iitem-0_0,ordr_0_[17,18,19], idist_0_0, iordr_0_22, control_002

Table 4-2: Bull Escala PL1660R Data Distribution

4.3. Data Base Model Implemented

A statement must be provided that describes the data base model implemented by the DBMS used.

The relational database manager used for this test was Oracle Database 10g Enterprise Edition.

4.4. Partitions/Replications Mapping

The mapping of data base partitions/replications must be explicitly described.

Bull did not implement horizontal or vertical partitioning for this TPC-C test.

4.5. 60 Day Space Calculation

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

TPM	404462.54					
Warehouses	36000					
SEGMENT	TYPE	BLOCKS	BLOCK SIZE	FIVE PCT	DAILY GROW	TOTAL (MB)
CUSTCLUSTER	CLUSTER	252751138	4096	12637557	0	1036674.59
DB_STAT	SYS	524288	4096	0	0	2048.00
DISTCLUSTER	CLUSTER	385456	4096	19273	0	1580.97
HIST	TABLE	16648066	4096	0	2992675	76721.64
ICUST1	INDEX	1622048	16384	81102	0	26611.73
ICUST2	INDEX	14612864	4096	730643	0	59935.58
IDIST	INDEX	45256	4096	2263	0	185.62
IITEM	INDEX	2816	4096	141	0	11.55
IORDR2	INDEX	10041330	4096	502067	0	41185.14
ISTOCK	INDEX	4503840	16384	225192	0	73891.13
ITEMCLUSTER	CLUSTER	4223	4096	211	0	17.32
IWARE	INDEX	11506	4096	575	0	47.19
NORDCLUSTER_QUEUE	CLUSTER	2761596	4096	138080	0	11326.86
ORDRCLUSTER_QUEUE	CLUSTER	56974200	16384	0	10241747	1050249.17
STOKCLUSTER	CLUSTER	514800117	2048	25740006	0	1055742.43
SYSAUX	SYS	30720	4096	0	0	120.00
SYSTEM	SYS	102400	4096	0	0	400.00
SYS_IQ000009766$$	SYS	225960	16384	11298	0	3707.16
SYS_IQ000009770$$	SYS	306844	4096	15342	0	1258.54
WARECLUSTER	CLUSTER	38776	4096	1939	0	159.04
Total		876,393,444		40,105,689	13,234,422	3,441,873.65

Dynamic space	955,253	Initial MB for (History+Orde	
Static space	2,314,903	Initial blocks +5% -Dynamic	
Daily growth	171,717		
Daily spread	0	Oracle may be configured such that daily spread is 0	
60-day space (MB)	12,617,949		
60-day (GB)	12,322.22		
		new_order	90699620
Log block size	512	Redo blocks written	953804359
Log blocks/tpmC	10.52	Number of log blocks used in one tpmC	
8-hour log (GB)	973.52		

Disk Type	**Disk Formatted Capacity**	**# of Disks**	**SUT Capacity (GB)**	**# of disks**	**Capacity(GB)**
FastT 36GB	32.76	720	23587.2	720	23587.2
Log (RAID5)	31.17	60	1870.2	60	1870.2
OS SAS 73GB	73	2.00	146	2.00	146
Total Capacity(GB)					25,603

Table 4-3: Space Calculation

5 Clause 5: Performance Metrics and Response Time Related Items

5.1. Response Times

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

Table 5-1 lists the response times and the ninetieth percentiles for each of the transaction types for the measured system.

5.2. Keying and Think Times

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

Table 5-1 lists the TPC-C keying and think times for the measured system.

Response Times	New Order	Payment	Order Status	Delivery (int./def.)	Stock Level	Menus
90%	0.69	0.68	0.69	0.10/0.03	0.68	0.10
Average	0.34	0.33	0.34	0.10/0.02	0.33	0.10
Maximum	15.02	6.39	5.67	4.91/0.4	7.74	8.26
Think Times						
Minimum	0.01	0.01	0.01	0.01	0.01	N/A
Average	12.01	12.01	10.02	5.01	5.01	N/A
Maximum	120.10	120.10	100.10	50.10	50.10	N/A
Keying Times						
Minimum	18.00	3.00	2.00	2.00	2.00	N/A
Average	18.01	3.01	2.01	2.01	2.01	N/A
Maximum	18.04	3.04	2.03	2.03	2.03	N/A

Table 5-1: Think and Keying Times

5.3. Response Time Frequency Distribution

Response time frequency distribution curves must be reported for each transaction type.

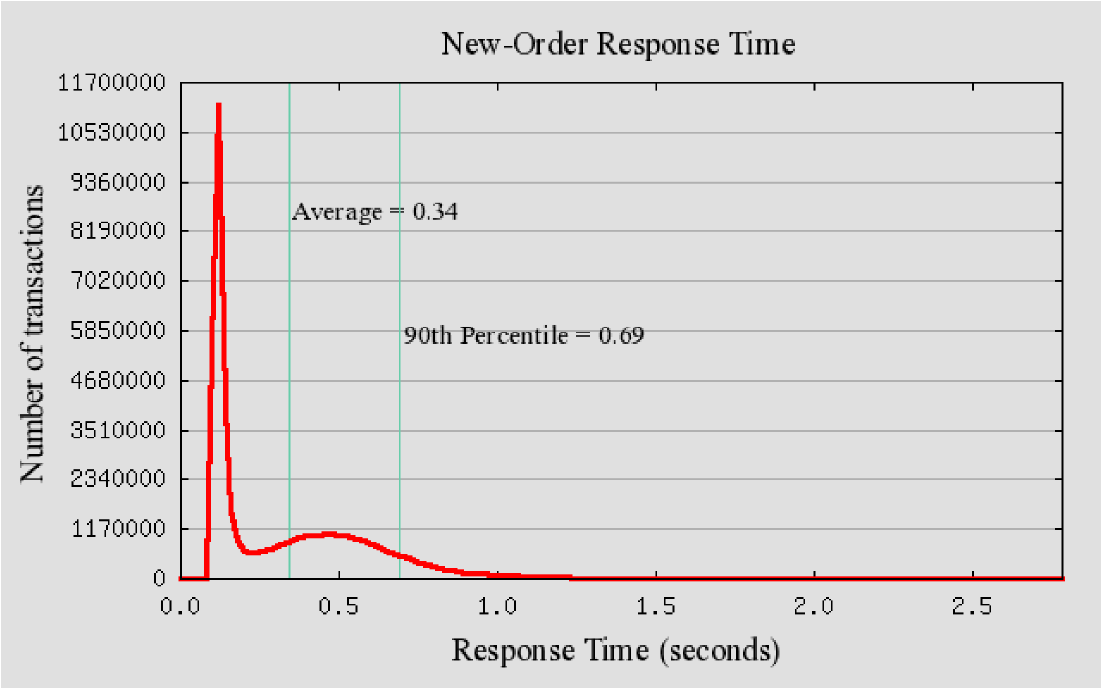


Figure 5-1: New-Order Response Time Distribution

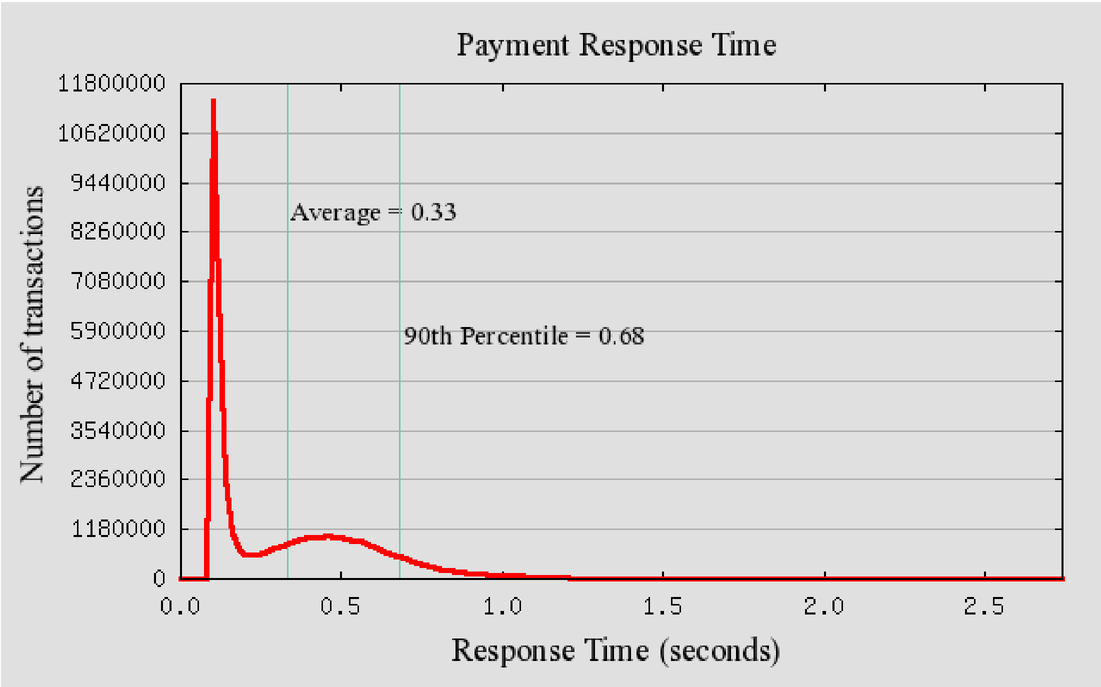


Figure 5-2: Payment Response Time Distribution

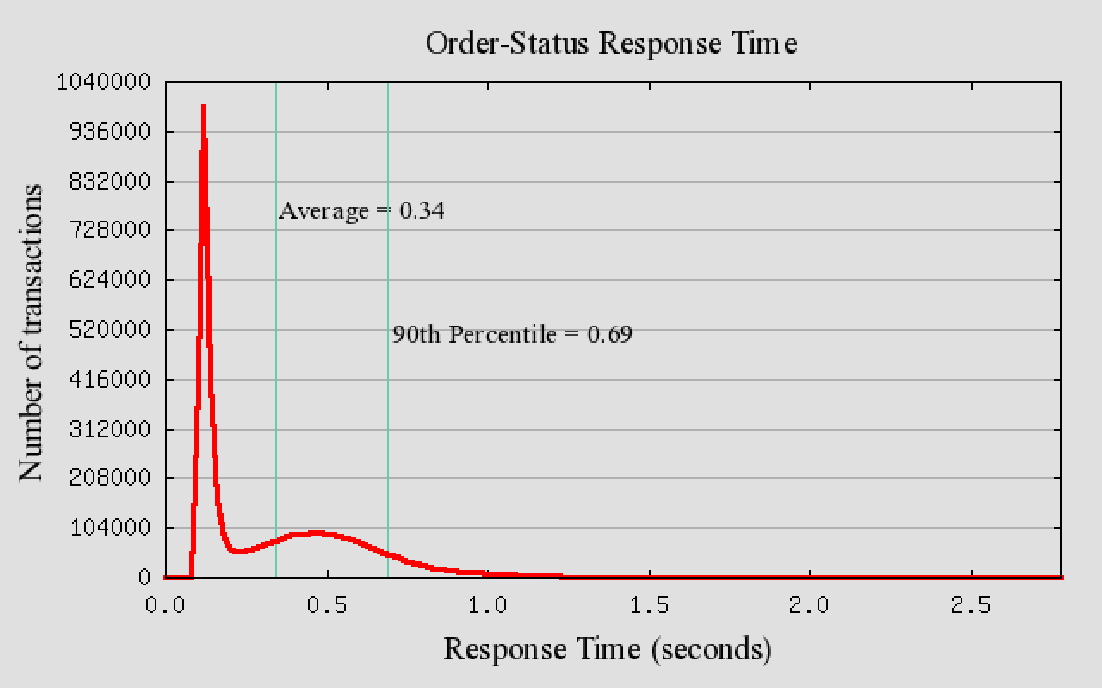


Figure 5-3: Order-Status Response Time Distribution

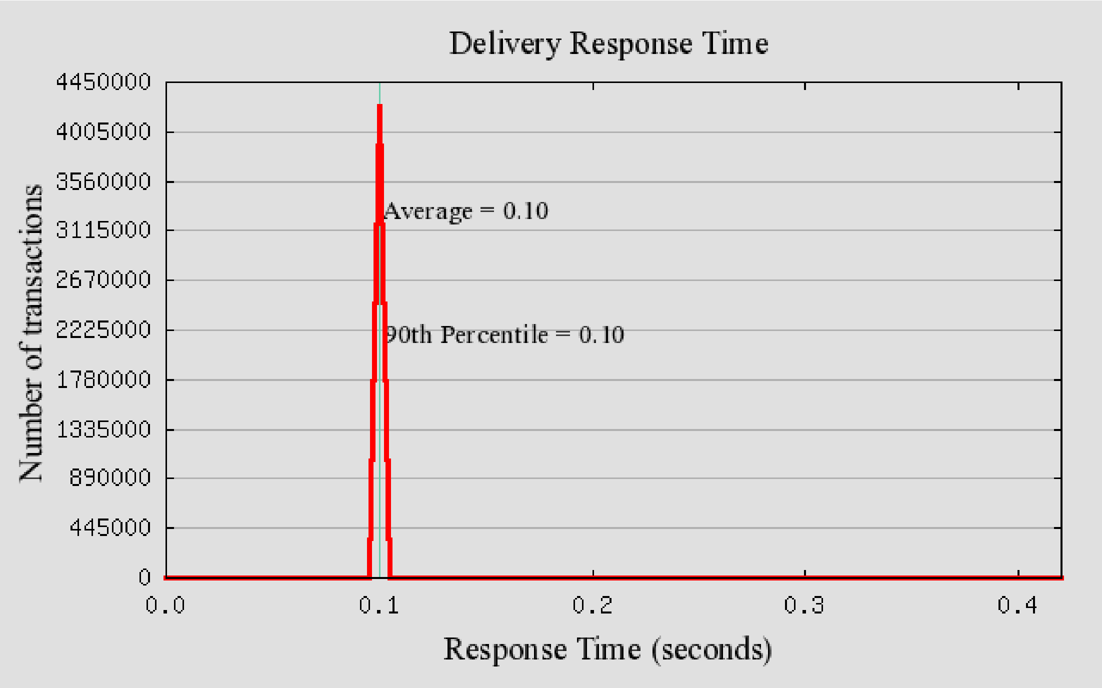


Figure 5-4: Delivery (Interactive) Response Time Distribution

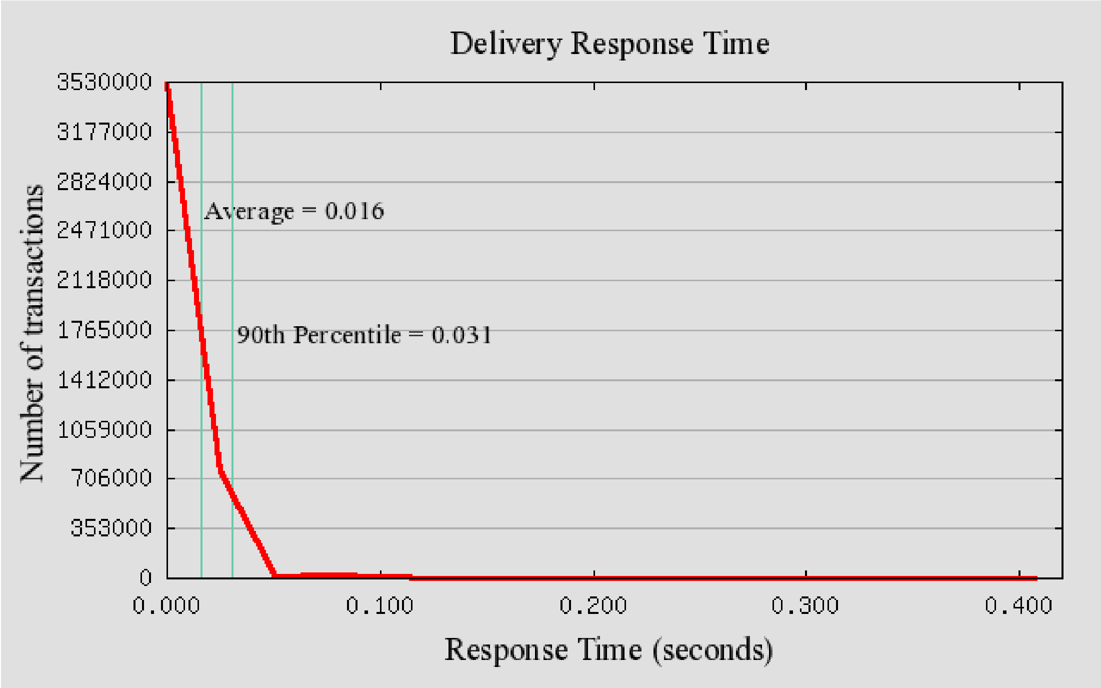


Figure 5-5: Delivery (Deferred) Response Time Distributio

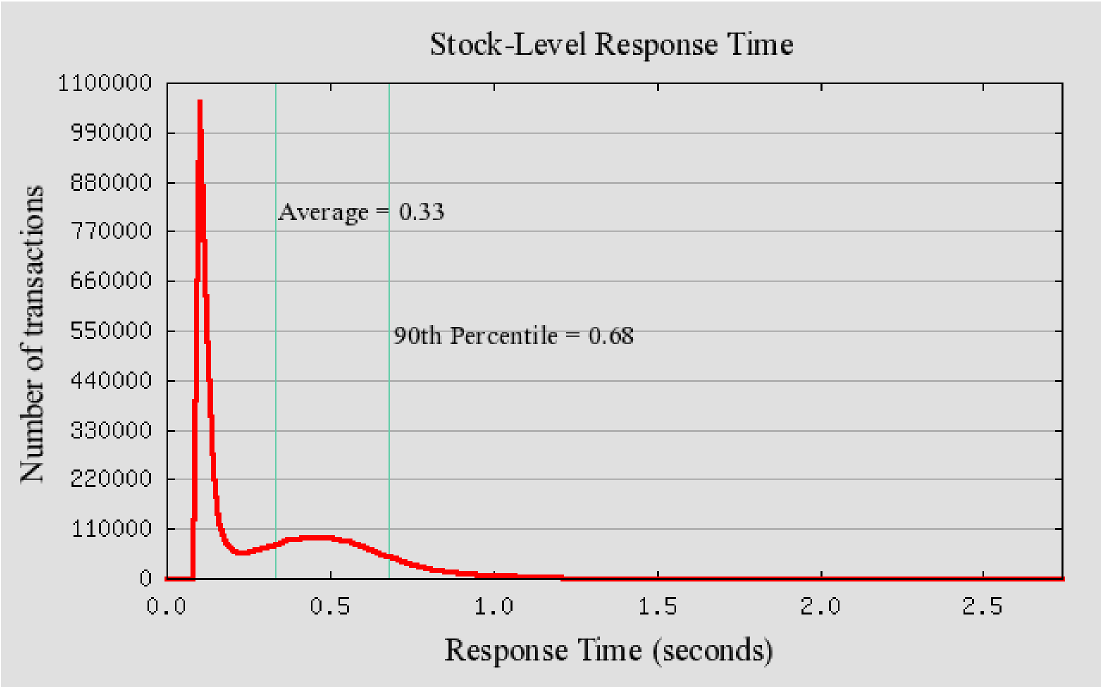


Figure 5-6: Stock Level Response Time Distribution

5.4. Performance Curve for Response Time versus Throughput

The performance curve for response times versus throughput must be reported for the New-Order transaction.

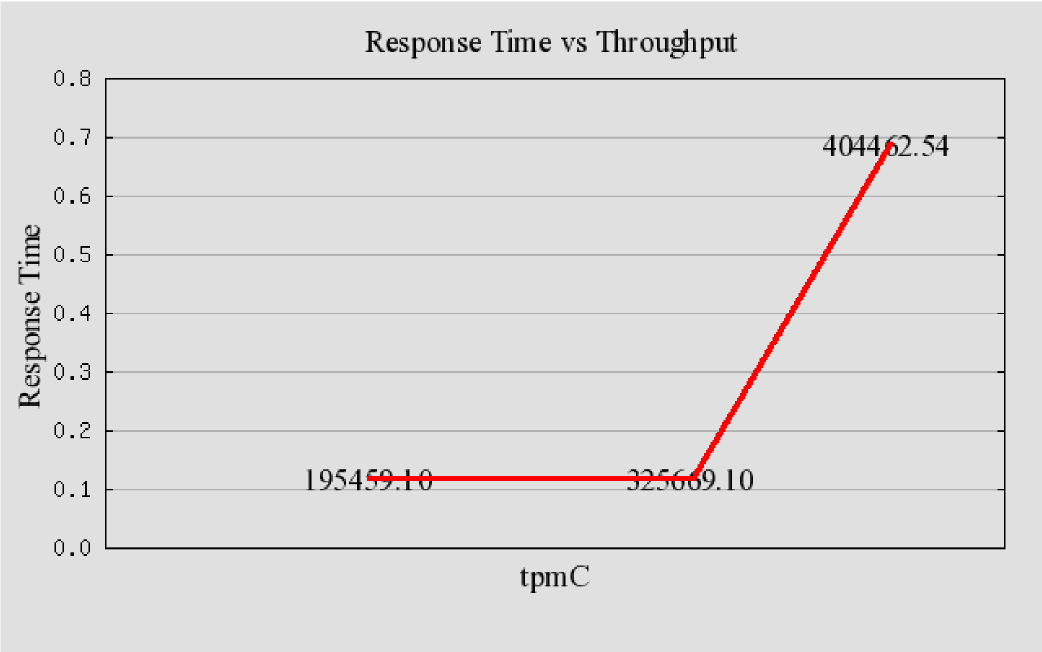


Figure 5-7: New-Order Response Time vs. Throughput

5.5. Think Time Frequency Distribution

A graph of the think time frequency distribution must be reported for the New-Order transaction.

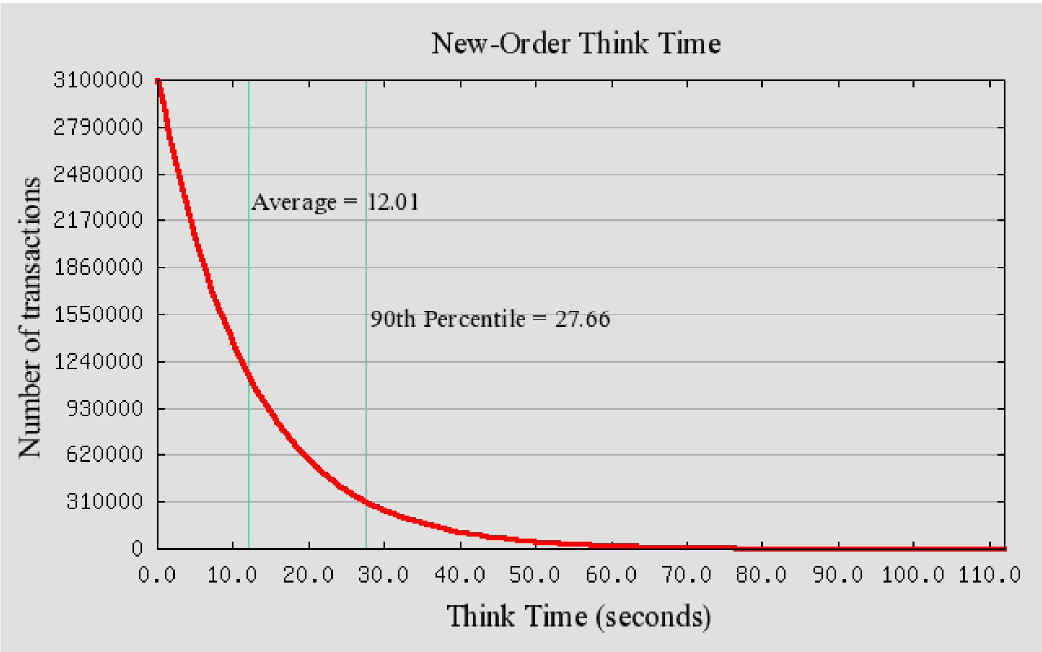


Figure 5-8: New-Order Think Time Distribution

5.6. Throughput versus Elapsed Time

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

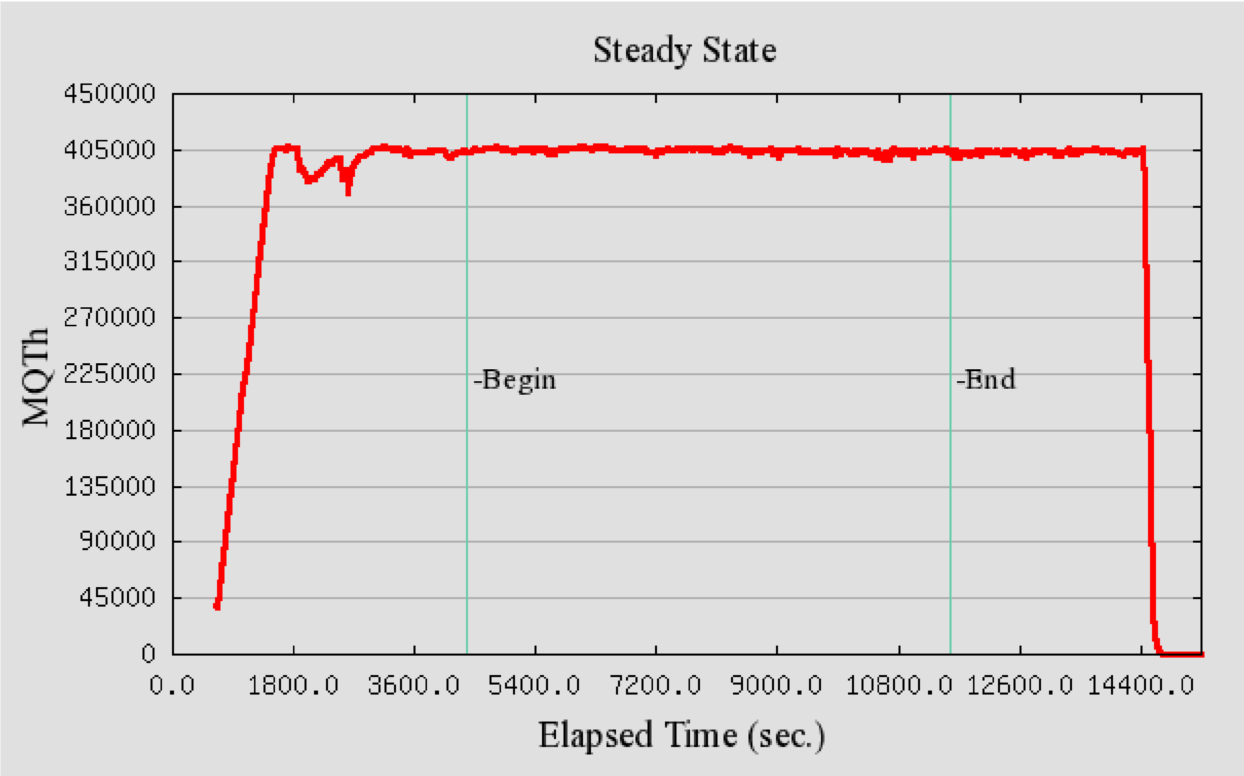


Figure 5-9: New-Order Throughput vs. Elapsed Time

5.7. Steady State Determination

The method used to determine that the SUT had reached a steady state prior to commencing the measurement interval must be described.

All the emulated users were allowed to logon and do transactions. The user ramp-up phase is clearly visible on the graph above. Refer to the Numerical Quantities Summary pages for the rampup time. Figure 5-9 New-Order throughput versus Elapsed Time graph shows that the system maintained a steady state during the measurement interval.

5.8. Work Performed During Steady State

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

A 2-hour measurement interval was used to guaranty that all work normally performed during an 8-hour sustained test are included in the reported throughput.

5.8.1. Transaction Flow

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

Microsoft COM+ for Windows 2003 Server was used as a Transaction Monitor(TM). The transaction framework was divided into three programs. The front end program, Microsoft Internet Information Server (IIS), handled all HTML requests through an ISAPI module, a back end database client program (COM+), which connected to the database, and a database server program which handled all database operations at the SUT (Oracle10g). Both the front and back end programs ran on the client systems. The front end program communicates with database client programs through COM+

RPC calls. IIS ISAPI code communicates with the clients through HTML over Ethernet. The database client program communicates with the Server system over Ethernet using SQL*Net calls. Besides calling initialization code during startup, all other functions are transparent to the application code. IIS and COM+ routes the transactions and balances the load according to the options defined in the configuration file (Windows Registry) in appendix B.2, IIS ISAPI code is capable based on this configuration file to direct transactions to COM+ pools. Delivery Transactions are Asynchronous and are handled in the IIS ISAPI code by implementing muliple configurably threads to processes requests from a common queue. The transaction flow is described below.

- COM+ is configured with 1 pool having 14 objects each with a connection to the database..
- ISAPI is configured with 2 threads to handle delivery threads.
- A total of 30000 browser entries are set up in ISAPI.
- IIS is configured with 800 threads to handle the communcation with the users.
- When the users login to the webserver the entire framework is established, including the connections to the database and the common Browser Array in ISAPI.
- When browsers are started, each emulated use connects to the IIS webserver, which has been configured to have all html pages handled by ISAPI code disclosed in Appendix A.
- The TPC-C user chooses the transaction type and proceeds to fill the screen fields required for the transaction.
- The ISAPI code accepts all values entered by the user and transmits those values to one of the TPC-C back end programs. The transaction is performed through a COM+ RPC. There is an interface for each TPC-C transaction type and each TPC-C back end program exports these interfaces. COM+ transparently routes the RPC to one of the servers exporting the corresponding handle.
- The delivery transactions are executed by placing the request on a queue in ISAPI.
- A TPC-C back-end server program receives a RPC and proceeds to execute all database operations related to the request. All information entered on the users emulated browser is contained in the RPC.
- Once the transaction is done (committed or rolled back), the server program fills in the output parameters. The RPC is then sent back to the ISAPI code.
- When the RPC returns to the ISAPI code, the routine writes the transaction out on the users browser

5.8.2. Database Transaction

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

Using SQL*Net calls, the TPC-C back-end program interacts with Oracle 10g 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.

Oracle 10g Server proceeds to update the database as follows:

When Oracle 10g 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, Oracle 10g 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.

5.8.3. Checkpoints

A checkpoint is the process of writing all modified data pages to disk. The TPC-C benchmark was setup to cause a checkpoint when the redo log file is filled up. After the first checkpoint a log switch was perform every 28:05 minutes. Two checkpoints occurs during the rampup period, and four other occurring during the measurement interval. The duration of the checkpoint on average is less than 25:30 minutes.

5.9. Measurement Interval

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

A 2-hour measurement interval was used.

6 Clause 6: SUT, Driver, and Communication Definition Related Items

6.1. RTE Availability

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

Bull used a RTE developped by IBM for these tests. Appendix D contains the scripts used in the testing.

6.2. Measurement Interval

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

A 2-hour measurement interval was used. No connections were lost during the run.

6.3. Functionality and Performance of Emulated Components

It must be demonstrated that the functionality and performance of the components being emulated in the Driver System are equivalent to that of the priced system.

No components were emulated.

6.4. Network Bandwidth

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

The network between the clients and the database server was configured as 1000 MegaBits per second Full Duplex.

6.5. Operator Intervention

If the configuration requires operator intervention, the mechanism and the frequency of this intervention must be disclosed.

No operator intervention is required to sustain the reported throughput.

7 Clause 7: Pricing Related Items

7.1. Hardware and Programs Used

A detailed list of the hardware and software used in the priced system must be reported. 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. Pricing source(s) and effective date(s) must also be reported.

The detailed list of all hardware and software for the priced configuration is listed in the pricing sheets as part of the executive summary. Third Party Pricing Information is provided in Appendix D.

7.2. Three Year Cost of System Configuration

The total 3-year price of the entire configuration must be reported, including: hardware, software, and maintenance charges. Separate component pricing is recommended. The basis of all discounts used must be disclosed.

The pricing details for this disclosure is contained in the executive summary pages. All 3rd party quotations are included at the end of this report in Appendix D. All prices are based on Bull and IBM US list prices.

The components (hardware and software) and the maintenances supplied by Bull are discounted by 37% from list price, only for similar quantities and configuration and in case of a prepay cash.

A discount of $ 649,482 was based on the overall value of the specific components from IBM in the quotation provided in Appendix D.. Discounts for similarly sized configurations with similar quantities and configurations will be similar to those quoted here.

The three years support pricing for Bull S.A. consists of one year warranty (two years for disks) included in the system package price and two years support price, defined as full care in the "GlobalCare" Bull maintenance offer.
This offer is presented in Three levels of service: Bronze, Silver and Gold. The customer may opt, according to their requirements, for the level of their choice. The level of service chosen must be the same for all of the products of the configuration.

Contents of the Gold service:
The Gold service offers a high quality of service, permanent prevention and accelerated response time. It is composed of the following services:
Hardware maintenance
• The reception of 'break-down' calls 24hrs 7/7 through a number allocated by Bull or upon the automatic telephone server or being recorded on the web.
• Telephone product assistance from 8 AM to 8 PM (*) Monday to Friday except bank holidays.
• The customer is called back by an expert within 1 hour of the call being received, not included during the intervention stages.
• Remote maintenance and remote diagnostics of the system (*)
• System controlled remotely (*)
• Access to technical product data via the web.
• Breakdown intervention carried out during working days, between 8 AM and 8 PM Monday to Friday with a delay inferior to 2 hours for a subsystem stops, or inferior to 4 hours for a partly non-functioning system. This consists of the on-site repair and replacement if necessary of parts or faulty equipment broken due to ordinary usage, by new or equivalent parts or equipment. Carrying out these interventions is included in the price of the service.
• The correction of faulty products is carried out within 8 hours of receiving the initial call from the customer.
• The creation and implementation of hardware technical status applicable to Bull customers.
In choosing the Gold level of service, the equivalent level of software support is chosen automatically.
Other extended coverage options are available
(*)The 'Alarm' (Autocalls) service authorises warning messages to be sent by the server to a Bull remote maintenance centre. These alarms can be received 24h 7/7, but the reaction depends wholly upon the contractual service cover period. This means that if action is necessary following an alarm, action will only be taken during the periods stated in the maintenance contract. It is mandatory to have the material necessary to alarming and remote maintenance to benefit this functionnality.

The Gold Service is choosen for the system configuration.

7.3. Availability Dates

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

All components of the SUT are available now.

7.4. Statement of tpmC and Price/Performance

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

.System	tpmC	3-year System Cost	$/tpmC	Availability Date
Bull Escala PL1660R	404,462.54	1,419,019USD	$3.51 USD	Available

Please refer to the price list on the Executive Summary page for details.

8 Clause 9: Audit Related Items

If the benchmark has been independently audited, then 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.

The auditor's attestation letter is included in this section of this report:

•

INFO SIZING

TPC CERTIFIED AUDITOR

Benchmark Sponsor: Jean-Francois Lemerre
Bull SAS
Rue Jean Jaures
78340 Les Clayes sous bois
France

December 13, 2007

I verified the TPC Benchmark™ C performance of the following Client Server configuration:

Platform: Bull Escala PL1660R c/s
Operating system: AIX 5L Version 5.3
Database Manager: Oracle Database 10g Enterprise Edition
Transaction Manager: Microsoft COM+

The results were:

CPU's Speed	Memory	Disks	NewOrder 90% Response Time	tpmC
Server: Bull Escala PL1660R				
2 x Dual-Core POWER6 (4.7 GHz)	192 GB (32 MB L3/Chip)	780 x 36.4 GB ext. 2 x 73.4 GB int.	0.69 Seconds	404,462.54
16 Clients: IBM System x346 (each with)				
2 x Xeon (3.2 GHz)	2.0 GB (2 MB L2/CPU)	1 x 36 GB int.	n/a	n/a

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

The following verification items were given special attention:

- The transactions were correctly implemented
- The database records were the proper size
- The database was properly scaled and populated
- The ACID properties were met
- 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.
- At least 90% of all delivery transactions met the 80 Second completion time limit
- All 90% response times were under the specified maximums
- The measurement interval was representative of steady state conditions
- The reported measurement interval was 120 minutes
- Four checkpoints were executed during the measurement interval
- The 60 day storage requirement was correctly computed
- The system pricing was verified for major components and maintenance

Additional Audit Notes:

None.

Respectfully Yours,

François Raab, President

125 West Monroe Street • Colorado Springs, CO 80907 • 719 473 7555 • www.sizing.com

Appendix - A: Client Server Code

A.1 Client/Terminal Handler Code

tpccIsapi.def

```
; tpccIsapi.def : declares the module parameters for the DLL.

LIBRARY     "tpccIsapi"

EXPORTS
  HttpExtensionProc
  GetExtensionVersion
  TerminateExtension
```

tpcc.h

```
// Common defines and structures use internally by client code
// Not to be confused with structures actually passed in transaxtions
//

// standard includes

#ifndef _COMMON_TPCC
#define _COMMON_TPCC

#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <sys/timeb.h>
#include <time.h>

#ifdef DB2
  #include <db2tpcc.h>
#endif

#ifdef ORACLE
  #include "ora_tpcc.h"
#endif

#ifdef SYBASE
  #include <sybtpcc.h>
#endif


#include <iostream>
#include <fstream>
#include <process.h>
#include <ios>

//////////////////////////////////////////////////////////////////////
// Defines
//////////////////////////////////////////////////////////////////////

#define    OK               0
#define    INVALID_STATUS        -1
#define    ERR              -1
#define    INVALID_COM_STATUS    -2


#define TXN_MAX_COMMANDS        55
#define MAX_TRANSACTIONS       14
#define MAX_CMD_LENGTH          100
#define INPUT_ITEMS            3
#define MAX_INT_BUFFER          15
#define NORD_ITEMS             15
#define ITEM_START             11
#define ITEM_END              55
#define MAX_ITEMS              15
#define MAX_STRING_LEN           256
#define MAX_HTML_PAGE_LEN       4096
#define MAX_HTML_HEADER_LEN        512

#define DELIVERY_THREADS_NUM    100

#define DISTRICTS_PER_WAREHOUSE    10
//////////////////////////////////////////////////////////////////////
// Transaction Codes
//////////////////////////////////////////////////////////////////////

#define    TXN_LOGIN            0
#define    TXN_NEW_ORDER           1
#define    TXN_PAYMENT           2
#define    TXN_ORDER_STATUS      3
#define    TXN_DELIVERY         4
#define    TXN_STOCK            5
#define    TXN_EXIT           6
#define    TXN_LOGIN_RESULTS        7
#define    TXN_NEW_ORDER_RESULTS   8
#define    TXN_PAYMENT_RESULTS      9
#define    TXN_ORDER_STATUS_RESULTS 10
#define    TXN_DELIVERY_RESULTS      11
#define    TXN_STOCK_RESULTS        12

#define    CMD_NORD             "nord"
#define    CMD_PYMT             "pymt"
#define    CMD_ORDS             "ords"
#define    CMD_DLVY             "dlvy"
#define    CMD_STOK             "stok"
#define    CMD_EXIT            "exit"
#define    CMD_MENU             "menu"

#define    APP_NAME             "tpcc.html"
#define    HEADER              "Content-Type:text/html\r\nContent-
Length: %d\r\nConnection: Keep-Alive\r\n\r\n"

//////////////////////////////////////////////////////////////////////
// URL Commands
//////////////////////////////////////////////////////////////////////

#define    CMD_TXN_ID           "00"
#define    CMD_TERM_ID            "01"
#define    CMD_W_ID         "02"
#define    CMD_D_ID         "03"
#define    CMD_C_ID         "04"
#define    CMD_C_NAME          "05"
#define    CMD_C_W_ID          "06"
#define    CMD_C_D_ID          "07"
#define    CMD_AMT_PAID        "08"
#define    CMD_STK_THRESHOLD    "09"
#define    CMD_CARRIER_NUM       "10"

#define    ITEM01_SUPP_W        "11"
#define    ITEM01_ITEM_NUM       "12"
#define    ITEM01_OTY         "13"


#define CHAR_FILL            ' '
#define NUMERIC_FILL         ' '
#define NEGITIVE_SYMBOL           '-'
#define MONEY_SYMBOL           '$'
#define DECIMAL_SYMBOL            '.'
#define ZERO_SYMBOL            '0'
#define ZIP_DELIMITER          '-'
#define PHONE_DELIMITER           '-'
#define DATE_DELIMITER          '-'
#define TIME_DELIMITER          ':'

#define DEFAULT_MONEY64_LEN      15
#define DEFAULT_MONEY32_LEN      9
#define DEFAULT_MONEY16_LEN      9
```

```
#define DEFAULT_NUMERIC64_LEN    15
#define DEFAULT_NUMERIC32_LEN    9
#define DEFAULT_NUMERIC16_LEN    9

#define DEFAULT_DECIMAL64_LEN    5
#define DEFAULT_DECIMAL32_LEN    5
#define DEFAULT_DECIMAL16_LEN    5

#define DEFAULT_DATETIME_LEN      19
#define DEFAULT_DATE_LEN        11
#define DEFAULT_TIME_LEN        8

#define DEFAULT_STRING_LEN       25
#define DEFAULT_ZIP_LEN          17
#define DEFAULT_PHONE_LEN        18

///////////////////////////////////////////////////////////////////////
// String Field Lengths
///////////////////////////////////////////////////////////////////////

#define NAME_LEN      24
#define LAST_NAME_LEN     16
#define FIRST_NAME_LEN    16
#define INITIALS_LEN     2

#define CREDIT_LEN      2

#define STREET_LEN         20
#define CITY_LEN        20
#define STATE_LEN        2
#define ZIP_LEN          9

#define PHONE_LEN       16
#define DATA_LEN       200

#define ITEM_LIST       15
#define ORDER_LIST      10

///////////////////////////////////////////////////////////////////////
// Type definitions
///////////////////////////////////////////////////////////////////////

typedef __int8         INT8b;
typedef __int16          INT16b;
typedef __int32          INT32b;
typedef __int64          INT64b;

typedef unsigned __int8    UINT8b;
typedef unsigned __int16  UINT16b;
typedef unsigned __int32  UINT32b;
typedef unsigned __int64  UINT64b;

typedef INT16b          sqlint16;
typedef INT32b          sqlint32;
typedef INT64b          sqlint64;

typedef INT16b          int16_t;
typedef INT32b          int32_t;
typedef INT64b          int64_t;

typedef char            BYTE8b;
typedef double           DOUBLE;
typedef unsigned long    NATURAL;

///////////////////////////////////////////////////////////////////////
// Date and time values
///////////////////////////////////////////////////////////////////////

#define SECONDS_IN_DAY      86400
#define SECONDS_IN_HOUR      3600
#define SECONDS_IN_MINUTE   60
#define GMT_OFFSET       5

#define DAYS_IN_YEAR     365
#define YEARS_IN_LEAP   4
#define START_YEAR        1970
#define MONTHS_IN_YEAR     12

///////////////////////////////////////////////////////////////////////
// Error codes
///////////////////////////////////////////////////////////////////////
#define ERR_INVALID_TXN_TYPE       -1

#define ERR_MISSING_W_ID           -2
#define ERR_NON_NUMERIC_W_ID       -3
#define ERR_MISSING_D_ID         -4
#define ERR_NON_NUMERIC_D_ID       -5
#define ERR_MISSING_C_ID         -6
#define ERR_NON_NUMERIC_C_ID       -7

#define ERR_MISSING_SUPP_W         -8
#define ERR_NON_NUMERIC_SUPP_W       -9
#define ERR_MISSING_ITEM_NUM        -10
#define ERR_NON_NUMERIC_ITEM_NUM   -11
#define ERR_MISSING_ITEM_QTY       -12
#define ERR_NON_NUMERIC_ITEM_QTY    -13

#define ERR_MISSING_CLAST_NAME      -14
#define ERR_NON_NUMERIC_CUST_W_ID     -15
#define ERR_NON_NUMERIC_CUST_D_ID   -16
#define ERR_MISSING_AMOUNT_PAID        -17
#define ERR_NON_NUMERIC_AMOUNT_PAID   -18

#define ERR_INVALID_D_ID        "ERROR : Invalid District ID. Try
Again."
#define ERR_INVALID_W_ID       "ERROR : Invalid Warehouse ID.
Try Again."
#define ERR_INVALID_C_ID        "ERROR : Invalid Customer ID.
Try Again."
#define ERR_INVALID_SUPPLY_W_ID    "ERROR : Invalid Item
Supply Warehouse. Try Again."
#define ERR_INVALID_ITEM_NUM    "ERROR : Invalid Item
Number. Try Again."
#define ERR_INVALID_ITEM_QTY     "ERROR : Invalid Item Qty.
Try Again."
#define ERR_MISSING_C_ID_OR_CLAST   "ERROR : Must Enter
Customer Id or Customer Last Name. Try Again."
#define ERR_INVALID_PAYMENT_AMOUNT "ERROR : Invalid
Payment Amount. Try Again."
#define ERR_INVALID_CARRIER      "ERROR : Invalid Carrier
Number. Try Again."
#define ERR_INVALID_THRESHOLD    "ERROR : Invalid
Threshold. Try Again."
#define ERR_INVALID_C_D_ID      "ERROR : Invalid Customer
District Id. Try Again."
#define ERR_INVALID_C_W_ID        "ERROR : Invalid Customer
Warehouse Id. Try Again."
#define ERR_TERMINAL_FULL      "ERROR : Terminal can not
support user.  Terminal full."
#define ERR_C_ID_OR_CLAST_ONLY    "ERROR : Either
customer id or customer last name can be specified."

#define ERR_UNABLE_TO_OPEN_REG        -50
#define ERR_DLVY_THREAD_FAILED       -51
#define ERR_DLVY_SEMAPHORE_INIT_FAILED -52
#define ERR_DLVY_EVENT_INIT_FAILED    -53
#define ERR_DLVY_QUEUE_EATING_TAIL      -54
#define ERR_DLVY_QUEUE_CALLOC_FAIL     -55

#define ERR_INVALID_USERNAME        -70
#define ERR_INVALID_PASSWORD        -71
#define ERR_INVALID_DB_NAME          -72
#define ERR_INVALID_REGISTERY_KEY      -73
```

```
#define ERR_DB2_DLL_NOT_LOADED       -74
#define ERR_ORACLE_DLL_NOT_LOADED     -75
#define ERR_CONNECT_ADDRESS_NOT_FOUND -76
#define ERR_NORD_ADDRESS_NOT_FOUND    -77
#define ERR_PYMT_ADDRESS_NOT_FOUND    -78
#define ERR_ORDS_ADDRESS_NOT_FOUND    -79
#define ERR_DLVY_ADDRESS_NOT_FOUND    -80
#define ERR_STOK_ADDRESS_NOT_FOUND    -81
#define ERR_NULL_DLL_NOT_LOADED       -82
#define ERR_UNKNOWN_DB            -83
#define ERR_DISCONNECT_ADDRESS_NOT_FOUND -84
#define ERR_ORA_DLL_NOT_LOADED        -85
#define ERR_SYB_DLL_NOT_LOADED       -86
#define ERR_DBINIT_ADDRESS_NOT_FOUND  -87

#define ERR_SAVING_CONTEXT           -90
#define ERR_DETACHING_CONTEXT        -91
#define ERR_ATTACHING_CONTEXT        -92
#define ERR_HANDLE_IN_USE           -93

#define ERR_CONNECT_TO_TM_FAILED     -99
#define ERR_DLVY_LOG_OPEN_FAILED     -100
#define ERR_DLVY_QUEUE_FULL          -101

////////////////////////////////////////////////////////////////////
// Registery Definitions
////////////////////////////////////////////////////////////////////
#define    REGISTERY_SUB_KEY   "SOFTWARE\\TPCC"

#define    DELIVERY_THREADS     "dlvyThreads"
#define    DELIVERY_QUEUE_LEN   "dlvyQueueLen"
#define    DELIVERY_LOG_PATH    "dlvyLogPath"
#define    ERROR_LOG_FILE       "errorLogFile"
#define    HTML_TRACE_LOG_FILE    "htmlTraceLogFile"
#define    DB_NAME              "dbName"
#define    NULL_DB              "nullDB"
#define    COM_NULL_DB          "comnullDB"
#define    CLIENT_NULL_DB       "clientNullDB"

#define    NUM_USERS         "numUsers"
#define    DB_TYPE           "dbType"

#define    TXN_MONITOR          "txn_server"
#define    COMM_POOL           "comm_pool"
#define    HTML_TRACE          "htmlTrace"
#define    ISAPI_TRACE         "isapi_trace"

#define    DEFAULT_DLVY_THREADS    1
#define    DEFAULT_DLVY_QUEUE_LEN   10
#define    DEFAULT_DLVY_LOG_PATH
   "c:\\inetpub\\wwwroot\\tpcc\\dlvy"
#define    DEFAULT_ERROR_LOG_FILE
   "c:\\inetpub\\wwwroot\\tpcc\\errorLog.txt"
#define    DEFAULT_HTML_TRACE_LOG_FILE
   "c:\\inetpub\\wwwroot\\tpcc\\htmlTrace.txt"
#define    DEFAULT_NUM_USERS       10000

#define    DEFAULT_DB_NAME         "tpcc"

////////////////////////////////////////////////////////////////////
// Structure defines
////////////////////////////////////////////////////////////////////

struct nord_wrapper {
     in_neword_struct   in_nord;
     out_neword_struct out_nord;
};

struct paym_wrapper {
   struct in_payment_struct in_paym;
   struct out_payment_struct out_paym;
};
```

```
struct ords_wrapper {
   struct in_ordstat_struct in_ords;
   struct out_ordstat_struct out_ords;
};

struct dlvy_wrapper {
   struct in_delivery_struct in_dlvy;
   struct out_delivery_struct out_dlvy;
};

struct stok_wrapper {
   struct in_stocklev_struct in_stok;
   struct out_stocklev_struct out_stok;
};

typedef struct
{
   int   year;
   int   month;
   int   day;

   int   hour;
   int   minute;
   int   second;
} datetime;

struct NEWORDERDATA
{
   struct   in_items_struct {
      int  s_OL_I_ID;
      int  s_OL_SUPPLY_W_ID;
      short  s_OL_QUANTITY;
   } in_item[15];

   long long  in_s_O_ENTRY_D_time;  /* init by SUT */
   int      in_s_C_ID;
   int      in_s_W_ID;
   short  in_s_D_ID;
   short  in_s_O_OL_CNT;    /* init by SUT */
   short  in_s_all_local;
   short  in_duplicate_items;

   struct   out_items_struct {
      float   s_I_PRICE;
      float  s_OL_AMOUNT;
      short  s_S_QUANTITY;
      char    s_I_NAME[25];
      char    s_brand_generic;
   } out_item[15];

   long long  out_s_O_ENTRY_D_time;
   double  out_s_W_TAX;
   double  out_s_D_TAX;
   double  out_s_C_DISCOUNT;
   double  out_s_total_amount;
   int      out_s_O_ID;
   short  out_s_O_OL_CNT;
   short  out_s_transtatus;
   short  out_deadlocks;
   char    out_s_C_LAST[17];
   char    out_s_C_CREDIT[3];

};

struct PAYMENTDATA
{
   long long  in_s_H_DATE_time;
   double  in_s_H_AMOUNT;
   int      in_s_W_ID;
   int      in_s_C_W_ID;
   int      in_s_C_ID;
```

```
   short  in_s_C_D_ID;
   short  in_s_D_ID;
   char   in_s_C_LAST[17];

   long long  out_s_H_DATE_time;
   long long  out_s_C_SINCE_time;
   double  out_s_C_CREDIT_LIM;
   double  out_s_C_BALANCE;
   double  out_s_C_DISCOUNT;
   int      out_s_C_ID;
   short  out_s_transtatus;
   short  out_deadlocks;
   char  out_s_W_STREET_1[21];
   char  out_s_W_STREET_2[21];
   char  out_s_W_CITY[21];
   char  out_s_W_STATE[3];
   char  out_s_W_ZIP[10];
   char  out_s_D_STREET_1[21];
   char  out_s_D_STREET_2[21];
   char  out_s_D_CITY[21];
   char  out_s_D_STATE[3];
   char  out_s_D_ZIP[10];
   char  out_s_C_FIRST[17];
   char  out_s_C_MIDDLE[3];
   char  out_s_C_LAST[17];
   char  out_s_C_STREET_1[21];
   char  out_s_C_STREET_2[21];
   char  out_s_C_CITY[21];
   char  out_s_C_STATE[3];
   char  out_s_C_ZIP[10];
   char  out_s_C_PHONE[17];
   char  out_s_C_CREDIT[3];
   char  out_s_C_DATA[201];
};

struct ORDERSTATUSDATA
{
   int   in_s_C_ID;
   int   in_s_W_ID;
   short in_s_D_ID;
   char  in_s_C_LAST[17];

   double out_s_C_BALANCE;
   long long  out_s_O_ENTRY_D_time;
   int    out_s_C_ID;
   int    out_s_O_ID;
   short  out_s_O_CARRIER_ID;
   short  out_s_ol_cnt;
   struct out_oitems_struct {
      long long  s_OL_DELIVERY_D_time;
      float   s_OL_AMOUNT;
      int   s_OL_I_ID;
      int   s_OL_SUPPLY_W_ID;
      short s_OL_QUANTITY;
   } out_item[15];
   short  out_s_transtatus;
   short  out_deadlocks;
   char   out_s_C_FIRST[17];
   char   out_s_C_MIDDLE[3];
   char   out_s_C_LAST[17];

};

struct DELIVERYDATA
{
   long long  in_s_O_DELIVERY_D_time;
   int   in_s_W_ID;
   short in_s_O_CARRIER_ID;
   int   out_s_O_ID[10];
   short out_s_transtatus;
   short outdeadlocks;
};

struct STOCKLEVELDATA
{
   int   in_s_threshold;
   int   in_s_W_ID;
   short in_s_D_ID;

   int   out_s_low_stock;
   short out_s_transtatus;
   short out_deadlocks;
};

struct DLVYQUEUEDATA
{
   int      warehouse;
   short  in_s_0_CARRIER_ID;

   struct _timeb enqueueTime;
};


//              MISCELLANEOUS HELPER FUNCTIONS
inline void appendText(char **string,char *text);
inline void appendText(char **string,char *text,int length,int justify);
inline void appendChar(char **string,char byte);
inline void DEBUGMSG(FILE * debugFile, char * message);
inline void appendSpaces(char **string,int spaces);

inline void calcOutDateTime(const INT64b value,datetime
*timestamp);
inline int copyOutPhone(char *buffer,char *value,int len);
inline bool copyInMoney64(const char * value,INT64b *number);
inline bool copyInMoney32(const char * value,float *number);
inline int copyInMoney(const char *value);
inline void copyOutMoney64(char *buffer,INT64b value,unsigned int
len);
inline int copyOutDateTime(char*buffer,INT64b value);
inline int copyOutDate(char *buffer,INT64b value);
inline int copyOutTime(char *buffer,INT64b value);
inline int copyOutDecimal64(char *buffer,INT64b value,unsigned int
len);

inline UINT16b changeOrder16(UINT16b value);
inline UINT32b changeOrder32(UINT32b value);
inline UINT64b changeOrder64(UINT64b value);

inline INT16b changeOrder16(INT16b value);
inline INT32b changeOrder32(INT32b value);
inline INT64b changeOrder64(INT64b value);

//
// Name         : appendText
// Description  :
//              Append text to string
// Parameters   :
//              char ** - string point to append to
//              char * - text to append
// Returns      :
//              None
// Comments     :
//

inline void appendText(char **string,char *text)
{
   while(*text)
   {
      *(*string)++ = *text++;
   }

   **string='\0';
   return;
}
```

```
//
// Name         : appendText
// Description  :
//              Append text to string
// Parameters   :
//              char ** - string point to append to
//              char * - text to append
//           int - total field length including blank spaces
//           int - justify flag
// Returns      :
//              None
// Comments     :
//           right justify
//           left justify


inline void appendText(char **string,char *text,int length,int justify)
{
  int byteCount = 0;

  if(justify)
  {
    while(*text)
    {
      *(*string)++ = *text++;
      if (++byteCount > length)
        break;
    }

    //append blank spaces if text is less than length at end
    for(byteCount;byteCount < length;byteCount++)
      *(*string)++ = ' ';
  }
  else
  {
    long long textLen = strlen(text);
    for(textLen;textLen < length;textLen++)
      *(*string)++ = ' ';

    while(*text)
      *(*string)++ = *text++;

  }
  **string='\0';
}


// Name                 : appendChar
// Description  :
//                              Append text to string
// Parameters   :
//                              char ** - string point to append to
//                              char * - text to append
// Returns              :
//                              None
// Comments             :
//

inline void appendChar(char **string,char byte)
{
  *(*string)++ = byte;
  **string='\0';

  return;
}


//
// Name       : appendSpaces
// Description  :
//           appends buffer spaces to result page
// Parameters :
//              **htmlPage
//
// Returns    :
//              amount of characters the function appened
//              to the html page
// Comments     :
//

inline void appendSpaces(char **string,int spaces)
{
  for(int index=0;index<spaces;index++)
  {
    *(*string)++ = ' ';
  }

  **string='\0';
}

//
// Name       : appendCustData
// Description  :
//           appends cust data buffer to result page
// Parameters :
//              **htmlPage
//
// Returns    :
//
//              Adds a newline character every 50 characters displayed.
// Comments     :
//

inline void appendCustData(char **string,char *text)
{
  short byteCount = 0;
  while(*text)
  {
    *(*string)++ = *text++;
    byteCount++;
    if((byteCount % 50) == 0)
    {
      *(*string)++ = '\n';
      *(*string)++ = ' ';*(*string)++ = ' ';*(*string)++ = ' ';*(*string)++ =
' ';
      *(*string)++ = ' ';*(*string)++ = ' ';*(*string)++ = ' ';*(*string)++ =
' ';
      *(*string)++ = ' ';*(*string)++ = ' ';*(*string)++ = ' ';
    }
  }
  **string='\0';
}



//
// calcOutDateTime
//
// Title      : Calculate date & time data out of class array
// Parameters : INT64b - date & time expressed in seconds
//           datetime * - timestamp
// Return Value  : None
// Comments     :
//

inline void calcOutDateTime(const INT64b value,datetime
*timestamp)
{
  // fixed days in each month (FEB 29 is special case)
  static int daysInMonth[12] =
{31,28,31,30,31,30,31,31,30,31,30,31};

  // mask out EPOC seconds
```

```
  int dateValue  = ((int) (value & 0xffffffff)) +
            (SECONDS_IN_DAY - (GMT_OFFSET *
SECONDS_IN_HOUR));

  int offset   = (int) (value >> 32);

  // break out the seconds
  int hms     = dateValue % SECONDS_IN_DAY;
  int days = dateValue / SECONDS_IN_DAY;

  int years   = (days - 1) / DAYS_IN_YEAR;
  int leaps   = years / YEARS_IN_LEAP;

  int daysUsed  = (years * DAYS_IN_YEAR) + leaps;

  // adjust the number of days to account for calculated years
  days = days - daysUsed;

  // set the starting year, month, and day
  timestamp->day    = 1;
  timestamp->month  = 1;
  timestamp->year      = START_YEAR + years;

  // is the current year a leap year
  int leap = !(timestamp->year % YEARS_IN_LEAP);

    // apply remaining days based on days in months
    int daysInCurrentMonth;

    while(days)
    {
      // get days in current month
      daysInCurrentMonth = daysInMonth[timestamp->month - 1];
      if(timestamp->month == 2 && leap)
        daysInCurrentMonth = daysInCurrentMonth + 1;

      // days > days in current month
      if(days > daysInCurrentMonth)
      {
        // increment month
        timestamp->month += 1;
        days = days - daysInCurrentMonth;

        // month exceeds months in year
        if(timestamp->month > MONTHS_IN_YEAR)
        {
          // increment year and reset month
          timestamp->year += 1; timestamp->month = 1;

          // are we now on a leap year
          leap = !(timestamp->year % YEARS_IN_LEAP);
        }
      }
      else
      {
        // set day of month to remaioning days
        timestamp->day = days; days = 0;
      }
    }

    // set time values to remaining seconds
    timestamp->hour = hms / SECONDS_IN_HOUR;
    hms = hms % SECONDS_IN_HOUR;

    timestamp->minute = hms / SECONDS_IN_MINUTE;
    timestamp->second = hms % SECONDS_IN_MINUTE;
    return;
  }

//
// copyOutZip
//
// Title       : Copy zip data out of class array
// Parameters : char * - buffer to copy zip string into
//
// Return Value  : int - Length of copy
// Comments      :
//

inline int copyOutZip(char *buffer,char *value,int len =
DEFAULT_ZIP_LEN)
{
  int index       = 0;
  int bufferPos   = 0;

  // add each digit of zip number to buffer inserting delimiter at 5
  while(value[index] && bufferPos < len)
  {
    if(index == 5)
      buffer[bufferPos++] = ZIP_DELIMITER;

    buffer[bufferPos++] = value[index++];
  }

  // space fill to the required length
  while(bufferPos < len)
    buffer[bufferPos++] = CHAR_FILL;

  buffer[bufferPos] = NULL;
  return len;
}

//
// copyOutPhone
//
// Title       : Copy phone data out of class array
// Parameters : char * - buffer to copy phone string into
//
// Return Value  : int - Length of copy
// Comments      :
//

inline int copyOutPhone(char *buffer,char *value,int len =
DEFAULT_PHONE_LEN)
{
  int index       = 0;
  int bufferPos   = 0;

  // add each digit of phone number to buffer inserting delimiter
before 6, 9, and 12
  while(value[index] && index < len)
  {
    switch(index)
    {
    case  6:
    case  9:
    case 12:
      // insert delimiter
      buffer[bufferPos++] = PHONE_DELIMITER;
    default:
      // add phone digit to buffer
      buffer[bufferPos++] = value[index++];
    }
  }

  // space fill to the required length
  while(bufferPos < len)
    buffer[bufferPos++] = CHAR_FILL;

  buffer[bufferPos] = '\0';

  return len;
}
```

```
//
// copyInMoney64
//
// Title      : Copy money data into class array
// Parameters : const char * - value string
// Return Value  : INT64b integer value
// Comments     :
//

inline bool copyInMoney64(const char * value,INT64b *number)
{
  //INT64b   number       = 0;
  int      index       = 0;
  int      decimal       = 0;
  int      decimals     = 0;
  int      digitsAfterDec= 0;

  bool   negitiveFlag= false;

  // convert each digit to a numeric portion
  while(value[index])
  {
    // handle $ . - All the rest assumed numeric
    switch(value[index])
    {
    case MONEY_SYMBOL:
      // ignore $ sign
      break;
    case NEGITIVE_SYMBOL:
      // set negitive flag
      negitiveFlag = true;
      break;

    case DECIMAL_SYMBOL:
      // set decimal
      decimal=1;
      decimals++;
      if(decimals >1)
        //more than 1 decimal point found
        return false;
      break;

    default:
      // adjust decimal places
      decimal = decimal * 10;

      // add digit to running total
      if(value[index] >= '0' && value[index] <= '9')
      {
        if(decimal)
          if(++digitsAfterDec > 2)
            return false;

        *number = (*number * 10) + (value[index] - '0');
      }
      else
      {
        //non-numeric field inserted
        return false;
      }
    }
    index++;
  }


  // apply decimal where decimal not found
  if(decimal < 100)
  {
    if(decimal)
    {
      *number *= (100 / decimal);
    }
    else
    {
      *number *= 100;
    }
  }

  // make negitive
  if(negitiveFlag)
    *number = *number * (-1);

  return true;
}

inline bool copyInMoney32(const char * value,double *number)
{
  int      index       = 0;
  int      decimal       = 0;
  int      decimals     = 0;
  int      digitsAfterDec= 0;

  bool   negitiveFlag= false;

  // convert each digit to a numeric portion
  while(value[index])
  {
    // handle $ . - All the rest assumed numeric
    switch(value[index])
    {
    case MONEY_SYMBOL:
      // ignore $ sign
      break;
    case NEGITIVE_SYMBOL:
      // set negitive flag
      negitiveFlag = true;
      break;

    case DECIMAL_SYMBOL:
      // set decimal
      decimal=1;
      decimals++;
      if(decimals >1)
        //more than 1 decimal point found
        return false;
      break;

    default:
      // adjust decimal places
      decimal = decimal * 10;

      // add digit to running total
      if(value[index] >= '0' && value[index] <= '9')
      {
        if(decimal)
          if(++digitsAfterDec > 2)
            return false;

        *number = (*number * 10) + (value[index] - '0');
      }
      else
      {
        //non-numeric field inserted
        return false;
      }
    }
    index++;
  }


  // apply decimal where decimal not found
  if(decimal < 100)
  {
    if(digitsAfterDec==1)
```

```
      {
         *number /= 10;
      }
      else if (digitsAfterDec==2)
      {
         *number /= 100;
      }
   }

   // make negitive
   if(negitiveFlag)
      *number = *number * (-1);

   return true;
}


//
// copyInMoney
//
// Title      : Convert char string money field to double
// Parameters : const char * - value string
// Return Value  : double integer value
// Comments     :
//

inline int copyInMoney(const char *value)
{
   char buf[20];
   int i,j,decimalFound,digitsAfterDecimal=0;

   int decimal=0;

   //walk past $ if present in char string
   if(*value == '$')
      *value++;

   int len=(int)strlen(value);
   for (i=0;i<len;i++)
   {
      if(value[i] == '.')
      {
         decimalFound++;
         if(decimalFound > 1)
            return -1;
      }
      if(value[i] == '-')


      if (value[i] != '.')
      {
         if(decimal)
         {
            if(digitsAfterDecimal<2)
               digitsAfterDecimal++;
            else
               return -1;
         }
         buf[j++] = value[i];
      }
   }
   int amount = atoi(buf);

   return amount;
}


//
// copyOutMoney64
//
// Title      : Copy money data out of class array
// Parameters : char * - buffer to copy string 64 bit money into
//            INT64b - value
//            unsigned len - max number of bytes to copy
// Return Value  : int - Length of copy
// Comments     :
//

inline void copyOutMoney64(char *buffer,INT64b value,unsigned int
len = DEFAULT_MONEY64_LEN)
{
   unsigned intindex       = len;

   int           places        = 0;

   bool         negitiveFlag= false;
   bool         moneyFlag     = true;

   // NULL terminate string
   buffer[index] = NULL;

   // check length > 0
// if(!index) return len;

   // handle negitive value
   if(value < 0)
   {
      negitiveFlag = true;
      value = value * (-1);
   }

   // break off each digit from value, fill if needed
   do
   {
      if(value)
      {
         // get next digit and add to buffer
         buffer[--index] = (char) (value % 10 + '0');
         value /= 10; places++;

         if(places == 2 && index)
         {
            places++;
            buffer[--index] = DECIMAL_SYMBOL;
         }
      }
      else
      {
         // add zeros to first place before decimal point on (i.e. 0.00)
         if(places < 2 || places == 3)
         {
            buffer[--index] = ZERO_SYMBOL;
         }
         else
         {
            // add the decimal point
            if(places == 2)
            {
               buffer[--index] = DECIMAL_SYMBOL;
            }
            else
            {
               // add the negitive indicator
               if(negitiveFlag)
               {
                  negitiveFlag = false;
                  buffer[--index] = NEGITIVE_SYMBOL;
               }
               else
               {
                  // add the money indicator
                  if(moneyFlag)
                  {
                     moneyFlag = false;
```

```
                buffer[--index] = MONEY_SYMBOL;
              }
              else buffer[--index] = NUMERIC_FILL;
            }
          }
        }

        // need to trace place for decimal point and zero fill
        places++;
      }
   } while(index);

   //return len;
}

//
// copyOutDateTime
//
// Title       : Copy date & time data out of class array
// Parameters : char * - buffer to copy date & time string into
//            INT64b - value
// Return Value  : int - Length of copy
// Comments      : Fixed length
//

inline int copyOutDateTime(char*buffer,INT64b value)
{
   datetime timestamp;

   // break value into time/date components
   calcOutDateTime(value,&timestamp);

   // put month into buffer
   *buffer++ =  (char) ((timestamp.month / 10) + '0');
   *buffer++ =  (char) ((timestamp.month % 10) + '0');
   *buffer++ =  DATE_DELIMITER;

   // put day into buffer
   *buffer++ =  (char) ((timestamp.day / 10) + '0');
   *buffer++ =  (char) ((timestamp.day % 10) + '0');
   *buffer++ =  DATE_DELIMITER;

   // put yearinto buffer
   int   year = timestamp.year;
   *buffer++ =  (char) ((year / 1000) + '0'); year = year  % 1000;
   *buffer++ =  (char) ((year / 100) + '0');   year = year  % 100;
   *buffer++ =  (char) ((year / 10) + '0');
   *buffer++ =  (char) ((year %  10) + '0');
   *buffer++ =  CHAR_FILL;

   // put hour   into buffer
   *buffer++ =  (char) ((timestamp.hour / 10) +   '0');
   *buffer++ =  (char) ((timestamp.hour % 10) +'0');
   *buffer++ =  TIME_DELIMITER;

   // put minute into buffer
   *buffer++ =  (char) ((timestamp.minute /  10) + '0');
   *buffer++ =  (char) ((timestamp.minute %   10) + '0');
   *buffer++ =  TIME_DELIMITER;

   // put second into buffer
   *buffer++ =  (char) ((timestamp.second / 10) + '0');
   *buffer++ =  (char) ((timestamp.second %  10) + '0');

   *buffer  = NULL;   return DEFAULT_DATETIME_LEN;
}
//
// copyOutTime
//
// Title       : Copy date data out of class array
// Parameters : char * - buffer to copy date string into
//            INT64b - value
// Return Value  : int - Length of copy
// Comments      : Fixed length
//

inline int copyOutDate(char *buffer,INT64b value)
{
   datetime timestamp;

   // break value into time/date components
   calcOutDateTime(value,&timestamp);

   // put month into buffer
   *buffer++ = (char) ((timestamp.month / 10) + '0');
   *buffer++ = (char) ((timestamp.month % 10) + '0');
   *buffer++ = DATE_DELIMITER;

   // put day into buffer
   *buffer++ = (char) ((timestamp.day / 10) + '0');
   *buffer++ = (char) ((timestamp.day % 10) + '0');
   *buffer++ = DATE_DELIMITER;

   // put year into buffer
   int year = timestamp.year;
   *buffer++ = (char) ((year / 1000) + '0'); year = year % 1000;
   *buffer++ = (char) ((year / 100) + '0');   year = year % 100;
   *buffer++ = (char) ((year / 10) + '0');
   *buffer++ = (char) ((year % 10) + '0');
   *buffer++ = CHAR_FILL;

   *buffer = NULL;

   return DEFAULT_DATE_LEN;
}

//
// copyOutTime
//
// Title       : Copy time data out of class array
// Parameters : char * - buffer to copy time string into
//            INT64b - value
// Return Value  : int - Length of copy
// Comments      : Fixed length TBD
//

inline int copyOutTime(char *buffer,INT64b value)
{
   datetime timestamp;

   // break value into time/date components
   calcOutDateTime(value,&timestamp);

   // put hour into buffer
   *buffer++ = (char) ((timestamp.hour / 10) + '0');
   *buffer++ = (char) ((timestamp.hour % 10) + '0');
   *buffer++ = TIME_DELIMITER;

   // put minute into buffer
   *buffer++ = (char) ((timestamp.minute / 10) + '0');
   *buffer++ = (char) ((timestamp.minute % 10) + '0');
   *buffer++ = TIME_DELIMITER;

   // put second into buffer
   *buffer++ = (char) ((timestamp.second / 10) + '0');
   *buffer++ = (char) ((timestamp.second % 10) + '0');

   *buffer = NULL; return DEFAULT_TIME_LEN;
}

//
// copyOutDecimal64
//
// Title       : Copy decimal data out of class array
```

```
// Parameters : char * - buffer to copy string 64 bit money into
//            INT64b - value
//            unsigned len - max number of bytes to copy
// Return Value  : int - Length of copy
// Comments     :
//

inline int copyOutDecimal64(char *buffer,INT64b value,unsigned int
len = DEFAULT_DECIMAL64_LEN)
{
   unsigned intindex       = len;

   int           places        = 0;

   bool         negitiveFlag= false;

   // NULL terminate string
   buffer[index] = NULL;

   // check length > 0
   if(!index) return len;

   // handle negitive value
   if(value < 0)
   {
      negitiveFlag = true;
      value = value * (-1);
   }

   // break off each digit from value, fill if needed
   do
   {
      if(value)
      {
         // get next digit and add to buffer
         buffer[--index] = (char) (value % 10 + '0');
         value /= 10; places++;

         if(places == 2 && index)
         {
            places++;
            buffer[--index] = DECIMAL_SYMBOL;
         }
      }
      else
      {
         // add zeros to first place before decimal point on (i.e. 0.00)
         if(places < 2 || places == 3)
         {
            buffer[--index] = ZERO_SYMBOL;
         }
         else
         {
            // add the decimal point
            if(places == 2)
            {
               buffer[--index] = DECIMAL_SYMBOL;
            }
            else
            {
               // add the negitive indicator
               if(negitiveFlag)
               {
                  negitiveFlag = false;
                  buffer[--index] = NEGITIVE_SYMBOL;
               }
               else buffer[--index] = NUMERIC_FILL;
            }
         }

         // need to trace place for decimal point and zero fill
         places++;
      }
   } while(index);

   return len;
}

////////////////////////////////////////////////////////////////////////////
//  Macros
////////////////////////////////////////////////////////////////////////////
using namespace std;

#ifdef DEBUG
   extern int debugFlag;
#else
   extern int debugFlag;
#endif

inline BYTE8b *debugFileName(BYTE8b *filePath)
{
   BYTE8b *fileName = filePath + strlen(filePath);

    while(fileName != filePath)
    {
      if(*fileName == '/' || *fileName == '\\' && *(fileName + 1))
         return (fileName + 1);

       fileName--;
    }

    return filePath;
}

extern char *get_time_prefix(char *buffer);

#define DEBUGADDRESS(POINTER)hex << (void *) POINTER <<
dec

#define ERRORMSG(TEXT)   {                                  \
                  EnterCriticalSection(&errorMutex);             \
                  char buf[50];                           \
                  errorStream << debugFileName(__FILE__)           \
                  << "|" << get_time_prefix(buf) << "|" << __LINE__ << "|"
   \
                  << _getpid() << "|" << GetCurrentThreadId() << "|" \
                  << TEXT;                         \
                  errorStream.flush();                      \
                  LeaveCriticalSection(&errorMutex);              \
                  }

#ifdef DEBUG

#define DEBUGMSG(TEXT)   {                                \
                  EnterCriticalSection(&debugMutex);             \
                  char buf[50];                           \
                  debugStream << debugFileName(__FILE__)          \
                  << "|" << get_time_prefix(buf) << "|" << __LINE__ << "|"
   \
                  << _getpid() << "|" << GetCurrentThreadId() << "|" \
                  << TEXT ;                           \
                  debugStream.flush();                       \
                  LeaveCriticalSection(&debugMutex);               \
                  }


   #define DEBUGSTRING(TEXT,LENGTH)                            \
         debugVarString(TEXT,LENGTH)


#else
      #define DEBUGMSG(TEXT) ;
      #define DEBUGSTRING(TEXT,LENGTH) ;
```

```
#endif

inline bool copyInMoney32(const char * value,float *number)
{
   int      index       = 0;
   int      decimal       = 0;
   int      decimals     = 0;
   int      digitsAfterDec= 0;
   bool   negitiveFlag= false;

   // convert each digit to a numeric portion
   while(value[index])
   {
      // handle $ . - All the rest assumed numeric
      switch(value[index])
      {
      case MONEY_SYMBOL:
         // ignore $ sign
         break;
      case NEGITIVE_SYMBOL:
         // set negitive flag
         negitiveFlag = true;
         break;

      case DECIMAL_SYMBOL:
         // set decimal
         decimal=1;
         decimals++;
         if(decimals >1)
            //more than 1 decimal point found
            return false;
         break;

      default:
         // adjust decimal places
         decimal = decimal * 10;

         // add digit to running total
         if(value[index] >= '0' && value[index] <= '9')
         {
            if(decimal)
               if(++digitsAfterDec > 2)
                  return false;

            *number = (*number * 10) + (value[index] - '0');
         }
         else
         {
            //non-numeric field inserted
            return false;
         }
      }
      index++;
   }


   // apply decimal where decimal not found

#ifndef DB2

   if(decimal)
   {
      *number /= decimal;
   }
#endif

   // make negitive
   if(negitiveFlag)
      *number = *number * (-1);

   return true;
}

#endif /* _COMMON_TPCC */
```

htmlPhraser.h

```
////////////////////////////////////////////////////////////////////////
// htmlPharaser.h
////////////////////////////////////////////////////////////////////////
// Class to decode a html query string
////////////////////////////////////////////////////////////////////////

#pragma once

#include <memory.h>

////////////////////////////////////////////////////////////////////////
// Definitions
////////////////////////////////////////////////////////////////////////

#define NULL               0

#define COMMAND_ID            0
#define TERM_ID            1
#define W_ID               2
#define D_ID               3
#define C_ID               4
#define C_NAME               5

#define C_W_ID               6
#define C_D_ID               7
#define AMT_PAID            8

#define STK_THRESHOLD         9
#define CARRIER_NUM            10

#define ITEM_LIST_START         11
#define ITEM_LIST_FINISH      55

#define MAX_QUERY_ID         55
#define MAX_FIELD_LEN         256
#define MAX_FIELD_NUM         56

////////////////////////////////////////////////////////////////////////
// Command Codes
////////////////////////////////////////////////////////////////////////

#define NEW_ORDER_CODE               'n'
#define PAYMENT_CODE               'p'
#define ORDER_STATUS_CODE            'o'
#define DELIVERY_CODE               'd'
#define STOCK_CODE               's'
#define EXIT_CODE               'e'
#define MENU_CODE               'm'

#define COMMAND_LOGIN            0
#define COMMAND_NEW_ORDER         1
#define COMMAND_PAYMENT            2
#define COMMAND_ORDER_STATUS      3
#define COMMAND_DELIVERY         4
#define COMMAND_STOCK            5
#define COMMAND_EXIT            6

#define COMMAND_LOGIN_RESULTS         7
#define COMMAND_NEW_ORDER_RESULTS      8
#define COMMAND_PAYMENT_RESULTS         9
#define COMMAND_ORDER_STATUS_RESULTS      10
#define COMMAND_DELIVERY_RESULTS      11
#define COMMAND_STOCK_RESULTS         12

////////////////////////////////////////////////////////////////////////
// Class htmlPhraser
////////////////////////////////////////////////////////////////////////
```

```
class htmlPhraser
{
  // Constructors / Destructor
  public:
    htmlPhraser(char *queryString);
    ~htmlPhraser()          {return;}

   // geters
   public:
    int  getCommandId();
    int validate(int txnType);

    char *get_TERM_ID()      {return iQueryValues[TERM_ID];}
    char *get_W_ID()         {return iQueryValues[W_ID];}
    char *get_D_ID()         {return iQueryValues[D_ID];}
    char *get_C_ID()         {return iQueryValues[C_ID];}
    char *get_C_NAME()       {return iQueryValues[C_NAME];}
    char *get_C_W_ID()       {return iQueryValues[C_W_ID];}
    char *get_C_D_ID()      {return iQueryValues[C_D_ID];}
    char *get_AMT_PAID()       {return iQueryValues[AMT_PAID];}
    char *get_STK_THRESHOLD()    {return
iQueryValues[STK_THRESHOLD];}
    char *get_CARRIER_NUM()     {return
iQueryValues[CARRIER_NUM];}

    char *get_ITEM_SUPP_W(int item)  {return
iQueryValues[(ITEM_LIST_START + 0) + (item * 3)];}
    char *get_ITEM_ITEM_NUM(int item) {return
iQueryValues[(ITEM_LIST_START + 1) + (item * 3)];}
    char *get_ITEM_QTY(int item)     {return
iQueryValues[(ITEM_LIST_START + 2) + (item * 3)];}

   // Class Functions
   private:
    char convertQueryToken(char **queryString);

   // Class Attributes
   private:
    int  iCustomerIdFlag;
    int  iCarrierNumFlag;
    int  iStockThresholdFlag;

    char  iQueryValues[MAX_FIELD_NUM][MAX_FIELD_LEN];
};

/////////////////////////////////////////////////////////////////////////////
```

resource.h

```
//{{NO_DEPENDENCIES}}
// Microsoft Visual C++ generated include file.
// Used by tpccIsapi.rc
//
#define IDS_PROJNAME 100



// Next default values for new objects
//
#ifdef APSTUDIO_INVOKED
#ifndef APSTUDIO_READONLY_SYMBOLS
#define _APS_NEXT_RESOURCE_VALUE       201
#define _APS_NEXT_COMMAND_VALUE        32768
#define _APS_NEXT_CONTROL_VALUE        201
#define _APS_NEXT_SYMED_VALUE          101
#endif
#endif
```

StdAfx.h

```
// stdafx.h : include file for standard system include files,
// or project specific include files that are used frequently, but
// are changed infrequently
//

#pragma once

#define WIN32_LEAN_AND_MEAN    // Exclude rarely-used stuff
from Windows headers

#define _ATL_CSTRING_EXPLICIT_CONSTRUCTORS // some
CString constructors will be explicit

// turns off ATL's hiding of some common and often safely ignored
warning messages
#define _ATL_ALL_WARNINGS

// critical error descriptions will only be shown to the user
// in debug builds. they will always be logged to the event log
#ifndef _DEBUG
#define ATL_CRITICAL_ISAPI_ERROR_LOGONLY
#endif


#ifndef _WIN32_WINNT
#define _WIN32_WINNT 0x0403
#endif

// TODO: this disables support for registering COM objects
// exported by this project since the project contains no
// COM objects or typelib. If you wish to export COM objects
// from this project, add a typelib and remove this line
#define _ATL_NO_COM_SUPPORT

#include "resource.h"
#include <atlsrvres.h>
#include <atlisapi.h>
#include <atlstencil.h>

// TODO: reference additional headers your program requires here
```

htmlPhraser.cpp

```
/////////////////////////////////////////////////////////////////////////////
// htmlPhraser.cpp
/////////////////////////////////////////////////////////////////////////////
// Class implmentation of htmlPhraser.
// This class will take a query string and break it into a series
// of consituant parts
/////////////////////////////////////////////////////////////////////////////

#include "htmlPhraser.h"

/////////////////////////////////////////////////////////////////////////////
// htmlPhraser::htmlPhraser
/////////////////////////////////////////////////////////////////////////////
// Title   : Constructor
// Parameters : char * query string
// Return Value  : None
// Comments  :
/////////////////////////////////////////////////////////////////////////////

htmlPhraser::htmlPhraser(char *queryString)
{
   // initilize query values
  iCustomerIdFlag = iCarrierNumFlag = iStockThresholdFlag = false;

   // this initilizes the query list to NULL's. This means that
   // characters being added are overwriting null characters and
   // therfore the string will be null terminated implicitly.

   memset(iQueryValues,NULL,(MAX_FIELD_NUM *
MAX_FIELD_LEN));
```

```
// controls
char     queryChar     = NULL;

int      queryIndex    = -1;
int      valueIndex    = -1;

// process each characeter of query string
while(*queryString)
{
   // check for special case characters
   if(queryChar)
   {
      // a percentage sign would indicate a token
      if(*queryString != '%')
      {
         // a plus sign repersents a space
         if(*queryString == '+')
         {
            queryChar = ' ';
            *queryString++;
         }
         else queryChar = *queryString++;
      }
      else queryChar = convertQueryToken(&queryString);
   }
   else queryChar = '&';

   // handle query reference (&)
   if(queryChar == '&')
   {
      // reset value index
      valueIndex = -1;

      // do we have a numeric query reference
      if(*queryString >= '0' && *queryString <= '9')
      {
         // numeric query id
         queryIndex =
            ((*queryString - '0') * 10) + (*(queryString + 1) - '0');

         // walk past the two command characters
         queryString += 2;

         // validate query value
         if(queryIndex > MAX_QUERY_ID)
            queryIndex = -1;
      }
      else queryIndex = -1;

      // finished processing for query reference
      continue;
   }

   // we have a query reference but need to wait until we see '='
   // before accepting value

   if(valueIndex == -1)
   {
      // we are waiting for '='
      if(queryChar == '=')
      {
         valueIndex = 0;

         // set query string flags
         switch(queryIndex)
         {
         case C_ID:
            iCustomerIdFlag = true; break;
         case CARRIER_NUM:
            iCarrierNumFlag = true; break;
         case STK_THRESHOLD:
            iStockThresholdFlag = true; break;
         default: break;
         }
      }

      // finishes looging for '='
      continue;
   }

   // add each character to the query value
   if(queryIndex > -1 && valueIndex > -1)
   {
      // we are processing a query value
      if(valueIndex < MAX_FIELD_LEN)
      {
         // we have not exceeded max line len
         iQueryValues[queryIndex][valueIndex++] = queryChar;
      }
      continue;
   }
}

return;
}

//////////////////////////////////////////////////////////////////////////
// htmlPhraser::getCommandId
//////////////////////////////////////////////////////////////////////////
// Title   : Returns the page command
// Parameters : None
// Return Value  : int - page command
// Comments  :
//////////////////////////////////////////////////////////////////////////

int htmlPhraser::getCommandId()
{
   // return command numeric code
   switch(*iQueryValues[COMMAND_ID])
   {
   case NEW_ORDER_CODE:
      if(iCustomerIdFlag)
         return COMMAND_NEW_ORDER_RESULTS;
      else return COMMAND_NEW_ORDER;
   case PAYMENT_CODE:
      if(iCustomerIdFlag)
         return COMMAND_PAYMENT_RESULTS;
      else return COMMAND_PAYMENT;
   case ORDER_STATUS_CODE:
      if(iCustomerIdFlag)
         return COMMAND_ORDER_STATUS_RESULTS;
      else return COMMAND_ORDER_STATUS;
   case DELIVERY_CODE:
      if(iCarrierNumFlag)
         return COMMAND_DELIVERY_RESULTS;
      else return COMMAND_DELIVERY;
   case STOCK_CODE:
      if(iStockThresholdFlag)
         return COMMAND_STOCK_RESULTS;
      else return COMMAND_STOCK;
   case MENU_CODE:
      return COMMAND_LOGIN_RESULTS;
   case EXIT_CODE:
      return COMMAND_EXIT;
   default:
      return COMMAND_LOGIN;
   };


   // should not get here
   return COMMAND_LOGIN;
}
```

```
//////////////////////////////////////////////////////////////////////
// htmlPhraser::validate
//////////////////////////////////////////////////////////////////////
// Title   : validate url parameter list for all txn types
// Parameters : int - txn type
// Return Value  : int - error code
// Comments  :
//////////////////////////////////////////////////////////////////////


int validate(int txnType)
{
   return 0;
}

//////////////////////////////////////////////////////////////////////
// htmlPhraser::convertQueryToken
//////////////////////////////////////////////////////////////////////
// Title   : Returns the page command
// Parameters : None
// Return Value  : int - page command
// Comments  :
//////////////////////////////////////////////////////////////////////

char htmlPhraser::convertQueryToken(char **queryString)
{
   char queryChar = NULL;

   // skip over %
   (*queryString)++;

   // look at first character
   switch(**queryString)
   {
   case '2':
      {
         // what follows?
         (*queryString)++;

         switch(**queryString)
         {
         case '1':
            queryChar = '!';
            break;
         case '3':
            queryChar = '#';
            break;
         case '4':
            queryChar = '$';
            break;
         case '5':
            queryChar = '%';
            break;
         case '6':
            queryChar = '&';
            break;
         case '8':
            queryChar = '(';
            break;
         case '9':
            queryChar = ')';
            break;
         case 'B':
            queryChar = '+';
            break;
         case 'C':
            queryChar = ',';
            break;
         case 'F':
            queryChar = '/';
            break;
         case ' ':
            queryChar = ' ';
            break;
         }
      }

      break;
   case '3':
      {
         // what follows?
         (*queryString)++;

         switch(**queryString)
         {
         case 'A':
            queryChar = ':';
            break;
         case 'B':
            queryChar = ';';
            break;
         case 'D':
            queryChar = '=';
            break;
         case 'F':
            queryChar = '?';
            break;
         case ' ':
            queryChar = ' ';
            break;
         }
      }

      break;
   case '4':
      {
         // what follows?
         (*queryString)++;

         switch(**queryString)
         {
         case '0':
            queryChar = '@';
            break;
         case ' ':
            queryChar = ' ';
            break;
         }
      }

      break;
   case '5':
      {
         // what follows?
         (*queryString)++;

         switch(**queryString)
         {
         case 'B':
            queryChar = '[';
            break;
         case 'D':
            queryChar = ']';
            break;
         case 'E':
            queryChar = '^';
            break;
         case ' ':
            queryChar = ' ';
            break;
         }
      }

      break;
```

```
  case '7':
    {
      // what follows?
      (*queryString)++;

      switch(**queryString)
      {
      case 'B':
        queryChar = '{';
        break;
      case 'C':
        queryChar = '|';
        break;
      case 'D':
        queryChar = '}';
        break;
      case 'E':
        queryChar = '~';
        break;
      case ' ':
        queryChar = ' ';
        break;
      }
    }

    break;
  case '+':
    queryChar = '+';
    break;
  }

  // advance pointer and return
  (*queryString)++; return queryChar;
}

//////////////////////////////////////////////////////////////////////
```

StdAfx.cpp

```
// stdafx.cpp : source file that includes just the standard includes
// tpccIsapi.pch will be the pre-compiled header
// stdafx.obj will contain the pre-compiled type information

#include "stdafx.h"

// TODO: reference any additional headers you need in STDAFX.H
// and not in this file
```

tpccIsapi.cpp

```
/*
*****************************************************************
** Project     : AIX
** Component: Performance/TPC-C Benchmark
** Name        : tpccIsapi.cpp
** Title     : TPCC html processing
*****************************************************************
** Copyright (c) 2003 IBM Corporation
** All rights reserved
*****************************************************************
** History       :
**              Developed at IBM Austin by the AIX RS/6000
**              performance group.
**
** Comments       :
**
*****************************************************************
*/

#include "stdafx.h"
#include "..\tpccCom\tpccCom.h"
#include "..\tpccCom\tpccCom_i.c"
#include "tpccIsapi.hpp"

// For custom assert and trace handling with WebDbg.exe
[ module(name="tpccIsapi", type="dll") ];
[ emitidl(restricted) ];

#define _WIN32_DCOM

#ifdef _DEBUG
  int debugFlag = 1;
#else
  int debugFlag = 0;
#endif

///////////////////////////////////////////////////////////////
// Globals
///////////////////////////////////////////////////////////////

int     maxDataSize;          //max struct size of all txn(s)
int     numUsers;             //number of users that client will service.
int     FirstClient;
int     dlvyQueueLen;           //static length of dlvy queue
int     dlvyThreads;          //number of dlvy threads to create
int     dlvyBufferFreeSlots;      //length of dlvy txn queue
int     dlvyBufferSlotIndex;   //index into next avaliable slot in dlvy
txn queue
int     dlvyBufferThreadIndex;    //thread index into dlvy txn queue
int     nullDB;                //null db on client(bypass com call).
int     trace;

static DWORD        threadLSIndex;       //isapi thread local storage
index
CRITICAL_SECTION    isapiLock;        //isapi lock
CRITICAL_SECTION    errorLock;           //error log file lock.
CRITICAL_SECTION    termLock;         //terminal array lock.
CRITICAL_SECTION    dlvyQueueLock;      //dlvy queue critical
section lock
HANDLE              dlvyThreadDone = INVALID_HANDLE_VALUE;
  //dlvy thread exit event
HANDLE              dlvyThreadSemaphore =
INVALID_HANDLE_VALUE;   //dlvy thread wrk to do semaphore
int                 dlvyThreadID = 0;

struct DLVYQUEUEDATA *dlvyQueue;           //dlvy queue
HANDLE              *dlvyThreadHandles;     //ptr to array of thread
handles

TERM_ENTRY  *termArray;                  //array of terminal entries to
store each users info.
int       termNextFree;                 //next available slot in terminal
array

FILE  *htmlDebug   = NULL;           //html debug file
FILE  *errorLog    = NULL;           //error file
FILE  *htmlTrace     = NULL;

ofstream debugStream;
ofstream errorStream;
CRITICAL_SECTION debugMutex;
CRITICAL_SECTION errorMutex;

char  dlvyLogPath[128]    = {NULL};
char  errorLogFile[128]    = {NULL};
char  htmlTraceLogFile[128]   = {NULL};
char  dbName[64]            = {NULL};
char  dbType[16]          = {NULL};

typedef INT (*CONNECT_PTR)(char *dbName,void
**connectHandle);
typedef INT (*DISCONNECT_PTR)(void *connectHandle);
```

```
typedef INT (*DLVY_FUNC_PTR)(dlvy_wrapper *dlvy,void
*connectHandle);
typedef INT (*NORD_FUNC_PTR)(nord_wrapper *nord,void
*connectHandle);
typedef INT (*PYMT_FUNC_PTR)(paym_wrapper *pymt,void
*connnectHandle);
typedef INT (*ORDS_FUNC_PTR)(ords_wrapper *ords,void
*connectHandle);
typedef INT (*STOK_FUNC_PTR)(stok_wrapper *stok,void
*connectHandle);

HINSTANCE     dbInstance;
CONNECT_PTR     db_connect;
DISCONNECT_PTR   db_disconnect;
DLVY_FUNC_PTR  dlvyCall;


////////////////////////////////////////////////////////////////////
// Page functions arrays
////////////////////////////////////////////////////////////////////

typedef int   (*pageFuncPtr) (htmlPhraser
*commandBlock,TXN_HANDLE *txnHandle);

pageFuncPtr htmlPageFunctions[MAX_TRANSACTIONS] =
        {
          {doLoginForm},
          {doNewOrderForm},
          {doPaymentForm},
          {doOrderStatusForm},
          {doDeliveryForm},
          {doStockForm},
          {doExit},
          {doLoginResults},
          {doNewOrderResults},
          {doPaymentResults},
          {doOrderStatusResults},
          {doDeliveryResults},
          {doStockResults}
        };

extern "C" DWORD WINAPI
HttpExtensionProc(LPEXTENSION_CONTROL_BLOCK lpECB)
{
  struct TXN_HANDLE  *txnHandle = NULL;

  txnHandle = (TXN_HANDLE *) TlsGetValue(threadLSIndex);

  if(txnHandle == NULL)
  {
    int rc = initTxnHandle(&txnHandle);
    if (rc != OK)
    {
      char response[256]; char htmlHeader[256];
      sprintf(response,"ERROR : Init txnHandle function failed.\n");

      size_t htmlPageLen = strlen(response);

      //add content length and keep alive header
      sprintf(htmlHeader,HEADER,htmlPageLen);
      lpECB->ServerSupportFunction(lpECB-
>ConnID,HSE_REQ_SEND_RESPONSE_HEADER,"200
OK",NULL,(DWORD*)htmlHeader);
      lpECB->WriteClient(lpECB-
>ConnID,response,(LPDWORD)&htmlPageLen,0);

      return HSE_STATUS_SUCCESS_AND_KEEP_CONN;
    }

    txnHandle = (TXN_HANDLE *) TlsGetValue(threadLSIndex);
    if (txnHandle == NULL)
    {
      char response[256]; char htmlHeader[256];
      sprintf(response,"ERROR : Unable to retrieve txnHandle from
TLS.\n");

      size_t htmlPageLen = strlen(response);

      //add content length and keep alive header
      sprintf(htmlHeader,HEADER,htmlPageLen);
      lpECB->ServerSupportFunction(lpECB-
>ConnID,HSE_REQ_SEND_RESPONSE_HEADER,"200
OK",NULL,(DWORD*)htmlHeader);
      lpECB->WriteClient(lpECB-
>ConnID,response,(LPDWORD)&htmlPageLen,0);

      return HSE_STATUS_SUCCESS_AND_KEEP_CONN;
    }
  }

  try
  {
    txnHandle->urlString  = (char*)lpECB->lpszQueryString;

    DEBUGMSG("calling doHtml() w/ query string:" << txnHandle-
>urlString << endl);
    doHtml(txnHandle);

    size_t htmlPageLen;
    htmlPageLen = strlen(txnHandle->htmlPage);
    if(htmlPageLen >= 4096)
    {
      ERRORMSG("WARNING:  HTML PAGE IS >= 4096!, page
size:"<<htmlPageLen<<endl);
    }
    //add content length and keep alive header
    sprintf(txnHandle->htmlHeader,HEADER,htmlPageLen);
    size_t headerLen = strlen(txnHandle->htmlHeader);
    if(headerLen >= 256)
    {
      ERRORMSG("WARNING:  HTML HEADER IS >= 256!,
header size:"<<headerLen<<endl);
    }

    //write response to user
    lpECB->ServerSupportFunction(lpECB-
>ConnID,HSE_REQ_SEND_RESPONSE_HEADER,"200
OK",NULL,(DWORD*)txnHandle->htmlHeader);
    lpECB->WriteClient(lpECB->ConnID,txnHandle-
>htmlPage,(LPDWORD)&htmlPageLen,0);

    DEBUGMSG("HTML PAGE-->"<<endl<<txnHandle-
>htmlHeader<<txnHandle->htmlPage<<endl);

  }
  catch (...)
  {
    char response[256];
    ZeroMemory(response,256);
    char *ptr = response;

    appendText(&ptr,"<HTML><BODY> Error : Unhandled
Exception </BODY></HTML>");
    DWORD   cbResponse = sizeof(response)-1 ;

    //write response to user
    lpECB->ServerSupportFunction(lpECB-
>ConnID,HSE_REQ_SEND_RESPONSE_HEADER,"200
OK",NULL,(DWORD*)response);
    lpECB->WriteClient(lpECB->ConnID,response,&cbResponse,0);

  }

   return HSE_STATUS_SUCCESS_AND_KEEP_CONN;
```

```
}

extern "C" BOOL WINAPI
GetExtensionVersion(HSE_VERSION_INFO* pVer)
{
  // Create the extension version string, and copy string to
HSE_VERSION_INFO structure.
  pVer->dwExtensionVersion =
MAKELONG(HSE_VERSION_MINOR, HSE_VERSION_MAJOR);

  // Copy description string into HSE_VERSION_INFO structure.
  strcpy(pVer->lpszExtensionDesc, "TPCC ISAPI Extension");

  // Initialze isapi critcal section
  InitializeCriticalSection(&isapiLock);

  // Initailize error log critcal section
  InitializeCriticalSection(&errorLock);

  // Initialze terminal critcal section
  InitializeCriticalSection(&termLock);

  // Initialize debug/error critcal sections
  if(debugFlag)
    InitializeCriticalSection(&debugMutex);
  InitializeCriticalSection(&errorMutex);

  // Read registery values
  if(readRegisteryValues() != OK)
    return(FALSE);

  // Initialize terminal array
  termArray = (TERM_ENTRY*)
calloc(numUsers,sizeof(TERM_ENTRY));
  termNextFree = 1;

  //open up error/debug streams
  errorStream.rdbuf( )->open(errorLogFile,ios::out);
  if(debugFlag)
    debugStream.rdbuf( )->open(htmlTraceLogFile,ios::out);

  ERRORMSG("Error log file open."<<endl);

  DEBUGMSG("Loading library for dlvy txn."<<endl);
  int rc = getDBInstance();
  if (rc != OK)
  {
    ERRORMSG("Error, unable to load database dll, rc:"<<rc);
    DEBUGMSG("Error, unable to load database dll, rc:"<<rc);

    return FALSE;
  }
  DEBUGMSG("Library loaded for dlvy txn."<<endl);

  DEBUGMSG("Calling initDlvy." <<endl);
  ERRORMSG("Calling initDlvy." <<endl);

  if(initDlvy() != OK)
    return (FALSE);

  DEBUGMSG("Initializing TLS." << endl);

  // Initialize thread local storage index
  threadLSIndex = TlsAlloc();
  if (threadLSIndex == TLS_NULL)
  {
    ERRORMSG("Isapi error: unable to initialize thread local
storage(TLS), rc:" << GetLastError()<<endl);
    return(FALSE);
  }
  ERRORMSG("Initialized TLS." << endl);
  DEBUGMSG("sizeof out_neword_struct:   "<<sizeof(struct
out_neword_struct)<<endl);
  DEBUGMSG("sizeof  in_neword_struct:   "<<sizeof(struct
in_neword_struct)<<endl);
  DEBUGMSG("sizeof out_payment_struct:  "<<sizeof(struct
out_payment_struct)<<endl);
  DEBUGMSG("sizeof  in_payment_struct:  "<<sizeof(struct
in_payment_struct)<<endl);
  DEBUGMSG("sizeof out_ordstat_struct:  "<<sizeof(struct
out_ordstat_struct)<<endl);
  DEBUGMSG("sizeof  in_ordstat_struct:  "<<sizeof(struct
in_ordstat_struct)<<endl);
  DEBUGMSG("sizeof out_delivery_struct: "<<sizeof(struct
out_delivery_struct)<<endl);
  DEBUGMSG("sizeof  in_delivery_struct: "<<sizeof(struct
in_delivery_struct)<<endl);
  DEBUGMSG("sizeof out_stocklev_struct: "<<sizeof(struct
out_stocklev_struct)<<endl);
  DEBUGMSG("sizeof  in_stocklev_struct: "<<sizeof(struct
in_stocklev_struct)<<endl);

  //compute the max struct size for com data construct
  maxDataSize = max(maxDataSize,sizeof(nord_wrapper));
  maxDataSize = max(maxDataSize,sizeof(paym_wrapper));
  maxDataSize = max(maxDataSize,sizeof(ords_wrapper));
  maxDataSize = max(maxDataSize,sizeof(dlvy_wrapper));
  maxDataSize = max(maxDataSize,sizeof(stok_wrapper));
  maxDataSize += 10;

  DEBUGMSG("max data struct size:"<<maxDataSize <<endl);
  ERRORMSG("max data struct size:"<<maxDataSize <<endl);

  return true;
}

extern "C" BOOL WINAPI TerminateExtension(DWORD dwFlags)
{
// ERRORMSG("TerminateExtension"<<endl);
  return true;
}


/*
*****************************************************************
** Name         :  initTxnHandle
** Description :
**          Isapi thread initializes its own com interface
**          structure.
** Parameters:
**          TXN_HANDLE*    isapi txn handle
** Returns      :
**          int - return code
** Comments    :
**
*****************************************************************
*/
int initTxnHandle(TXN_HANDLE **txnHandle)
{
  DEBUGMSG("Inside init txn handle, getting isapiLock." << endl);
// ERRORMSG("Inside init txn handle, getting isapiLock." << endl);

  EnterCriticalSection(&isapiLock);

  HRESULT hres = NULL;

  try
  {
    DEBUGMSG("Got ispaiLock, initializing txnHandle:
"<<DEBUGADDRESS(*txnHandle)<< endl);
//    ERRORMSG("Got ispaiLock, initializing txnHandle:
"<<DEBUGADDRESS(*txnHandle)<< endl);
    *txnHandle = (TXN_HANDLE *) calloc(1,sizeof(TXN_HANDLE));
```

```
    if (*txnHandle == NULL)
    {
      ERRORMSG("Unable to allocated TXN_HANDLE,
rc:"<<GetLastError()<<endl);
      return ERR;
    };

    (*txnHandle)->comInterface.comHandle = NULL;
    DEBUGMSG("Initializing txnHandle com data buffer to
"<<maxDataSize<<"bytes"<<endl);
//  ERRORMSG("Initializing txnHandle com data buffer to
"<<maxDataSize<<"bytes"<<endl);
    (*txnHandle)->comInterface.txnBuffer = (char *)
CoTaskMemAlloc(maxDataSize);
    if (!((*txnHandle)->comInterface.txnBuffer))
    {
      ERRORMSG("CoTaskMemAlloc() failed of size
"<<maxDataSize<<", rc: "<<hres<<endl);
      return(ERR);
    };
    DEBUGMSG("txnHandle com data buffer initialized to " <<
maxDataSize << "bytes" <<endl);
//  ERRORMSG("txnHandle com data buffer initialized to " <<
maxDataSize << "bytes" <<endl);

    //(*txnHandle)->comInterface.comHandle = NULL;
    DEBUGMSG("Calling CoInitialize with txnHandle:
"<<DEBUGADDRESS(*txnHandle)<<endl);
//  ERRORMSG("Calling CoInitialize with txnHandle:
"<<DEBUGADDRESS(*txnHandle)<<endl);
    hres = CoInitializeEx(NULL,COINIT_MULTITHREADED);
    if (FAILED(hres))
    {
      ERRORMSG("CoInitializeEx() failed, rc : "<<hres<<endl);
      return(ERR);
    };

    struct  _timeb          startTime;
    struct  _timeb          endTime;

    DEBUGMSG("Calling CoCreateInstance with
txnHandle:"<<DEBUGADDRESS(*txnHandle)<< endl);
//  ERRORMSG("Calling CoCreateInstance with
txnHandle:"<<DEBUGADDRESS(*txnHandle)<< endl);
    _ftime(&startTime);
    hres =
CoCreateInstance(CLSID_tpcc_com,NULL,CLSCTX_SERVER,IID_I
tpcc_com,(void **)&(*txnHandle)->comInterface.comHandle);
    if (FAILED(hres))
    {
      _ftime(&endTime);
      //store error code in txnHandle
      ERRORMSG("CoCreateInstance() failed,
code:"<<HRESULT_CODE(hres)<<"
facility:"<<HRESULT_FACILITY(hres)<<
        " hres:"<<hres<< " time waiting:"<<
        ((((endTime.time - startTime.time)*1000)+
          (endTime.millitm - startTime.millitm))/1000.0)<<endl);

      DEBUGMSG("CoCreateInstance() failed,
code:"<<HRESULT_CODE(hres)<<"
facility:"<<HRESULT_FACILITY(hres)<<
        " hres:"<<hres<< " time waiting:"<<
        ((((endTime.time - startTime.time)*1000)+
          (endTime.millitm - startTime.millitm))/1000.0)<<endl);

//    return(ERR);
    };

    _ftime(&endTime);
    DEBUGMSG("CoCreateInstance successful.txnHande com
initialized, time waiting for object to be activated:" <<
        ((((endTime.time - startTime.time)*1000)+
          (endTime.millitm - startTime.millitm))/1000.0)<<endl);
//  ERRORMSG("CoCreateInstance successful.txnHande com
initialized, time waiting for object to be activated:" <<
//      ((((endTime.time - startTime.time)*1000)+
//        (endTime.millitm - startTime.millitm))/1000.0)<<endl);

    //call set complete to return object to pool.
    (*txnHandle)->comInterface.comHandle->doSetComplete();

    hres = (*txnHandle)->comInterface.comHandle->doDBInfo();
    (*txnHandle)->comInterface.comHandle->doSetComplete();

    //set the com buffers size
    DEBUGMSG("Setting txnHandle: " <<
DEBUGADDRESS(*txnHandle) << "com buffer size to " <<
maxDataSize<< endl)
//  ERRORMSG("Setting txnHandle: " <<
DEBUGADDRESS(*txnHandle) << "com buffer size to " <<
maxDataSize<< endl)
    (*txnHandle)->comInterface.size = maxDataSize;

    DEBUGMSG("txnHandle: "<<DEBUGADDRESS(*txnHandle)
<<"set to " << maxDataSize << endl);
//  ERRORMSG("txnHandle: "<<DEBUGADDRESS(*txnHandle)
<<"set to " << maxDataSize << endl);

    TlsSetValue(threadLSIndex,*txnHandle);

    DEBUGMSG("txnHandle: "<<DEBUGADDRESS(*txnHandle) <<
"stored in TLS" << endl);
//  ERRORMSG("txnHandle: "<<DEBUGADDRESS(*txnHandle) <<
"stored in TLS" << endl);

    ZeroMemory((*txnHandle)-
>htmlPage,MAX_HTML_PAGE_LEN);
    ZeroMemory((*txnHandle)-
>htmlHeader,MAX_HTML_HEADER_LEN);

    LeaveCriticalSection(&isapiLock);
    return(OK);
  }
  catch(...)
  {
    DEBUGMSG("Unhandled exeception in initTxnHandle,
unlocking isapi lock" <<endl);
//  ERRORMSG("Unhandled exeception in initTxnHandle,
unlocking isapi lock" <<endl);
    LeaveCriticalSection(&isapiLock);
  };

  return ERR;
}

/*
****************************************************************
** Name         :  getDBInstance
** Description :
**          load db specific lib based on dbType registery
**          value.
** Parameters:
**
** Returns      :
**          int - return code
** Comments     :
**          This function only exists for the dlvy threads
**          Dlvy threads hold direct connections to the database
**          and therefore need to know what db interface to talk to.
****************************************************************
*/
int getDBInstance()
{
```

```
  if(nullDB)
  {
    dbInstance =
LoadLibrary("c:\\inetpub\\wwwroot\\tpcc\\nullDB.dll");
    if(dbInstance == NULL)
    {
      return ERR_NULL_DLL_NOT_LOADED;
    }
  }
  else if( (strcmp(dbType,"DB2") == 0) )
  {
    dbInstance =
LoadLibrary("c:\\inetpub\\wwwroot\\tpcc\\tpccDB2glue.dll");
    if(dbInstance == NULL)
    {
      return ERR_DB2_DLL_NOT_LOADED;
    }
  }
  else if( (strcmp(dbType,"ORACLE") == 0) )
  {
    ERRORMSG("Loading Oracle dll"<<endl);
    dbInstance =
LoadLibrary("c:\\inetpub\\wwwroot\\tpcc\\tpccOracleGlue.dll");
    if(dbInstance == NULL)
    {
      ERRORMSG("Could not Load Oracle dll"<<endl);
      return ERR_ORA_DLL_NOT_LOADED;
    }
    ERRORMSG("Loaded Oracle dll"<<endl);
  }
  else if( (strcmp(dbType,"SYBASE") == 0) )
  {
    ERRORMSG("Loading Sybase dll"<<endl);
    dbInstance =
LoadLibrary("c:\\inetpub\\wwwroot\\tpcc\\tpccSybaseGlue.dll");
    if(dbInstance == NULL)
    {
      ERRORMSG("Could not Load Sybase dll"<<endl);
      return ERR_SYB_DLL_NOT_LOADED;
    }
    ERRORMSG("Loaded Sybase dll"<<endl);
  }
  else
  {
    return ERR_UNKNOWN_DB;
  }

  ERRORMSG("Get address"<<endl);
  db_connect =
(CONNECT_PTR)GetProcAddress(dbInstance,"connect_db");
  if(db_connect == NULL)
  {
    ERRORMSG("Could not find connect_db function in dll"<<endl);
    return ERR_CONNECT_ADDRESS_NOT_FOUND;
  }
  ERRORMSG("Get address"<<endl);
  dlvyCall =
(DLVY_FUNC_PTR)GetProcAddress(dbInstance,"do_dlvy");
  if(dlvyCall == NULL)
  {
    ERRORMSG("Could not find do_dlvy in dll"<<endl);
    return ERR_DLVY_ADDRESS_NOT_FOUND;
  }
  return OK;
}

/*
****************************************************************
** Name         :  initDlvy
** Description :
**          initialize dlvy threads/dlvy queueu
** Parameters:
**
** Returns      :
**          int - return code
** Comments     :
**
****************************************************************
*/

int initDlvy()
{
  ERRORMSG(">>initDlvy"<<endl);
  // Initialze critcal section
  InitializeCriticalSection(&dlvyQueueLock);

  //create dlvy queue
  dlvyQueue = (DLVYQUEUEDATA *)
calloc(dlvyQueueLen,sizeof(DLVYQUEUEDATA));

  if (dlvyQueue == NULL)
  {
    ERRORMSG("calloc failed to allocate dlvyQueue"<<endl);
    return  ERR_DLVY_QUEUE_CALLOC_FAIL;
  }
  ERRORMSG(">>calloc"<<endl);
  //init dlvy buffer critcal section
  //InitializeCriticalSection(&dlvyQueueLock);

  dlvyThreadDone = CreateEvent(NULL,
                    TRUE,   //manual reset
                    FALSE,  //initially not signalled.
                    NULL);
  if(dlvyThreadDone == NULL)
  {
    DEBUGMSG("Error: dlvyThreadDone handled init failed,
GetLastError:"<<GetLastError()<<endl);

    ERRORMSG("Error : dlvyThreadDone handled init failed,
GetLastError:"<<GetLastError()<<endl);

    return  ERR_DLVY_EVENT_INIT_FAILED;
  }
  //create dlvy semaphore
  dlvyThreadSemaphore =
CreateSemaphore(NULL,0,dlvyQueueLen,NULL);
  if(dlvyThreadSemaphore == NULL)
  {
    DEBUGMSG("Error: dlvyThreadSemaphore semaphore init
failed, GetLastError:"<<GetLastError()<<endl);
    ERRORMSG("Error: dlvyThreadSemaphore semaphore init
failed, GetLastError:"<<GetLastError()<<endl);
    return  ERR_DLVY_SEMAPHORE_INIT_FAILED;

  }

  //set number of free slots available in queue
  dlvyBufferFreeSlots = dlvyQueueLen;

  //index into next avaliable slot in dlvy txn queue
  dlvyBufferSlotIndex = 0;

  //thread index into dlvy txn queue
  dlvyBufferThreadIndex = 0;

  dlvyThreadHandles = new HANDLE[dlvyThreads];

  //create threads
 for(int threadCount = 0;threadCount < dlvyThreads;threadCount++)
  {
    ERRORMSG(">>Calling dlvyThreadEntry"<<endl);
    dlvyThreadHandles[threadCount] =
(HANDLE)_beginthread(dlvyThreadEntry,0,NULL);
```

```
    if(dlvyThreadHandles[threadCount] ==
INVALID_HANDLE_VALUE) {
        ERRORMSG(">>Calling dlvyThreadEntry failed"<<endl);
        return ERR_DLVY_THREAD_FAILED;
    }
  }


  return OK;
}


/*
*****************************************************************
** Name         :  readRegisteryValues
** Description :
**              initialize isapi global variables from registery
** Parameters:
**
** Returns      :
**              int - return code
** Comments    :
**
*****************************************************************
*/
int readRegisteryValues()
{
  HKEY   registeryKey;
  char   value[MAX_STRING_LEN];
  DWORD  regType;
  DWORD  regValue;
  DWORD  regValueSize = MAX_STRING_LEN;

// ERRORMSG(">>readRegisteryValues"<<endl);
  //open up registery key
  if(RegOpenKeyEx(HKEY_LOCAL_MACHINE,REGISTERY_SUB_
KEY,0,KEY_READ,&registeryKey) != ERROR_SUCCESS)
    return ERR_UNABLE_TO_OPEN_REG;

  //get null db flag
  regValueSize = sizeof(regValue);
  if(RegQueryValueEx(registeryKey,NULL_DB,0,&regType,(BYTE
*)&regValue,&regValueSize) == ERROR_SUCCESS)
        nullDB = regValue;
  else
        nullDB = 0;

  //get num dlvy threads
  regValueSize = sizeof(regValue);
  if(RegQueryValueEx(registeryKey,DELIVERY_THREADS,0,&regT
ype,(BYTE *)&regValue,&regValueSize) == ERROR_SUCCESS)
        dlvyThreads = regValue;
  else
        dlvyThreads = DEFAULT_DLVY_THREADS;

  //get dlvy queue len
  regValueSize = sizeof(regValue);
  if(RegQueryValueEx(registeryKey,DELIVERY_QUEUE_LEN,0,&r
egType,(BYTE *)&regValue,&regValueSize) == ERROR_SUCCESS)
        dlvyQueueLen = regValue;
  else
        dlvyQueueLen = DEFAULT_DLVY_QUEUE_LEN;

  //get the htmlTrace flag
  regValueSize = sizeof(regValue);
  if(RegQueryValueEx(registeryKey,HTML_TRACE,0,&regType,(BY
TE *)&regValue,&regValueSize) == ERROR_SUCCESS)
        trace = regValue;
  else
        trace = 0;

  //get the client null db flag
  regValueSize = sizeof(regValue);
  if(RegQueryValueEx(registeryKey,NULL_DB,0,&regType,(BYTE
*)&regValue,&regValueSize) == ERROR_SUCCESS)
        nullDB = regValue;
  else
        nullDB = 0;

  //get the num of users
  regValueSize = sizeof(regValue);
  if(RegQueryValueEx(registeryKey,NUM_USERS,0,&regType,(BY
TE *)&regValue,&regValueSize) == ERROR_SUCCESS)
        numUsers = regValue;
  else
        numUsers = DEFAULT_NUM_USERS;

  //get dlvy log file path
  regValueSize = sizeof(value);
  if
(RegQueryValueEx(registeryKey,DELIVERY_LOG_PATH,0,&regTy
pe,(BYTE *) &value,&regValueSize)== ERROR_SUCCESS )
     strcpy(dlvyLogPath,value);
  else
     strcpy(dlvyLogPath,DEFAULT_DLVY_LOG_PATH);

  //get global error log file path/name
  regValueSize = sizeof(value);
  if
(RegQueryValueEx(registeryKey,ERROR_LOG_FILE,0,&regType,(
BYTE *) &value,&regValueSize)== ERROR_SUCCESS )
     strcpy(errorLogFile,value);
  else
     strcpy(errorLogFile,DEFAULT_ERROR_LOG_FILE);

  //get global error log file path/name
  regValueSize = sizeof(value);
  if
(RegQueryValueEx(registeryKey,HTML_TRACE_LOG_FILE,0,&reg
Type,(BYTE *) &value,&regValueSize)== ERROR_SUCCESS )
     strcpy(htmlTraceLogFile,value);
  else
     strcpy(htmlTraceLogFile,DEFAULT_HTML_TRACE_LOG_FILE);

  //get db name
  regValueSize = sizeof(value);
  if (RegQueryValueEx(registeryKey,DB_NAME,0,&regType,(BYTE
*) &value,&regValueSize)== ERROR_SUCCESS )
     strcpy(dbName,value);
  else
     strcpy(dbName,DEFAULT_DB_NAME);

  //get db type
  regValueSize = sizeof(value);
 if (RegQueryValueEx(registeryKey,DB_TYPE,0,&regType,(BYTE *)
&value,&regValueSize)== ERROR_SUCCESS )
     strcpy(dbType,value);

  //get First Client
  regValueSize = sizeof(regValue);
  if(RegQueryValueEx(registeryKey,"FirstClient",0,&regType,(BYTE
*)&regValue,&regValueSize) == ERROR_SUCCESS)
        FirstClient = regValue;
  else
        FirstClient = 1;

  RegCloseKey(registeryKey);

  return OK;
}

/*
*****************************************************************
** Name         : doLoginForm
```

```
** Description :
**          HTML Login page entry point
** Parameters:
**          htmlPhraser command block
**          char *     html result page
** Returns      :
**          int - return code
** Comments     :
**
*******************************************************************
*/

int doLoginForm(htmlPhraser *commandBlock,TXN_HANDLE
*txnHandle)
{
   char buffer[20];
   DEBUGMSG("Entering doLoginForm()."<<endl);
// ERRORMSG("Entering doLoginForm()."<<endl);
   char *html=txnHandle->htmlPage;

   DEBUGMSG("Creating html login page"<<endl);
   //begin html page
   appendText(&html,"<HTML><HEAD><TITLE>TPC-C Client Home
Page</TITLE></HEAD>"
                "<FORM ACTION=\""
                APP_NAME
                "\" METHOD=\"GET\">"
                "<H2>Please Login.</H2>"
                "<INPUT TYPE=\"hidden\" NAME=\""
                CMD_TXN_ID
                "\" VALUE=\""
                CMD_MENU
                "\">"
                "<H3>Warehouse <INPUT NAME=\""
                CMD_W_ID
                "\" SIZE=6>"
                " District <INPUT NAME=\""
                CMD_D_ID
                "\" SIZE=2></H3>"
                "<INPUT TYPE=\"submit\" VALUE=\"Submit\">"
                "</FORM></BODY></HTML>");

   appendText(&html," dlvyBufferFreeSlots ");
   appendText(&html,itoa(dlvyBufferFreeSlots,buffer,10));
   appendText(&html," dlvyBufferSlotIndex ");
   appendText(&html,itoa(dlvyBufferSlotIndex,buffer,10));
   appendText(&html," dlvyBufferThreadIndex ");
   appendText(&html,itoa(dlvyBufferThreadIndex,buffer,10));

   DEBUGMSG("Html login page done"<<endl);
   return OK;
}

/*
*******************************************************************
** Name         : doLoginResults
** Description :
**          HTML Login results page entry point
** Parameters:
**          htmlPhraser command block
**          char *     html result page
** Returns      :
**          int - return code
** Comments     :
**
*******************************************************************
*/

int doLoginResults(htmlPhraser *commandBlock,TXN_HANDLE
*txnHandle)
{
   char *html=txnHandle->htmlPage;

   //validate parameters
   if( (txnHandle->w_id = atoi(commandBlock->get_W_ID())) == 0 )
   {
      doLoginErrorPage(html,ERR_INVALID_W_ID);
      return OK;
   }
   if( (txnHandle->d_id = atoi(commandBlock->get_D_ID())) == 0 )
   {
      doLoginErrorPage(html,ERR_INVALID_D_ID);
      return OK;
   }

   //store user into terminal array,
   //function will ERR if the terminal array is full
   if( assignTerminal(txnHandle) != OK)
   {
      doLoginErrorPage(html,ERR_TERMINAL_FULL);
      return OK;
   };

   appendText(&html,"<HTML><HEAD><TITLE>TPC-C Main
Menu</TITLE></HEAD>\r\n"
                "<BODY><FORM ACTION=\""
                APP_NAME
                "\" METHOD=\"GET\">\r\n"
                "<H3>Please Select Transaction.</H3>\r\n");
   html+=appendButtons(html);

   html+=appendHiddenFields(html,txnHandle);

   appendText(&html,"</FORM></BODY></HTML>");

   return OK;
}

/*
*******************************************************************
** Name         : doLoginErrorPage
** Description :
**          HTML Login page entry point
** Parameters:
**          char *     html page buffer
**          char *     error message
** Returns      :
**          int - return code
** Comments     :
**
*******************************************************************
*/

int doLoginErrorPage(char *htmlPage,char *errorMessage)
{
   char *html=htmlPage;

   //begin html page
   appendText(&html,"<HTML><HEAD><TITLE>TPC-C Client Home
Page</TITLE></HEAD>"
                "<FORM ACTION=\""
                APP_NAME
                "\" METHOD=\"GET\">");

   appendText(&html,"<H2>Please Login.</H2>"
                "<INPUT TYPE=\"hidden\" NAME=\""
                CMD_TXN_ID
                "\" VALUE=\""
                CMD_MENU
                "\">"
                "<H3>Warehouse <INPUT NAME=\""
                CMD_W_ID
                "\" SIZE=6>"
                " District <INPUT NAME=\""
```

```
            CMD_D_ID
            "\" SIZE=2></H3>"
            "<INPUT TYPE=\"submit\" VALUE=\"Submit\">"
            "</FORM>");
   appendText(&html,errorMessage);
   appendText(&html,"<BODY></HTML>");

   return OK;
}


/*
******************************************************************
** Name         : doNewOrderForm
** Description :
**          HTML neworder page entry point
** Parameters:
**          htmlPhraser command block
**          char *     html result page
** Returns     :
**          int - return code
** Comments    :
**
******************************************************************
*/


int doNewOrderForm(htmlPhraser *commandBlock,TXN_HANDLE
*txnHandle)
{
   char *html=txnHandle->htmlPage;

   appendText(&html,"<HTML><HEAD><TITLE>TPC-C New
Order</TITLE></HEAD>\r\n"
            "<BODY><FORM ACTION=\""
            APP_NAME
            "\" METHOD=\"GET\">\r\n"
            "<CENTER><H3>Please Fill In New Order
Form.</H3></CENTER>\r\n" //check if not needed
            "Submit Transaction <INPUT TYPE=\"submit\" NAME=\""
            CMD_TXN_ID
            "\" VALUE=\""
            CMD_NORD
            "\">");

   //append the hidden
   html+=appendHiddenFields(html,txnHandle);

   //int buffer for warehouse
   char buffer[15];
   appendText(&html," <PRE>"
//          "      1       2       3       4       5       6       7       8
9\r\n"
//
"12345678901234567890123456789012345678901234567890123
4567890123456789012345678901234567890\r\n"
            "Warehouse: ");
   appendText(&html,itoa(txnHandle->w_id,buffer,10),7,1);
   appendText(&html,"District: <INPUT NAME=\""
            CMD_D_ID
            "\" SIZE=1>                    Date:<BR>"
               "Customer <INPUT NAME=\""
            CMD_C_ID
            "\" SIZE=6>  Name:                Credit:      %Disc.:<BR>"
            "Order Number:          Number of Lines:          W_tax:
D_tax:<BR> <BR>"
//          "      1       2       3       4       5       6       7       8
9\r\n"
//
"12345678901234567890123456789012345678901234567890123
4567890123456789012345678901234567890\r\n"
```

```
               " Supp_W  Item_Num  Item_Name               Qty Stock
B/G  Price    Amount <BR> ");

   //append the 15 items commands
   html+=appendItems(html,NORD_ITEMS,ITEM_START);

   //seal up html page
   appendText(&html,"</PRE></BODY></HTML>");

   return OK;
}

/*
******************************************************************
** Name         : doNewOrderResults
** Description :
**          HTML neworder page entry point
** Parameters:
**          htmlPhraser command block
**          char *     html result page
** Returns     :
**          int - return code
** Comments    :
**
******************************************************************
*/


int doNewOrderResults(htmlPhraser
*commandBlock,TXN_HANDLE *txnHandle)
{
   DEBUGMSG("Entered doNewOrderResults" << endl);

   char *html=txnHandle->htmlPage;
   struct nord_wrapper *nord = NULL;

   DEBUGMSG("Casting COM txnBuffer to nord struct" <<endl);
   nord = (nord_wrapper*)txnHandle->comInterface.txnBuffer;
   ZeroMemory(nord,sizeof(nord_wrapper));
   DEBUGMSG("COM txnBuffer initialized, validating input
parameters" << endl);

   //set warehouse,district and customer id from command block
   nord->in_nord.s_W_ID = txnHandle->w_id;
   DEBUGMSG("nord w_id:" <<  nord->in_nord.s_W_ID << endl);

   if( (nord->in_nord.s_D_ID = atoi(commandBlock->get_D_ID()) ) ==
0)
   {

   doNewOrderErrorPage(html,ERR_INVALID_D_ID,commandBlock
,txnHandle);
      return OK;
   }
   DEBUGMSG("nord d_id:" <<  nord->in_nord.s_D_ID << endl);

   if((nord->in_nord.s_C_ID = atoi(commandBlock->get_C_ID()) ) ==
0)
   {

   doNewOrderErrorPage(html,ERR_INVALID_C_ID,commandBlock
,txnHandle);
      return OK;
   }
   DEBUGMSG("nord c_id:" <<  nord->in_nord.s_C_ID << endl);

   int itemCmd      = ITEM_START;
   short itemComplete = 0;
   char field[256] ={NULL};

   for (int itemIndex=0;itemIndex<NORD_ITEMS;itemIndex++)
   {
```

```
      //supply warehouse
      if( *(commandBlock->get_ITEM_SUPP_W(itemIndex)) )
#ifdef DB2
        if ( (nord->in_nord.in_item[nord->in_nord.s_O_OL_CNT].s_OL_SUPPLY_W_ID = atoi(commandBlock->get_ITEM_SUPP_W(itemIndex))) == 0)
#elif ORACLE
        if ( (nord->in_nord.s_OL_SUPPLY_W_ID[nord->in_nord.s_O_OL_CNT] = atoi(commandBlock->get_ITEM_SUPP_W(itemIndex))) == 0)
#elif SYBASE
        if ( (nord->in_nord.s_OL_SUPPLY_W_ID[nord->in_nord.s_O_OL_CNT] = atoi(commandBlock->get_ITEM_SUPP_W(itemIndex))) == 0)
#endif
        {
   doNewOrderErrorPage(html,ERR_INVALID_SUPPLY_W_ID,commandBlock,txnHandle);
          return OK;
        }
        else
          itemComplete++;

      //item number
      if( *(commandBlock->get_ITEM_ITEM_NUM(itemIndex)) )
      {
        if(itemComplete==1)
        {
#ifdef DB2
          if ( (nord->in_nord.in_item[nord->in_nord.s_O_OL_CNT].s_OL_I_ID = atoi(commandBlock->get_ITEM_ITEM_NUM(itemIndex))) == 0)
#elif ORACLE
          if ( (nord->in_nord.s_OL_I_ID[nord->in_nord.s_O_OL_CNT] = atoi(commandBlock->get_ITEM_ITEM_NUM(itemIndex))) == 0)
#elif SYBASE
          if ( (nord->in_nord.s_OL_I_ID[nord->in_nord.s_O_OL_CNT] = atoi(commandBlock->get_ITEM_ITEM_NUM(itemIndex))) == 0)
#endif
          {
   doNewOrderErrorPage(html,ERR_INVALID_ITEM_NUM,commandBlock,txnHandle);
            return OK;
          }
          else
            itemComplete++;
        }
        //missing previous value of item supp warehouse, flag error
        else
        {
   doNewOrderErrorPage(html,ERR_INVALID_SUPPLY_W_ID,commandBlock,txnHandle);
          return OK;
        }
      }
      else if( (itemComplete==1) ) //nothing in the command block, check to see if the previous item value is present
      {
   doNewOrderErrorPage(html,ERR_INVALID_ITEM_NUM,commandBlock,txnHandle);
        return OK;
      }

      //item qty
      if(*(commandBlock->get_ITEM_QTY(itemIndex)))
      {
        if(itemComplete==2)
        {
#ifdef DB2
          if( (nord->in_nord.in_item[nord->in_nord.s_O_OL_CNT].s_OL_QUANTITY = atoi(commandBlock->get_ITEM_QTY(itemIndex))) == 0)
#elif ORACLE
          if( (nord->in_nord.s_OL_QUANTITY[nord->in_nord.s_O_OL_CNT] = atoi(commandBlock->get_ITEM_QTY(itemIndex))) == 0)
#elif SYBASE
          if( (nord->in_nord.s_OL_QUANTITY[nord->in_nord.s_O_OL_CNT] = atoi(commandBlock->get_ITEM_QTY(itemIndex))) == 0)
#endif
          {
   doNewOrderErrorPage(html,ERR_INVALID_ITEM_OTY,commandBlock,txnHandle);
            return OK;
          }
          else
            itemComplete++;
        }
        //missing previous value of item number
        else if (itemComplete ==1)
        {
   doNewOrderErrorPage(html,ERR_INVALID_ITEM_NUM,commandBlock,txnHandle);
          return OK;
        }
        //missing 1st value of supp warehouse
        else
        {
   doNewOrderErrorPage(html,ERR_INVALID_SUPPLY_W_ID,commandBlock,txnHandle);
          return OK;
        }
      }
      else if(itemComplete==2)     //nothing in the command block, check to see if the previous item values are present
      {
   doNewOrderErrorPage(html,ERR_INVALID_ITEM_NUM,commandBlock,txnHandle);
        return OK;
      }

#ifndef DB2
      DEBUGMSG("nord item:" << nord->in_nord.s_O_OL_CNT << "SUPPLY_W_ID:" << nord->in_nord.s_OL_SUPPLY_W_ID[nord->in_nord.s_O_OL_CNT] <<
        " OL_I_ID:" << nord->in_nord.s_OL_I_ID[nord->in_nord.s_O_OL_CNT] << " OL_QUANTITY:" << nord->in_nord.s_OL_QUANTITY[nord->in_nord.s_O_OL_CNT] <<endl);
#endif
      if(itemComplete == 3)
        nord->in_nord.s_O_OL_CNT++;

      itemComplete=0;
   }

   DEBUGMSG("complete nord items:"<<nord->in_nord.s_O_OL_CNT<<" initializing remaing unused items " << NORD_ITEMS - nord->in_nord.s_O_OL_CNT  << " to 0" <<endl);
   for(int itemIndex=nord->in_nord.s_O_OL_CNT;itemIndex<NORD_ITEMS;itemIndex++)
   {
#ifdef DB2
      nord->in_nord.in_item[itemIndex].s_OL_SUPPLY_W_ID=0;
      nord->in_nord.in_item[itemIndex].s_OL_I_ID = 0;
      nord->in_nord.in_item[itemIndex].s_OL_QUANTITY =0;
```

```
#elif ORACLE
      nord->in_nord.s_OL_SUPPLY_W_ID[itemIndex]=0;
      nord->in_nord.s_OL_I_ID[itemIndex] = 0;
      nord->in_nord.s_OL_QUANTITY[itemIndex] =0;
#elif SYBASE
      nord->in_nord.s_OL_SUPPLY_W_ID[itemIndex]=0;
      nord->in_nord.s_OL_I_ID[itemIndex] = 0;
      nord->in_nord.s_OL_QUANTITY[itemIndex] =0;
#endif
   }

   DEBUGMSG("nord creating new order results html title page"
<<endl);

   appendText(&html,"<HTML><HEAD><TITLE>TPC-C New Order
Results</TITLE></HEAD>\r\n"
              "<BODY><FORM ACTION=\""
              APP_NAME
              "\" METHOD=\"GET\">\r\n");
   //append menu buttons
   html+=appendButtons(html);
   html+=appendHiddenFields(html,txnHandle);

   appendText(&html,"</FORM><CENTER><H3>New Order</H3>
<BR></CENTER>"
               "<PRE>"
//             "        1        2        3        4        5        6        7        8
9\r\n"
//
"12345678901234567890123456789012345678901234567890123
4567890123456789012345678901234567890\r\n
              "");
   //assume failure
   nord->out_nord.s_transtatus = -1;
// nord->in_nord.len = sizeof(in_neword_struct);
// nord->out_nord.len = sizeof(out_neword_struct);

   DEBUGMSG("nord executing COM interface function,"<<endl<<
      "nord c_id: " <<  nord->in_nord.s_C_ID << endl <<
      "nord w_id: " <<  nord->in_nord.s_W_ID << endl <<
      "nord d_id: " <<  nord->in_nord.s_D_ID << endl);
   HRESULT   hres=0;
   if (txnHandle->comInterface.size > maxDataSize)
   {
      ERRORMSG("[NO]txnHandle->comInterface.size "<<txnHandle-
>comInterface.size);
   }
   try
   {
      hres = txnHandle->comInterface.comHandle-
>doNewOrder(&txnHandle-
>comInterface.size,(UCHAR**)&txnHandle->comInterface.txnBuffer);
   }
   catch(...)
   {
      html+=sprintf(html,"ERROR : nord com call caused exeception
to occur.</PRE></BODY></HTML>");
      ERRORMSG("COM+ exception [NO]txnHandle-
>comInterface.size "<<txnHandle->comInterface.size);
      return OK;
   }

   if(FAILED(hres))
   {
      ERRORMSG("ERROR : nord com call failed, rc:" << hex  <<
hres);
      DEBUGMSG("ERROR : nord com call failed, rc:" << hex  <<
hres);
   }
   else
   {
   DEBUGMSG("nord executed OK,"<<endl<<
      "nord c_id: " <<  nord->in_nord.s_C_ID << endl <<
      "nord w_id: " <<  nord->in_nord.s_W_ID << endl <<
      "nord d_id: " <<  nord->in_nord.s_D_ID << endl);
      //com call successful, return object back to pool.
      hres = txnHandle->comInterface.comHandle->doSetComplete();
      if(FAILED(hres))
      {
         ERRORMSG("ERROR : nord setcomplete call failed, rc:" <<
hex  << hres);
         DEBUGMSG("ERROR : nord setcomplete call failed, rc:" <<
hex  << hres);
         return OK;
      }
   }

   nord = (nord_wrapper *)txnHandle->comInterface.txnBuffer;
   DEBUGMSG("nord COM interface function successful,
s_transtatus:" << nord->out_nord.s_transtatus << endl);

   int rc = nord->out_nord.s_transtatus;

   char buffer[10];
   appendText(&html,"Warehouse:  ");
   appendText(&html,itoa(nord->in_nord.s_W_ID,buffer,10),6,1);

   appendText(&html,"District: ");
   appendText(&html,itoa(nord->in_nord.s_D_ID,buffer,10),26,1);

   appendText(&html,"Date: ");
   appendText(&html,nord->out_nord.s_O_ENTRY_D_time,18,1);
   appendText(&html," <BR>"
               "Customer: ");
   appendText(&html,itoa(nord->in_nord.s_C_ID,buffer,10),8,1);

   appendText(&html,"Name: ");
   appendText(&html,nord-
>out_nord.s_C_LAST,LAST_NAME_LEN+3,1);

   appendText(&html,"Credit: ");
   appendText(&html,nord->out_nord.s_C_CREDIT,5,1);

   appendText(&html,"%Disc.: ");
   if(rc == OK)
   {
      html+=sprintf(html,"%2.2lf",nord->out_nord.s_C_DISCOUNT);
   }
   appendText(&html," <BR>"
         "Order Number: ");
   if(rc != INVALID_STATUS)
      appendText(&html,itoa(nord->out_nord.s_O_ID,buffer,10),10,1);

   appendText(&html,"Number of Lines: ");

   if(rc != INVALID_STATUS)
      appendText(&html,itoa(nord-
>out_nord.s_O_OL_CNT,buffer,10),10,1);

   appendText(&html,"W_Tax: ");
   if(rc == OK)
   {
      html+=sprintf(html,"%5.2lf",nord->out_nord.s_W_TAX);
   }

   appendText(&html,"   D_Tax: ");
   if(rc == OK)
   {
      html+=sprintf(html,"%5.2lf",nord->out_nord.s_D_TAX);
   }
   appendText(&html," <BR> <BR>"
//         "        1        2        3        4        5        6        7        8
9\r\n"
```

```
//
"12345678901234567890123456789012345678901234567890123
4567890123456789012345678901234567890\r\n"
          " Supp_W  Item_Id   Item_Name                Qty Stock  B/G
Price    Amount <BR> ");

   //display items
   if (rc == OK)
   {
      //display valid items
      for(int itemCount=0;itemCount < nord-
>out_nord.s_O_OL_CNT;itemCount++)
      {
#ifdef DB2
        appendText(&html,itoa(nord-
>in_nord.in_item[itemCount].s_OL_SUPPLY_W_ID,buffer,10),8,1);
        appendText(&html,itoa(nord-
>in_nord.in_item[itemCount].s_OL_I_ID,buffer,10),10,1);
        appendText(&html,nord-
>out_nord.item[itemCount].s_I_NAME,DEFAULT_STRING_LEN+1,
1);
        appendText(&html,itoa(nord-
>in_nord.in_item[itemCount].s_OL_QUANTITY,buffer,10),5,1);
        appendText(&html,itoa(nord-
>out_nord.item[itemCount].s_S_QUANTITY,buffer,10),7,1);
        html+=sprintf(html,"%c   $%-7.2lf $%-7.2lf <BR> ",nord-
>out_nord.item[itemCount].s_brand_generic,
                                 nord-
>out_nord.item[itemCount].s_I_PRICE,
                                 nord-
>out_nord.item[itemCount].s_OL_AMOUNT);
#elif ORACLE
        appendText(&html,itoa(nord-
>in_nord.s_OL_SUPPLY_W_ID[itemCount],buffer,10),8,1);
        appendText(&html,itoa(nord-
>in_nord.s_OL_I_ID[itemCount],buffer,10),10,1);
        appendText(&html,nord-
>out_nord.s_I_NAME[itemCount],DEFAULT_STRING_LEN+1,1);
        appendText(&html,itoa(nord-
>in_nord.s_OL_QUANTITY[itemCount],buffer,10),5,1);
        appendText(&html,itoa(nord-
>out_nord.s_S_QUANTITY[itemCount],buffer,10),7,1);
        html+=sprintf(html,"%c   $%-7.2lf $%-7.2lf <BR> ",nord-
>out_nord.s_brand_generic[itemCount],
                                 nord-
>out_nord.s_I_PRICE[itemCount]/100.0,
                                 nord-
>out_nord.s_OL_AMOUNT[itemCount]/100.0);
#elif SYBASE
        appendText(&html,itoa(nord-
>in_nord.s_OL_SUPPLY_W_ID[itemCount],buffer,10),8,1);
        appendText(&html,itoa(nord-
>in_nord.s_OL_I_ID[itemCount],buffer,10),10,1);
        appendText(&html,nord-
>out_nord.s_I_NAME[itemCount],DEFAULT_STRING_LEN+1,1);
        appendText(&html,itoa(nord-
>in_nord.s_OL_QUANTITY[itemCount],buffer,10),5,1);
        appendText(&html,itoa(nord-
>out_nord.s_S_QUANTITY[itemCount],buffer,10),7,1);
        html+=sprintf(html,"%c   $%-7.2lf $%-7.2lf <BR> ", nord-
>out_nord.s_brand_generic[itemCount][0],
                                 nord->out_nord.s_I_PRICE[itemCount],
                                 nord-
>out_nord.s_OL_AMOUNT[itemCount]);
#endif
      }
      //display blank line for remaining empty items in the order
      for(int lineBreaks=0;lineBreaks < (NORD_ITEMS-nord-
>out_nord.s_O_OL_CNT);lineBreaks++)
        appendText(&html," <BR>");
   }
   else
      appendText(&html," <BR> <BR> <BR> <BR> <BR> <BR>
<BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR> <BR>");

   appendText(&html,"\r\n <BR> ");

   html+=displayStatus(html,rc);
   if(rc == OK)
      html+=sprintf(html,"      Total: $%.2lf",nord-
>out_nord.s_total_amount);
   else
      appendText(&html,"      Total: <BR>");

   appendText(&html,"</PRE></BODY> </HTML>");

   DEBUGMSG("nord html page complete.  returning to calling
function" << endl);

   return OK;
}

/*
*****************************************************************
** Name          : doNewOrderErrorPage
** Description :
**            HTML neworder page entry point
** Parameters:
**            char *     html result page
**            char *     error message
** Returns      :
**            int - return code
** Comments     :
**
*****************************************************************
*/


int doNewOrderErrorPage(char *htmlPage,char
*message,htmlPhraser *commandBlock,TXN_HANDLE *txnHandle)
{
   char *html=htmlPage;

   appendText(&html,"<HTML><HEAD><TITLE>TPC-C New
Order</TITLE></HEAD>\r\n"
              "<BODY><FORM ACTION=\""
              APP_NAME
              "\" METHOD=\"GET\">\r\n"
              "<CENTER><H3>Please Fill In New Order
Form.</H3></CENTER>\r\n"
              "Submit Transaction <INPUT TYPE=\"submit\" NAME=\""
              CMD_TXN_ID
              "\" VALUE=\""
              CMD_NORD
              "\">");

   //append the hidden warehouse and district fields
   html+=appendHiddenFields(html,txnHandle);

   //int buffer for warehouse
   char buffer[15];
   /*appendText(&html,"<PRE>        1        2        3        4        5
6        7        8        9\r\n"

"12345678901234567890123456789012345678901234567890123
4567890123456789012345678901234567890\r\n"
              "Warehouse: ");*/
   appendText(&html,"<PRE>Warehouse: ");
   appendText(&html,itoa(txnHandle->w_id,buffer,10),7,1);
   appendText(&html,"District: <INPUT NAME=\""
              CMD_D_ID
              "\" SIZE=1>                    Date:<BR>"
                "Customer <INPUT NAME=\""
              CMD_C_ID
```

```
            "\" SIZE=6>  Name:              Credit:      %Disc.:<BR>"
            "Order Number:         Number of Lines:         W_tax:
D_tax:<BR> <BR>"
            //"        1        2        3        4        5        6        7        8
9\r\n"

//"12345678901234567890123456789012345678901234567890123456789012
34567890123456789012345678901234567890\r\n"
            " Supp_W  Item_Num  Item_Name               Qty Stock
B/G  Price    Amount <BR> ");

  //append the 15 items commands
  html+=appendItems(html,NORD_ITEMS,ITEM_START);
  appendText(&html,message);

  //seal up html page
  appendText(&html,"</PRE></BODY></HTML>");

  return OK;
}


/*
******************************************************************
** Name         : doPaymentForm
** Description :
**          HTML payment page entry point
** Parameters:
**          htmlPhraser command block
**          char *     html result page
** Returns      :
**          int - return code
** Comments     :
**
******************************************************************
*/

int doPaymentForm(htmlPhraser *commandBlock,TXN_HANDLE
*txnHandle)
{
  char *html=txnHandle->htmlPage;
  appendText(&html,"<HTML><HEAD><TITLE>TPC-C
Payment</TITLE></HEAD>\r\n"
            "<BODY><FORM ACTION=\""
            APP_NAME
            "\" METHOD=\"GET\">\r\n"
            "<CENTER><H3>Please Fill In Payment
Form.</H3></CENTER> <BR>\r\n"
            "Submit Transaction <INPUT TYPE=\"submit\" NAME=\""
            CMD_TXN_ID
            "\" VALUE=\""
            CMD_PYMT
            "\">");
  html+=appendHiddenFields(html,txnHandle);
  appendText(&html,"<BR><PRE>\r\n"
            "Date:<BR>"
            "Warehouse: ");
  char buffer[15];
  appendText(&html,itoa(txnHandle->w_id,buffer,10));

  appendSpaces(&html,10);
  appendText(&html,"District: <INPUT NAME=\""
            CMD_D_ID
            "\" SIZE=1>\r\n<BR>"
            "<BR> <BR> <BR>"
            "Customer: "
            "<INPUT NAME=\""
            CMD_C_ID
            "\" SIZE=5>"
            "   "
            "Cust-Warehouse: "
            "<INPUT NAME=\""
            CMD_C_W_ID
            "\" SIZE=5>"
            "   "
            "Cust-District: "
            "<INPUT NAME=\""
            CMD_C_D_ID
            "\" SIZE=1><BR>"
            "Name:  <INPUT NAME=\""
            CMD_C_NAME
            "\" SIZE=20>");
  appendText(&html,"                              Since: <BR>"
            "                         "
            "                         Credit: <BR>"
            "                         "
            "                         %Disc: <BR>"
            "Amount Paid:            "
            "<INPUT NAME=\""
            CMD_AMT_PAID
            "\" SIZE=10>"
            "          "
            "New Cust-Balance:<BR>"
            "Credit Limit:<BR> <BR>Cust-Data:<BR> <BR> <BR>
<BR> </PRE>");

  return OK;
}

/*
******************************************************************
** Name         : doPaymentResults
** Description :
**          HTML neworder page entry point
** Parameters:
**          htmlPhraser command block
**          char *     html result page
** Returns      :
**           int - return code
** Comments     :
**
******************************************************************
*/

int doPaymentResults(htmlPhraser *commandBlock,TXN_HANDLE
*txnHandle)
{
  char *html=txnHandle->htmlPage;
  char buffer[50];

  struct paym_wrapper  *pymt = NULL;
  pymt = (paym_wrapper*)txnHandle->comInterface.txnBuffer;
  ZeroMemory(pymt,sizeof(paym_wrapper));

  //set login warehouse id from command block
  pymt->in_paym.s_W_ID = txnHandle->w_id;

  //set district from command block
#ifdef SYBASE
  if( (pymt->in_paym.s_D_ID = (CS_TINYINT)atoi(commandBlock-
>get_D_ID())) == 0)
  {

  doPaymentErrorPage(html,ERR_INVALID_D_ID,commandBlock,t
xnHandle);
     return OK;
  }
#else
  if( (pymt->in_paym.s_D_ID = atoi(commandBlock->get_D_ID()))
== 0)
  {

  doPaymentErrorPage(html,ERR_INVALID_D_ID,commandBlock,t
xnHandle);
```

```
      return OK;
   }
#endif
   //set customer id from command block
   if( (pymt->in_paym.s_C_ID = atoi(commandBlock->get_C_ID()))
== 0)
   {
      if(*(commandBlock->get_C_NAME()) == NULL)
      {
         //no customer id nor customer last name specified.

   doPaymentErrorPage(html,ERR_MISSING_C_ID_OR_CLAST,co
mmandBlock,txnHandle);
         return OK;
      }
      else
         strcpy(pymt->in_paym.s_C_LAST,commandBlock-
>get_C_NAME());
   }
   else
   {
      //make sure that the user only inserted just c_id
      if(*(commandBlock->get_C_NAME()) != NULL)
      {

   doPaymentErrorPage(html,ERR_C_ID_OR_CLAST_ONLY,comm
andBlock,txnHandle);
         return OK;
      }
   }

   //get customer warehose id field
   if( (pymt->in_paym.s_C_W_ID = atoi(commandBlock-
>get_C_W_ID())) == 0)
   {

   doPaymentErrorPage(html,ERR_INVALID_C_W_ID,commandBlo
ck,txnHandle);
      return OK;
   }

   //get customer district id field
#ifdef SYBASE
   if ( (pymt->in_paym.s_C_D_ID =
(CS_TINYINT)atoi(commandBlock->get_C_D_ID())) == 0)
   {

   doPaymentErrorPage(html,ERR_INVALID_C_D_ID,commandBloc
k,txnHandle);
      return OK;
   }
#else
   if ( (pymt->in_paym.s_C_D_ID = atoi(commandBlock-
>get_C_D_ID())) == 0)
   {

   doPaymentErrorPage(html,ERR_INVALID_C_D_ID,commandBloc
k,txnHandle);
      return OK;
   }
#endif
#ifdef DB2
   pymt->in_paym.s_H_AMOUNT = (float)atof(commandBlock-
>get_AMT_PAID());
#else
   if(!copyInMoney32(commandBlock->get_AMT_PAID(),&pymt-
>in_paym.s_H_AMOUNT))
   {

   doPaymentErrorPage(html,ERR_INVALID_PAYMENT_AMOUNT,
commandBlock,txnHandle);
      return OK;
   }
#endif
   appendText(&html,"<HTML><HEAD><TITLE>TPC-C Payment
Results</TITLE></HEAD>\r\n"
             "<BODY><FORM ACTION=\""
             APP_NAME
             "\" METHOD=\"GET\">\r\n");
   html+=appendButtons(html);

   html+=appendHiddenFields(html,txnHandle);

   appendText(&html,"</FORM><CENTER><H3>Payment</H3></C
ENTER>");

   DEBUGMSG("pymt executing COM interface function,"<<endl<<
      "pymt c_id: " <<  pymt->in_paym.s_C_ID << endl <<
      "pymt w_id: " <<  pymt->in_paym.s_W_ID << endl <<
      "pymt d_id: " <<  pymt->in_paym.s_D_ID << endl);
   //assume failure
   pymt->out_paym.s_transtatus = -1;

   DEBUGMSG("paym in,"<<endl<<
      "s_W_ID "<<pymt->in_paym.s_W_ID<<endl<<
      "s_C_W_ID "<<pymt->in_paym.s_C_W_ID<<endl<<
      "s_H_AMOUNT "<<pymt->in_paym.s_H_AMOUNT<<endl<<
      "s_D_ID "<<(int)pymt->in_paym.s_D_ID<<endl<<
      "s_C_D_ID "<<(int)pymt->in_paym.s_C_D_ID<<endl<<
      "s_C_ID "<<pymt->in_paym.s_C_ID<<endl<<
      "s_W_ID "<<pymt->in_paym.s_W_ID<<endl<<
      "s_C_LAST "<<pymt->in_paym.s_C_LAST<<endl);

   HRESULT   hres=0;
   if (txnHandle->comInterface.size > maxDataSize)
   {
      ERRORMSG("[PY]txnHandle->comInterface.size "<<txnHandle-
>comInterface.size);
   }
   try
   {
      hres = txnHandle->comInterface.comHandle-
>doPayment(&txnHandle-
>comInterface.size,(UCHAR**)&txnHandle->comInterface.txnBuffer);
   }
   catch(...)
   {
      html+=sprintf(html,"ERROR : Com Stock call caused exeception
to occur.</PRE></BODY></HTML>");
      ERRORMSG("COM+ exception [PY]txnHandle-
>comInterface.size "<<txnHandle->comInterface.size);
      return OK;
   }

   if(FAILED(hres))
   {
      html+=sprintf(html,"ERROR : pymt com call failed,
rc:%x</PRE></BODY></HTML>",hres);
     ERRORMSG("ERROR : pymt com call failed, rc:"<<hres<<endl);
      DEBUGMSG("ERROR : pymt com call failed, rc:"<<hres<<endl);
      return OK;
   }

   DEBUGMSG("pymt executed OK,"<<endl<<
      "pymt c_id: " <<  pymt->in_paym.s_C_ID << endl <<
      "pymt w_id: " <<  pymt->in_paym.s_W_ID << endl <<
      "pymt d_id: " <<  pymt->in_paym.s_D_ID << endl);
   txnHandle->comInterface.comHandle->doSetComplete();
   pymt = (paym_wrapper *)txnHandle->comInterface.txnBuffer;

   //get return code
   int rc = pymt->out_paym.s_transtatus;
   if( rc != OK)
   {
```

```
      html+=displayStatus(html,rc);
      appendText(&html,"</PRE></BODY></HTML>");
      return OK;
    }
// appendText(&html, "<BR><PRE>\r\n");
// appendText(&html,"        1        2        3        4        5        6
7        8<BR>");
//
   appendText(&html,"12345678901234567890123456789012345678901234567890123456789012345678901234567890<BR>");

   //start creating result body
   appendText(&html, "<BR><PRE>\r\n"
              "Date: ");

   appendText(&html,pymt->out_paym.s_H_DATE_time,18,1);
   appendText(&html, "<BR>"
                 "Warehouse: ");
  appendText(&html,itoa(pymt->in_paym.s_W_ID,buffer,10),6+24,1);
   appendText(&html,"District: ");
   appendText(&html,itoa(pymt->in_paym.s_D_ID,buffer,10),2,1);
   appendText(&html,"<BR>");

   //print out warehouse and district information
   appendText(&html,pymt-
>out_paym.s_W_STREET_1,STREET_LEN+21,1);
   appendText(&html,pymt-
>out_paym.s_D_STREET_1,STREET_LEN,1);
   appendText(&html,"<BR>");

   appendText(&html,pymt-
>out_paym.s_W_STREET_2,STREET_LEN+21,1);
   appendText(&html,pymt-
>out_paym.s_D_STREET_2,STREET_LEN,1);
   appendText(&html,"<BR>");

   appendText(&html,pymt->out_paym.s_W_CITY,CITY_LEN+1,1);
   appendText(&html,pymt-
>out_paym.s_W_STATE,STATE_LEN+1,1);
   copyOutZip(buffer,pymt->out_paym.s_W_ZIP);
   appendText(&html,buffer);

   appendText(&html,pymt->out_paym.s_D_CITY,CITY_LEN+1,1);
   appendText(&html,pymt-
>out_paym.s_D_STATE,STATE_LEN+1,1);
   copyOutZip(buffer,pymt->out_paym.s_D_ZIP);
   appendText(&html,buffer);

   //print out customer information
   appendText(&html,"<BR> <BR>Customer: ");
   appendText(&html,itoa(pymt->out_paym.s_C_ID,buffer,10),5+1,1);

   appendText(&html,"Cust-Warehouse: ");
   appendText(&html,itoa(pymt-
>in_paym.s_C_W_ID,buffer,10),6+1,1);

   appendText(&html,"Cust-District: ");
   appendText(&html,itoa(pymt->in_paym.s_C_D_ID,buffer,10));

   //add customer information
   appendText(&html,"<BR>Name:   ");
   appendText(&html,pymt-
>out_paym.s_C_FIRST,FIRST_NAME_LEN+1,1);
   appendText(&html,pymt-
>out_paym.s_C_MIDDLE,INITIALS_LEN+1,1);
   DEBUGMSG("Last name:"<<pymt->out_paym.s_C_LAST<<endl);
   appendText(&html,pymt-
>out_paym.s_C_LAST,LAST_NAME_LEN+5,1);

   appendText(&html,"Since: ");
#ifdef ORACLE
   appendText(&html,pymt->out_paym.c_since_d);
#elif DB2
   appendText(&html,pymt->out_paym.s_C_SINCE_time,18,1);
#elif SYBASE
   appendText(&html,pymt->out_paym.c_since);
#endif
   appendText(&html,"<BR>");
   appendSpaces(&html,8);

   appendText(&html,pymt-
>out_paym.s_C_STREET_1,STREET_LEN+20,1);
   appendText(&html," Credit: ");
   appendText(&html,pymt->out_paym.s_C_CREDIT);

   appendText(&html,"<BR>");
   appendSpaces(&html,8);

   appendText(&html,pymt-
>out_paym.s_C_STREET_2,STREET_LEN+21,1);
   appendText(&html,"%Disc: ");
   html+=sprintf(html,"%2.2lf",pymt->out_paym.s_C_DISCOUNT);

   appendText(&html,"<BR>");
   appendSpaces(&html,8);

   appendText(&html,pymt->out_paym.s_C_CITY,CITY_LEN+1,1);

   appendText(&html,pymt-
>out_paym.s_C_STATE,STATE_LEN+1,1);

   copyOutZip(buffer,pymt->out_paym.s_C_ZIP);
   appendText(&html,buffer,15,1);

   appendText(&html,"Phone: ");
   copyOutPhone(buffer,pymt->out_paym.s_C_PHONE);
   appendText(&html,buffer);

   appendText(&html," <BR> <BR>Amount Paid: $");
   html+=sprintf(html,"%-9.2lf",pymt->in_paym.s_H_AMOUNT);

   appendText(&html," New Cust-Balance: $");
   html+=sprintf(html,"%-9.2lf",pymt->out_paym.s_C_BALANCE);

   appendText(&html,"<BR>Credit Limit: $");
   html+=sprintf(html,"%-9.2lf",pymt->out_paym.s_C_CREDIT_LIM);

   appendText(&html," <BR> <BR>Cust-Data: ");
   if(pymt->out_paym.s_C_CREDIT[0] == 'B' && pymt-
>out_paym.s_C_CREDIT[1] == 'C')
   {
      appendCustData(&html,pymt->out_paym.s_C_DATA);
      appendText(&html," <BR>");
   }
   else
      appendText(&html," <BR> <BR> <BR>");

   html+=displayStatus(html,rc);
   appendText(&html,"</PRE></BODY></HTML>");

   return OK;
}
/*
*****************************************************************
** Name        : doPaymentErrorPage
** Description :
**          append payment error body
** Parameters:
**          char *    html page result
**          char *    error message
**          htmlPhraser * command block
** Returns     :
**          int - return code
** Comments    :
```

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

int doPaymentErrorPage(char *htmlPage,char
*message,htmlPhraser *commandBlock,TXN_HANDLE *txnHandle)
{
  char *html=htmlPage;
  appendText(&html,"<HTML><HEAD><TITLE>TPC-C
Payment</TITLE></HEAD>\r\n"
          "<BODY><FORM ACTION=\""
          APP_NAME
          "\" METHOD=\"GET\">\r\n"
          "<CENTER><H3>Please Fill In Payment
Form.</H3></CENTER> <BR>\r\n"
          "Submit Transaction <INPUT TYPE=\"submit\" NAME=\""
          CMD_TXN_ID
          "\" VALUE=\""
          CMD_PYMT
          "\">");
  html+=appendHiddenFields(html,txnHandle);
  appendText(&html,"<BR><PRE>\r\n"
          "Date:<BR>"
          "Warehouse: ");
  char buffer[15];
  appendText(&html,itoa(txnHandle->w_id,buffer,10));

  appendSpaces(&html,10);
  appendText(&html,"District: <INPUT NAME=\""
          CMD_D_ID
          "\" SIZE=1>\r\n<BR>"
          "<BR> <BR> <BR> <BR>"
          "Customer: "
          "<INPUT NAME=\""
          CMD_C_ID
          "\" SIZE=5>"
          "  "
          "Cust-Warehouse: "
          "<INPUT NAME=\""
          CMD_C_W_ID
          "\" SIZE=6>"
          "  "
          "Cust-District: "
          "<INPUT NAME=\""
          CMD_C_D_ID
          "\" SIZE=1><BR>"
          "Name:  <INPUT NAME=\""
          CMD_C_NAME
          "\" SIZE=20>");
  appendText(&html,"                Since: <BR>"
          "                "
          "              Credit: <BR>"
          "                "
          "              %Disc: <BR>"
          "Amount Paid:      "
          "<INPUT NAME=\""
          CMD_AMT_PAID
          "\" SIZE=10>"
          "       "
          "New Cust-Balance:<BR>"
          "Credit Limit:<BR> <BR> <BR> Cust-Data:<BR> <BR>
<BR> <BR> ");
  appendText(&html,message);
  appendText(&html,"</PRE>");

  return OK;
}

/*
****************************************************************
** Name       : doOrderStatusForm
** Description :
**          HTML orderStatus page entry point
** Parameters:
**          htmlPhraser command block
**          char *    html result page
** Returns     :
**          int - return code
** Comments    :
**
****************************************************************
*/

int doOrderStatusForm(htmlPhraser *commandBlock,TXN_HANDLE
*txnHandle)
{
  char *html=txnHandle->htmlPage;

  appendText(&html,"<HTML><HEAD><TITLE>TPC-C Order
Status</TITLE></HEAD>\r\n"
          "<BODY><FORM ACTION=\""
          APP_NAME
          "\" METHOD=\"GET\">\r\n"
          "<CENTER><H3>Please Fill In Order Status
Form.</H3></CENTER> <BR>\r\n"
          "Submit Transaction <INPUT TYPE=\"submit\" NAME=\""
          CMD_TXN_ID
          "\" VALUE=\""
          CMD_ORDS
          "\">"
          "<BR> ");
  html+=appendHiddenFields(html,txnHandle);

  appendText(&html,"<PRE>\r\n"
          "Warehouse: ");
  char buffer[15];
  appendText(&html,itoa(txnHandle->w_id,buffer,10));

  appendText(&html,"          District: <INPUT NAME=\""
          CMD_D_ID
          "\" SIZE=1>\r\n<BR>"
          "Customer: "
          "<INPUT NAME=\""
          CMD_C_ID
          "\" SIZE=5>"
          "  "
          "Name: "
          "<INPUT NAME=\""
          CMD_C_NAME
          "\" SIZE=20><BR>"
          "Cust-Balance: <BR>"
          "Order-Number:     Entry-Date:          Carrier-
Number<BR>"
          "Supply-W    Item-Num    Oty      Amount
Delivery<BR></PRE>");

  appendText(&html,"</BODY></HTML>");

  return OK;
}

/*
****************************************************************
** Name       : doOrderStatusResults
** Description :
**          HTML orderStatus page entry point
** Parameters:
**          htmlPhraser*   command block
**          char *    html result page
** Returns     :
**          int - return code
** Comments    :
**
****************************************************************
```

```
*/

int doOrderStatusResults(htmlPhraser
*commandBlock,TXN_HANDLE *txnHandle)
{
   char *html=txnHandle->htmlPage;
   struct ords_wrapper *ords = NULL;
   ords = (ords_wrapper *) txnHandle->comInterface.txnBuffer;
   ZeroMemory(ords,sizeof(ords_wrapper));

   //set warehouse login id from command blk
   ords->in_ords.s_W_ID = txnHandle->w_id;

   //set district login id from command blk
   if( (ords->in_ords.s_D_ID = atoi(commandBlock->get_D_ID())) ==
0)
   {

   doOrderStatusErrorPage(html,ERR_INVALID_D_ID,commandBlo
ck,txnHandle);
      return OK;
   }

   if( (ords->in_ords.s_C_ID = atoi(commandBlock->get_C_ID())) ==
0)
   {
      if(*(commandBlock->get_C_NAME()) == NULL)
      {
         //no customer id nor customer last name specified.

   doOrderStatusErrorPage(html,ERR_MISSING_C_ID_OR_CLAST,
commandBlock,txnHandle);
         return OK;
      }
      else
         strcpy(ords->in_ords.s_C_LAST,commandBlock-
>get_C_NAME());
   }
   else
   {
      //make sure that the user only inserted just c_id
      if(*(commandBlock->get_C_NAME()) != NULL)
      {

   doOrderStatusErrorPage(html,ERR_C_ID_OR_CLAST_ONLY,co
mmandBlock,txnHandle);
         return OK;
      }
   }

   appendText(&html,"<HTML><HEAD><TITLE>TPC-C Order
Status Results</TITLE></HEAD>\r\n"
               "<BODY><FORM ACTION=\""
               APP_NAME
               "\" METHOD=\"GET\">\r\n");
   html+=appendButtons(html);

   html+=appendHiddenFields(html,txnHandle);

   appendText(&html,"</FORM>");

   ords->out_ords.s_transtatus = -1;

   DEBUGMSG("ords executing COM interface function,"<<endl<<
      "ords c_id: " <<  ords->in_ords.s_C_ID << endl <<
      "ords w_id: " <<  ords->in_ords.s_W_ID << endl <<
      "ords d_id: " <<  ords->in_ords.s_D_ID << endl);
   HRESULT   hres=0;
   if (txnHandle->comInterface.size > maxDataSize)
   {
      ERRORMSG("[OS]txnHandle->comInterface.size "<<txnHandle-
>comInterface.size);
```

```
   }
   try
   {
      hres = txnHandle->comInterface.comHandle-
>doOrderStatus(&txnHandle-
>comInterface.size,(UCHAR**)&txnHandle->comInterface.txnBuffer);
   }
   catch(...)
   {
      html+=sprintf(html,"ERROR : ords com call caused
exeception.</PRE></BODY></HTML>");
      ERRORMSG("COM+ exception [OS]txnHandle-
>comInterface.size "<<txnHandle->comInterface.size);
      return OK;
   }

   if(FAILED(hres))
   {
      html+=sprintf(html,"ERROR : ords com call failed,
rc:%x</PRE></BODY></HTML>",hres);
      ERRORMSG("ERROR : ords com call failed,
rc:"<<DEBUGADDRESS(hres));
      DEBUGMSG("ERROR : ords com call failed,
rc:"<<DEBUGADDRESS(hres));
      return OK;
   }
   DEBUGMSG("ords executed OK,"<<endl<<
      "ords c_id: " <<  ords->in_ords.s_C_ID << endl <<
      "ords w_id: " <<  ords->in_ords.s_W_ID << endl <<
      "ords d_id: " <<  ords->in_ords.s_D_ID << endl);

   txnHandle->comInterface.comHandle->doSetComplete();

   ords = (ords_wrapper *)txnHandle->comInterface.txnBuffer;
   int rc = ords->out_ords.s_transtatus;

   if( rc != OK)
   {
      html+=displayStatus(html,rc);
      appendText(&html,"</PRE></BODY></HTML>");
      return OK;
   }

   //start creating result body
   appendText(&html,"</FORM><CENTER><H3>Order-
Status</H3></CENTER>");
   appendText(&html, "<BR><PRE>\r\n");
// appendText(&html,"         1         2         3         4         5         6
7         8<BR>");
//
   appendText(&html,"1234567890123456789012345678901234567
8901234567890123456789012345678901234567890<BR>");
   appendText(&html, "Warehouse: ");
   char buffer[50];

   appendText(&html,itoa(ords->in_ords.s_W_ID,buffer,10),6+1,1);
   appendText(&html,"District: ");
   appendText(&html,itoa(ords->in_ords.s_D_ID,buffer,10));
   appendText(&html,"<BR>"
            "Customer: ");
   //get customer id
   appendText(&html,itoa(ords->in_ords.s_C_ID,buffer,10),6+1,1);
   appendText(&html,"Name: ");
   //get first, middle, and last from wrapper
   appendText(&html,ords-
>out_ords.s_C_FIRST,FIRST_NAME_LEN+1,1);
   appendText(&html,ords-
>out_ords.s_C_MIDDLE,INITIALS_LEN+1,1);
   appendText(&html,ords-
>out_ords.s_C_LAST,LAST_NAME_LEN+5,1);

   //get customer balance from wrapper
```

```
   appendText(&html,"\r\nCust-Balance: $");
   html+=sprintf(html,"%.2lf",ords->out_ords.s_C_BALANCE);
   //display order number, entry date, and carrier number
   appendText(&html,"<BR> <BR>"
            "Order-Number ");
   appendText(&html,itoa(ords->out_ords.s_O_ID,buffer,10),11,1);
   appendText(&html,"Entry-Date:");
   appendText(&html,ords->out_ords.s_O_ENTRY_D_time,18,1);
   appendText(&html,"Carrier-Number: ");
   appendText(&html,itoa(ords-
>out_ords.s_O_CARRIER_ID,buffer,10));

   //add item title columns
   appendText(&html,"<BR>"
             "Supply-W    "
             "Item-Id    "
             "Qty    "
             "Amount      "
             "Delivery-Date<BR>");

   //display items
   for (int itemCount=0;itemCount<ords-
>out_ords.s_ol_cnt;itemCount++)
   {
      appendSpaces(&html,2);

#ifdef DB2
      //get supp w
      appendText(&html,itoa(ords-
>out_ords.item[itemCount].s_OL_SUPPLY_W_ID,buffer,10),11,1);

      //get item num
      appendText(&html,itoa(ords-
>out_ords.item[itemCount].s_OL_I_ID,buffer,10),11,1);

      //get item oty
      appendText(&html,itoa(ords-
>out_ords.item[itemCount].s_OL_QUANTITY,buffer,10),6,1);

      //get item dollor amount
      html+=sprintf(html,"$%-14.2lf",ords-
>out_ords.item[itemCount].s_OL_AMOUNT);
#elif ORACLE
      //get supp w
      appendText(&html,itoa(ords-
>out_ords.s_OL_SUPPLY_W_ID[itemCount],buffer,10),11,1);

      //get item num
      appendText(&html,itoa(ords-
>out_ords.s_OL_I_ID[itemCount],buffer,10),11,1);

      //get item oty
      appendText(&html,itoa(ords-
>out_ords.s_OL_QUANTITY[itemCount],buffer,10),6,1);

      //get item dollor amount
      html+=sprintf(html,"$%-14.2lf",ords-
>out_ords.s_OL_AMOUNT[itemCount]/100.0);
#elif SYBASE
      //get supp w
      appendText(&html,itoa(ords-
>out_ords.s_OL_SUPPLY_W_ID[itemCount],buffer,10),11,1);

      //get item num
      appendText(&html,itoa(ords-
>out_ords.s_OL_I_ID[itemCount],buffer,10),11,1);

      //get item oty
      appendText(&html,itoa(ords-
>out_ords.s_OL_QUANTITY[itemCount],buffer,10),6,1);

      //get item dollor amount
      html+=sprintf(html,"$%-14.2lf",ords-
>out_ords.s_OL_AMOUNT[itemCount]);
#endif

      //get delivery date
#ifdef ORACLE
      appendText(&html,ords-
>out_ords.s_OL_DELIVERY_D_time[itemCount]);
#elif DB2
      appendText(&html,ords-
>out_ords.item[itemCount].s_OL_DELIVERY_D_time,18,1);
#elif SYBASE
      appendText(&html,ords-
>out_ords.s_OL_DELIVERY_D_time[itemCount]);
#endif
      appendText(&html," <BR>");

   }

   //append line breaks if item count is less than 15
   for (int itemCount=0;itemCount < (15-ords-
>out_ords.s_ol_cnt);itemCount++)
      appendText(&html,"<BR> ");

   html+=displayStatus(html,rc);

   appendText(&html,"</PRE></BODY></HTML>");

   return OK;
}

/*
****************************************************************
** Name         : doOrderStatusErrorPage
** Description :
**          HTML orderStatus error page
** Parameters:
**          char *     html page result
**          char *     error message
**          htmlPhraser*   command block
**          TXN_HANDLE*  txn handle
** Returns      :
**          int - return code
** Comments     :
**
****************************************************************
*/

int doOrderStatusErrorPage(char *htmlPage,char
*message,htmlPhraser *commandBlock,TXN_HANDLE *txnHandle)
{
   char *html=htmlPage;

   appendText(&html,"<HTML><HEAD><TITLE>TPC-C Order
Status</TITLE></HEAD>\r\n"
            "<BODY><FORM ACTION=\""
            APP_NAME
            "\" METHOD=\"GET\">\r\n"
            "<CENTER><H3>Please Fill In Order Status
Form.</H3></CENTER> <BR>\r\n"
            "Submit Transaction <INPUT TYPE=\"submit\" NAME=\""
            CMD_TXN_ID
            "\" VALUE=\""
            CMD_ORDS
            "\">"
            "<BR> ");
   html+=appendHiddenFields(html,txnHandle);

   appendText(&html,"<PRE>\r\n"
            "Warehouse: ");
   char buffer[15];
   appendText(&html,itoa(txnHandle->w_id,buffer,10));
```

```
  appendText(&html,"                District: <INPUT NAME=\""
            CMD_D_ID
            "\" SIZE=1>\r\n<BR>"
            "Customer: "
            "<INPUT NAME=\""
            CMD_C_ID
            "\" SIZE=5>"
            "   "
            "Name: "
            "<INPUT NAME=\""
            CMD_C_NAME
            "\" SIZE=20><BR>"
            "Cust-Balance: <BR>"
            "Order-Number:         Entry-Date:                  Carrier-
Number<BR>"
            "Supply-W    Item-Num    Oty         Amount
Delivery <BR>");

  appendText(&html,message);
  appendText(&html,"</PRE></BODY></HTML>");

  return OK;
}

/*
*****************************************************************
** Name        : doDeliveryForm
** Description :
**          HTML payment page entry point
** Parameters:
**          htmlPhraser command block
**          char *    html result page
** Returns      :
**          int - return code
** Comments    :
**
*****************************************************************
*/
int doDeliveryForm(htmlPhraser *commandBlock,TXN_HANDLE
*txnHandle)
{
  char *html=txnHandle->htmlPage;

  appendText(&html,"<HTML><HEAD><TITLE>TPC-C
Delivery</TITLE></HEAD>\r\n"
            "<BODY><FORM ACTION=\""
            APP_NAME
            "\" METHOD=\"GET\">\r\n"
            "<CENTER><H3>Delivery.</H3></CENTER>\r\n"
            "Submit Transaction <INPUT TYPE=\"submit\" NAME=\""
            CMD_TXN_ID
            "\" VALUE=\""
            CMD_DLVY
            "\">");
  html+=appendHiddenFields(html,txnHandle);

  appendText(&html,"<BR> <PRE>"
            "Warehouse: ");
  char buffer[10];
  appendText(&html,itoa(txnHandle->w_id,buffer,10));

  appendText(&html," <BR> <BR>"
            "Carrier Number: "
            "<INPUT NAME=\""
            CMD_CARRIER_NUM
            "\" SIZE=1>"
            "</FORM></PRE>");

  appendText(&html,"</BODY></HTML>");

  return OK;
}

/*
*****************************************************************
** Name        : doDeliveryResults
** Description :
**          HTML payment page entry point
** Parameters:
**          htmlPhraser*   command block
**          TXN_HANDLE*  txn handle
** Returns      :
**          int - return code
** Comments    :
**
*****************************************************************
*/

int doDeliveryResults(htmlPhraser *commandBlock,TXN_HANDLE
*txnHandle)
{
  char *html = txnHandle->htmlPage;

  //declare delivery structure
  struct dlvy_wrapper    dlvy;

  //set warehouse login id from command blk
  dlvy.in_dlvy.s_W_ID = txnHandle->w_id;

  //set the carrier id from command blk
  if( (dlvy.in_dlvy.s_O_CARRIER_ID = atoi(commandBlock-
>get_CARRIER_NUM())) == 0)
  {

  doDeliveryErrorPage(html,ERR_INVALID_CARRIER,commandBl
ock,txnHandle);
    return OK;
  }

  //print title, add hidden fields , txn buttons
  appendText(&html,"<HTML><HEAD><TITLE>TPC-C Delivery
Results</TITLE></HEAD>\r\n<BODY><FORM ACTION=\""
            APP_NAME
            "\" METHOD=\"GET\">\r\n");

  html+=appendButtons(html);

  html+=appendHiddenFields(html,txnHandle);

  appendText(&html,
"<FORM><CENTER><H3>Delivery</H3></CENTER>");

  //call null db or comm w/ delivery wrapper
  int rc =
queueDlvyTxn(dlvy.in_dlvy.s_W_ID,dlvy.in_dlvy.s_O_CARRIER_ID);
  //if we are using the null db, rc will always be ok.  The only time
rc != OK is
  //1) unable to queue txn because dlvy queue is full.
  if( rc != OK)
  {
    html+=displayStatus(html,rc);
    appendText(&html,"</PRE></BODY></HTML>\r\n");

    ERRORMSG("ERROR : Unable to queue dlvy txn,
rc:"<<rc<<endl);
    return OK;
  }

  //start creating result body
  appendText(&html,"Warehouse: ");

  //get w_id from wrapper
  char buffer[10];
```

```
  appendText(&html,itoa(dlvy.in_dlvy.s_W_ID,buffer,10));
  appendText(&html,"<BR> <BR>Carrier Number: ");

  //get carrier_id from wrapper
  appendText(&html,itoa(dlvy.in_dlvy.s_O_CARRIER_ID,buffer,10));
  appendText(&html,"<BR> <BR>Execution Status: Delivery has
been queued </PRE></BODY></HTML>");

  return OK;
}

/*
****************************************************************
** Name         : doDeliveryErrorPage
** Description :
**          HTML payment error page entry point
** Parameters:
**          char *    html result page
**          char *    error message
**          htmlPhraser command block
**          TXN_HANDLE*  txn handle
**
** Returns      :
**          int - return code
** Comments     :
**
****************************************************************
*/
int doDeliveryErrorPage(char *htmlPage,char
*message,htmlPhraser *commandBlock,TXN_HANDLE *txnHandle)
{
  char *html=htmlPage;

  appendText(&html,"<HTML><HEAD><TITLE>TPC-C
Delivery</TITLE></HEAD>\r\n"
            "<BODY><FORM ACTION=\""
            APP_NAME
            "\" METHOD=\"GET\">\r\n"
            "<CENTER><H3>Delivery.</H3></CENTER>\r\n"
            "Submit Transaction <INPUT TYPE=\"submit\" NAME=\""
            CMD_TXN_ID
            "\" VALUE=\""
            CMD_DLVY
            "\">");
  html+=appendHiddenFields(html,txnHandle);

  appendText(&html,"<BR> <PRE>"
            "Warehouse: ");
  char buffer[15];
  appendText(&html,itoa(txnHandle->w_id,buffer,10));

  appendText(&html," <BR> <BR>"
            "Carrier Number: "
            "<INPUT NAME=\""
            CMD_CARRIER_NUM
            "\" SIZE=1> <BR>");

  appendText(&html,message);
  appendText(&html,"</PRE></BODY></HTML>");

  return OK;
}



/*
****************************************************************
** Name         : doStockForm
** Description :
**          HTML stock page entry point
** Parameters:
**          htmlPhraser command block
**          TXN_HANDLE*  txn handle
** Returns      :
**          int - return code
** Comments     :
**
****************************************************************
*/

int doStockForm(htmlPhraser *commandBlock,TXN_HANDLE
*txnHandle)
{
  char *html=txnHandle->htmlPage;
  appendText(&html,"<HTML><HEAD><TITLE>TPC-C Stock
Level</TITLE></HEAD>\r\n"
            "<BODY><FORM ACTION=\""
            APP_NAME
            "\" METHOD=\"GET\">\r\n"
            "<CENTER><H3>Please Fill In Stock
Form.</H3></CENTER> <BR>\r\n"
            "Submit Transaction <INPUT TYPE=\"submit\" NAME=\""
            CMD_TXN_ID
            "\" VALUE=\""
            CMD_STOK
            "\">");
  html+=appendHiddenFields(html,txnHandle);

  appendText(&html,"<PRE>"
            "Warehouse: ");
  char buffer[15];
  appendText(&html,itoa(txnHandle->w_id,buffer,10),6+1,1);
  appendText(&html,"District: ");

  appendText(&html,itoa(txnHandle->d_id,buffer,10));
  appendText(&html," <BR> <BR>"
            "Stock Level Threshold: "
            "<INPUT NAME=\""
            CMD_STK_THRESHOLD
            "\" SIZE=1> <BR> <BR>"
            "Low Stock: <BR>"
            "</PRE>");

  appendText(&html,"</FORM></BODY></HTML>");

  return OK;
}

/*
****************************************************************
** Name         : doStockResults
** Description :
**           HTML stock page entry point
** Parameters:
**          htmlPhraser command block
**          TXN_HANDLE * handle for this transaction
** Returns      :
**          int - return code
** Comments     :
**
****************************************************************
*/

int doStockResults(htmlPhraser *commandBlock,TXN_HANDLE
*txnHandle)
{
  char *html = txnHandle->htmlPage;

  struct stok_wrapper *stok;
  stok = (stok_wrapper*)txnHandle->comInterface.txnBuffer;
  ZeroMemory(stok,sizeof(stok_wrapper));

  //set warehouse login id from command blk
  stok->in_stok.s_W_ID = txnHandle->w_id;
```

```
    //set district login id from command blk
    stok->in_stok.s_D_ID = txnHandle->d_id;

    //set stock level threshold id from command blk
    if( (stok->in_stok.s_threshold = atoi(commandBlock-
>get_STK_THRESHOLD())) == 0)
    {

    doStockErrorPage(html,ERR_INVALID_THRESHOLD,commandB
lock,txnHandle);
        return OK;
    }
    //assume failure, set s_transtatus to err
    stok->out_stok.s_transtatus = INVALID_STATUS;

    //print title, add hidden fields , txn buttons
    appendText(&html,"<HTML><HEAD><TITLE>TPC-C Stock Level
Results</TITLE></HEAD>\r\n"
                "<BODY><FORM ACTION=\""
                APP_NAME
                "\" METHOD=\"GET\">\r\n");

    html+=appendButtons(html);

    html+=appendHiddenFields(html,txnHandle);

    appendText(&html,"</FORM>");

    stok->out_stok.s_transtatus = OK;

    DEBUGMSG("stok executing COM interface function,"<<endl<<
        "stok d_id: " <<  stok->in_stok.s_D_ID << endl <<
        "stok w_id: " <<  stok->in_stok.s_W_ID << endl <<
        "stok s_threshold: " <<  stok->in_stok.s_threshold << endl);

    HRESULT   hres=0;
    if (txnHandle->comInterface.size > maxDataSize)
    {
        ERRORMSG("[SR]txnHandle->comInterface.size "<<txnHandle-
>comInterface.size);
    }
    try
    {
        hres = txnHandle->comInterface.comHandle-
>doStockLevel(&txnHandle-
>comInterface.size,(UCHAR**)&txnHandle->comInterface.txnBuffer);
    }
    catch(...)
    {
        html+=sprintf(html,"ERROR : Com Stock call caused exeception
to occur.</PRE></BODY></HTML>");
        ERRORMSG("COM+ exception [SR]txnHandle-
>comInterface.size "<<txnHandle->comInterface.size);
        return OK;
    }

    //cast result back to stock structure
    if(FAILED(hres))
    {
        html+=sprintf(html,"ERROR : stok com call failed,
rc:%ld</PRE></BODY></HTML>",hres);
        ERRORMSG("ERROR : stok com call failed,
rc:"<<DEBUGADDRESS(hres)<<endl);
        DEBUGMSG("ERROR : stok com call failed,
rc:"<<DEBUGADDRESS(hres)<<endl);
        return OK;
    }

    DEBUGMSG("stok executed OK,"<<endl<<
        "stok d_id: " <<  stok->in_stok.s_D_ID << endl <<
        "stok w_id: " <<  stok->in_stok.s_W_ID << endl <<
        "stok s_threshold: " <<  stok->in_stok.s_threshold << endl);
    try
    {
        txnHandle->comInterface.comHandle->doSetComplete();
    }
    catch(...)
    {
        ERRORMSG("txnHandle address:"<<hex<<txnHandle<<
            "txnHandle->comInterface.comHandle:"<<hex<<txnHandle-
>comInterface.comHandle<<
            "txnHandle->comInterface.txnBuffer:"<<hex<<(void
*)txnHandle->comInterface.txnBuffer<<endl);


        ERRORMSG("Com Stock setComplete call caused exeception
to occur."<<endl);
        html+=sprintf(html,"ERROR : Com Stock setComplete call
caused exeception to occur.</PRE></BODY></HTML>");
        return OK;
    }

    stok = (stok_wrapper *)txnHandle->comInterface.txnBuffer;
    int rc = stok->out_stok.s_transtatus;
    if(rc != OK)
    {
        html+=displayStatus(html,rc);
        appendText(&html,"</PRE></BODY></HTML>");
        return OK;
    }

    //start creating result body
    appendText(&html,"<FORM><CENTER><H3>Stock-
Level</H3></CENTER>");
    appendText(&html, "<BR><PRE>\r\n"
        "Warehouse: ");

    //get w_id from wrapper
    char buffer[10];
    appendText(&html,itoa(stok->in_stok.s_W_ID,buffer,10),6+1,1);

    appendText(&html,"District: ");
    appendText(&html,itoa(stok->in_stok.s_D_ID,buffer,10));

    appendText(&html," <BR> <BR>"
            "Stock Level Threshold: ");
    appendText(&html,itoa(stok->in_stok.s_threshold,buffer,10));

    appendText(&html," <BR> <BR>"
            "Low Stock: ");
    appendText(&html,itoa(stok->out_stok.s_low_stock,buffer,10));
    appendText(&html," <BR> <BR>");

    html+=displayStatus(html,rc);
    appendText(&html,"</PRE></BODY></HTML>");

    return OK;
}

/*
*****************************************************************
** Name         : doStockErrorPage
** Description :
**              HTML stock page entry point
** Parameters:
**            htmlPhraser command block
**            char *     html result page
**              char *     query string
**              tpccHandle *handle for this transaction
** Returns      :
**              int - return code
** Comments     :
**
```

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

int doStockErrorPage(char *htmlPage,char *message,htmlPhraser
*commandBlock,TXN_HANDLE *txnHandle)
{
  char *html=htmlPage;

  appendText(&html,"<HTML><HEAD><TITLE>TPC-C Stock
Level</TITLE></HEAD>\r\n"
        "<BODY><FORM ACTION=\""
        APP_NAME
        "\" METHOD=\"GET\">\r\n"
        "<CENTER><H3>Please Fill In Stock
Form.</H3></CENTER> <BR>\r\n"
        "Submit Transaction <INPUT TYPE=\"submit\" NAME=\""
        CMD_TXN_ID
        "\" VALUE=\""
        CMD_STOK
        "\">");
  html+=appendHiddenFields(html,txnHandle);

  appendText(&html,"<PRE>"
        "Warehouse:  ");
  char buffer[15];
  appendText(&html,itoa(txnHandle->w_id,buffer,10));
  appendSpaces(&html,2);
  appendText(&html,"District: ");
  appendText(&html,commandBlock->get_D_ID());
  appendText(&html," <BR> <BR>"
        "Stock Level Threshold: "
        "<INPUT NAME=\""
        CMD_STK_THRESHOLD
        "\" SIZE=1> <BR> <BR>"
        "Low Stock: <BR>");

  appendText(&html,message);


  appendText(&html,"</PRE></FORM></BODY></HTML>");

  return OK;
}



/*
*****************************************************************
** Name        : doExit
** Description :
**        HTML exit page entry point
** Parameters:
**        htmlPhraser command block
**        char *    html result page
** Returns     :
**        int - return code
** Comments    :
**
*****************************************************************
*/
int doExit(htmlPhraser *commandBlock,TXN_HANDLE *txnHandle)
{
  return (doLoginForm(commandBlock,txnHandle));
}

/*
*****************************************************************
** Name        : displayStatus
** Description :
**        appends status string to the html page
** Parameters:
**        char*     html page
**        int    rc
** Returns     :
**        amount of characters the function appened
**        to the html page
** Comments    :
**
*****************************************************************
*/
int displayStatus(char *htmlPage,int rc)
{
  char *html = htmlPage;

  appendText(&html,"");

  switch (rc)
  {
  case OK:
    appendText(&html,"Execution Status: Transaction
Committed",50,1);
    break;
  case INVALID_ITEM:
    appendText(&html,"Execution Status: Item number is not
valid",50,1);
    break;
  case INVALID_STATUS:
    appendText(&html,"Execution Status: ERROR: Rollback
INVALID_STATUS",50,1);
    break;
  case INVALID_COM_STATUS:
    appendText(&html,"Execution Status: ERROR: Rollback COM
FAILURE",50,1);
    break;
  case ERR_DLVY_QUEUE_FULL:
    appendText(&html,"Execution Status: ERROR: Rollback DLVY
QUEUE FULL",50,1);
    break;
  default:
    appendText(&html,"Execution Status: ERROR: Rollback",50,1);

  };

  appendText(&html,"     ");

  return (int)(html - htmlPage);
}
/*
*****************************************************************
** Name        : appendButtons
** Description :
**        append hidden field to recognize user after login
**
** Parameters:
**        *htmlPage      html result page
**        *TXN_HANDLE     txn handle
** Returns     :
**        int        amount of characters the function appened
**                   to the html page
** Comments    :
**
*****************************************************************
*/
int appendHiddenFields(char *htmlPage,TXN_HANDLE *txnHandle)
{
  char *html = htmlPage;
  char buffer[15];

  appendText(&html,"<INPUT TYPE=\"hidden\" NAME=\""
        CMD_TERM_ID
        "\" VALUE=\"");
  appendText(&html,itoa(txnHandle->term_id,buffer,10));
  appendText(&html,"\">\r\n");
```

```
  return (int)(html-htmlPage);

}
/*
****************************************************************
** Name         : appendButtons
** Description :
**         appends buttons transaction buttons to result page
** Parameters:
**         *htmlPage
**
** Returns      :
**         amount of characters the function appened
**         to the html page
** Comments    :
**
****************************************************************
*/
int appendButtons(char *htmlPage)
{
  char *html = htmlPage;

  appendText(&html,"<INPUT TYPE=\"submit\" NAME=\""
            CMD_TXN_ID
            "\" VALUE=\""
            CMD_NORD
            "\">\r\n"
            "<INPUT TYPE=\"submit\" NAME=\""
            CMD_TXN_ID
            "\" VALUE=\""
            CMD_PYMT
            "\">\r\n"
            "<INPUT TYPE=\"submit\" NAME=\""
            CMD_TXN_ID
            "\" VALUE=\""
            CMD_ORDS
            "\">\r\n"
            "<INPUT TYPE=\"submit\" NAME=\""
            CMD_TXN_ID
            "\" VALUE=\""
            CMD_DLVY
            "\">\r\n"
            "<INPUT TYPE=\"submit\" NAME=\""
            CMD_TXN_ID
            "\" VALUE=\""
            CMD_STOK
            "\">\r\n"
            "<INPUT TYPE=\"submit\" NAME=\""
            CMD_TXN_ID
            "\" VALUE=\""
            CMD_EXIT
           "\">\r\n <BR>");

  return (int)(html - htmlPage);
}

/*
****************************************************************
** Name         : appendItems
** Description :
**         appends items to new order and order status page
** Parameters:
**         *htmlPage        html result page
**         short            items to append
**         short            item CMD id start
**
** Returns      :
**         amount of characters the function appened
**         to the html page
** Comments    :
**
****************************************************************
*/
int appendItems(char *htmlPage,short itemCount,short cmdIDStart)
{
  char *html = htmlPage;
  char numBuffer[MAX_INT_BUFFER];

  for(int item=0;item < itemCount;item++)
  {
    appendText(&html,"<BR> <INPUT NAME=\"");
    appendText(&html,itoa(cmdIDStart++,numBuffer,10));
    appendText(&html,"\" SIZE=6> <INPUT NAME=\"");
    appendText(&html,itoa(cmdIDStart++,numBuffer,10));
    appendText(&html,"\" SIZE=6>                    <INPUT
NAME=\"");
    appendText(&html,itoa(cmdIDStart++,numBuffer,10));
    appendText(&html,"\" SIZE=2>\r\n");
  }

  return (int)(html - htmlPage);
}

/*
****************************************************************
** Name         : dlvyThreadEntry
** Description :
**         dlvy thread worker entry point
** Parameters:
**
** Returns      :
**
** Comments    :
**         All dlvy threads created by initDly enter at
**         this point.  They must first make a connection
**         to the database, then go to sleep.
**
**         Main isapi threads control dlvy worker semaphore
**         and signal when a dlvy txn is queued.
**
****************************************************************
*/

void dlvyThreadEntry(void *)
{
  int     rc = 0;

  DEBUGMSG("dlvyThread " << GetCurrentThreadId() << " entered
dlvyThreadEntry, calling db_connect to db:" << dbName << endl);

  void *connectHandle;
  //connect to database.
  DEBUGMSG("ptr created. calling db_connect to db:" << dbName
<< endl);
  ERRORMSG("ptr created. calling db_connect to db:" << dbName
<< endl);
  rc = db_connect(dbName,&connectHandle);

  if(rc != OK)
  {
    ERRORMSG("dlvyThread " << GetCurrentThreadId() <<"
unable to connect to database, rc:" << rc << endl);
    DEBUGMSG("dlvyThread " << GetCurrentThreadId() <<" unable
to connect to database, rc:" << rc << endl);
    return;
  }

  DEBUGMSG("dlvyThread " << GetCurrentThreadId() << " connect
to db:" << dbName << " successful" << endl);

  FILE *dlvyLog = NULL;
  char logFileName[MAX_STRING_LEN] = {NULL};

  EnterCriticalSection(&isapiLock);
```

```
   //open dlvy log file for this thread
   sprintf(logFileName,"%s\\del_%d.txt",dlvyLogPath,dlvyThreadID);
   dlvyLog = fopen(logFileName,"w");
   if(!dlvyLog)
   {
      ERRORMSG("dlvyThread " << GetCurrentThreadId() << " unable to open dlvy log "
            << dlvyLogPath << "\\del_" << dlvyThreadID << endl);
      DEBUGMSG("dlvyThread " << GetCurrentThreadId() << " unable toopen dlvy log "
            << dlvyLogPath << "\\del_" << dlvyThreadID << endl);
      return;
   }

   //increment the global dlvy thread id
   dlvyThreadID++;

   LeaveCriticalSection(&isapiLock);

   DEBUGMSG("dlvyThread " << GetCurrentThreadId() <<" dlvy log file name: " << logFileName << " open." << endl);

   HANDLE  workerHandles[2];                   //handle array to store event to wait on

   struct  DLVYQUEUEDATA      dlvyQueueData;      //dlvy queue struct to store queued txn
   struct dlvy_wrapper     dlvyTxn;            //dlvy wrapper of db2 structs

   struct  _timeb          endQueueTime;      //time stamp to queue removal time
   struct  _timeb          endProcessTime;       //time stamp for end process time

   char   orderIDs[MAX_STRING_LEN] = {NULL};         //string to store oids for each district
   int      bytesWritten =   0;
   int      dlvyCount =0;

   DEBUGMSG("dlvyThread entering work loop" << endl);

   //successful, while true
   while(true)
   {
//    try
//    {
         DEBUGMSG("dlvyThread initializing wait handles" << endl);

         //wait for both program exit AND if there is work to do
         workerHandles[0] = dlvyThreadDone;
         workerHandles[1] = dlvyThreadSemaphore;

         DEBUGMSG("dlvyThread going to sleep waiting for wrk" << endl);

         rc = WaitForMultipleObjects(2,&workerHandles[0],FALSE,INFINITE);

         DEBUGMSG("dlvyThread awake, checking wake condition" << endl);

         if(rc == WAIT_OBJECT_0)
            break;
         else if(rc == (WAIT_OBJECT_0+1) )
         {
            DEBUGMSG("dlvyThread awake, wake condition of dlvyThreadSemaphore" << endl);
         }

         DEBUGMSG("dlvyThread trying to enter critical section" << endl);

         EnterCriticalSection(&dlvyQueueLock);

         DEBUGMSG("dlvyThread entered critical section" << endl);

         //remove queued dlvy txn
         dlvyQueueData.enqueueTime.time      =
   dlvyQueue[dlvyBufferThreadIndex].enqueueTime.time;
         dlvyQueueData.enqueueTime.millitm   =
   dlvyQueue[dlvyBufferThreadIndex].enqueueTime.millitm;
         dlvyQueueData.in_s_0_CARRIER_ID     =
   dlvyQueue[dlvyBufferThreadIndex].in_s_0_CARRIER_ID;
         dlvyQueueData.warehouse           =
   dlvyQueue[dlvyBufferThreadIndex].warehouse;

         DEBUGMSG("dlvyThread removed dlvy:" << dlvyCount << ",w_id:" << dlvyQueueData.warehouse
                  << " carrier_id:" << dlvyQueueData.in_s_0_CARRIER_ID << endl);

         DEBUGMSG("dlvyThread removed dlvy in queue index: " <<dlvyBufferThreadIndex<< " w_id: " << dlvyQueueData.warehouse
                  << " carrier_id: " << dlvyQueueData.in_s_0_CARRIER_ID << endl);

         //increment the number of free slots
         dlvyBufferFreeSlots++;

         //increment the thread index to next slot in dlvy queue
         dlvyBufferThreadIndex++;

         DEBUGMSG("dlvyThread incremented amount of free slots:" << dlvyBufferFreeSlots << " and thread index:" <<
                  dlvyBufferThreadIndex << endl);

         //check if we reached the end of dlvy queue, if so, reset back index back to 0
         if(dlvyBufferThreadIndex == dlvyQueueLen)
         {
           DEBUGMSG("dlvyThread  reset dlvyBufferThreadIndex to 0, current dlvyBufferThreadIndex:" << dlvyBufferThreadIndex
                << " free slots:"<<dlvyBufferFreeSlots<<endl);
           ERRORMSG("dlvyThread  reset dlvyBufferThreadIndex to 0, current dlvyBufferThreadIndex:" << dlvyBufferThreadIndex
                << " free slots:"<<dlvyBufferFreeSlots<<endl);

           dlvyBufferThreadIndex=0;
         }

         DEBUGMSG("dlvyThread releasing critical section" << endl);

         LeaveCriticalSection(&dlvyQueueLock);

         //take enqueue time
         _ftime(&endQueueTime);

         DEBUGMSG("dlvyThread executing txn w_id:" << dlvyQueueData.warehouse
              << " carrier_id:" << dlvyQueueData.in_s_0_CARRIER_ID << endl);

         //prepare to call database
         dlvyTxn.in_dlvy.s_O_CARRIER_ID  =
   dlvyQueueData.in_s_0_CARRIER_ID;
         dlvyTxn.in_dlvy.s_W_ID       = dlvyQueueData.warehouse;
#ifdef SYBASE
         dlvyTxn.in_dlvy.s_D_ID       = 1;
#endif
         dlvyTxn.out_dlvy.s_transtatus =  OK;

         //increment dlvy count
         dlvyCount++;
```

```
	DEBUGMSG("dlvyThread %d calling dlvy txn" << rc << endl);

	//call dvly txn
	rc = dlvyCall(&dlvyTxn,connectHandle);

	_ftime(&endProcessTime);

	rc = dlvyTxn.out_dlvy.s_transtatus;

#ifdef ORACLE
	DEBUGMSG("dlvy txn response time:"<<
		((((endProcessTime.time - endQueueTime.time)*1000)+
		(endProcessTime.millitm -
endQueueTime.millitm))/1000.0)<<
		" w_id:"<<dlvyTxn.in_dlvy.s_W_ID<<" carrier:"
<<dlvyTxn.in_dlvy.s_O_CARRIER_ID<<
		" rc: "<< rc <<endl);
#elif DB2
	DEBUGMSG("dlvy txn response time:"<<
		((((endProcessTime.time - endQueueTime.time)*1000)+
		(endProcessTime.millitm -
endQueueTime.millitm))/1000.0)<<
		" w_id:"<<dlvyTxn.in_dlvy.s_W_ID<<" carrier:"
<<dlvyTxn.in_dlvy.s_O_CARRIER_ID<<
		" deadLocks:"<<dlvyTxn.out_dlvy.deadlocks<<" rc: "<< rc
<<endl);
#elif SYBASE
	DEBUGMSG("dlvy txn response time:"<<
		((((endProcessTime.time - endQueueTime.time)*1000)+
		(endProcessTime.millitm -
endQueueTime.millitm))/1000.0)<<
		" w_id:"<<dlvyTxn.in_dlvy.s_W_ID<<" carrier:"
<<dlvyTxn.in_dlvy.s_O_CARRIER_ID<<
		" rc: "<< rc <<endl);
#endif
	DEBUGMSG("dlvyThread dlvy s_transtatus:" << rc << endl);

	if(rc == OK)
	{
	  bytesWritten=0;
	  char *buffer = orderIDs;

#ifdef SYBASE
	  for(int districtIndex=1;districtIndex <=
DISTRICTS_PER_WAREHOUSE;districtIndex++)
	  {
	    if(dlvyTxn.out_dlvy.s_O_ID[districtIndex] == 0)
	      bytesWritten = sprintf(buffer,"\nD_ID %d had no new
orders",districtIndex);
	    else
	      bytesWritten = sprintf(buffer,"%d
",dlvyTxn.out_dlvy.s_O_ID[districtIndex]);


	    buffer+=bytesWritten;
	  }
#else
	  for(int districtIndex=0;districtIndex <
DISTRICTS_PER_WAREHOUSE;districtIndex++)
	  {
	    if(dlvyTxn.out_dlvy.s_O_ID[districtIndex] == 0)
	      bytesWritten = sprintf(buffer,"\nD_ID %d had no new
orders",districtIndex);
	    else
	      bytesWritten = sprintf(buffer,"%d
",dlvyTxn.out_dlvy.s_O_ID[districtIndex]);


	    buffer+=bytesWritten;
	  }
#endif
	}
	else
	  sprintf(orderIDs,"/nDelivery transaction failed");


	fprintf(dlvyLog,DELIVERY_LOG_SUCCESS_STR,
		dlvyCount,
		dlvyQueueData.enqueueTime.time,
		dlvyQueueData.enqueueTime.millitm,
		endQueueTime.time,
		endQueueTime.millitm,
		dlvyQueueData.warehouse,
		dlvyQueueData.in_s_0_CARRIER_ID,
		orderIDs,
		endProcessTime.time,
		endProcessTime.millitm);

	fflush(dlvyLog);
//	}
//	catch(...)
//	{
//	  ERRORMSG("ERROR : Unhandled exeception in dlvy thread.
Thread exiting"<<endl);
//	  fprintf(dlvyLog,"ERROR : Unhandled exeception in dlvy thread
%ld. Thread exiting.\n",GetCurrentThreadId());
//	  fflush(dlvyLog);

//	  LeaveCriticalSection(&dlvyQueueLock);
//	  throw;
//	}
  }//end while true
}

/*
*****************************************************************
** Name		: queueDlvyTxn
** Description :
**		function queues dlvy txn in dlvy queue
** Parameters:
**		int	warehouse
**		short	carrier
** Returns	:
**		int	error code
** Comments	:
**		Function will queue dlvy txn if 2 points are true
**		1) We have room in our dlvy buffer
**		2) We writing over the end of the queue
**
*****************************************************************
*/

int queueDlvyTxn(int warehouse, short carrier_id)
{
  DEBUGMSG("Taking lock to queue dlvy txn.");

  EnterCriticalSection(&dlvyQueueLock);

  DEBUGMSG("Lock aquired to queue dlvy txn");

  if(dlvyBufferFreeSlots)
  {
    DEBUGMSG("Checking if we are inserting at tail of dlvy
queue."<<endl);
    if( dlvyBufferSlotIndex == (dlvyBufferThreadIndex-1))
    {
      ERRORMSG("Error dlvy queue inserting over unserviced
queued dlvy txn."<<endl);
      DEBUGMSG("Error dlvy queue inserting over unserviced
queued dlvy txn."<<endl);
      LeaveCriticalSection(&dlvyQueueLock);
      return ERR_DLVY_QUEUE_EATING_TAIL;
    }
```

```
      DEBUGMSG("free slots dlvy queue:"<<dlvyBufferFreeSlots<<" inserting txn in slot: " <<dlvyBufferSlotIndex<<
        "w_id: "<<warehouse<<" carrier: "<<carrier_id<<endl);

      dlvyQueue[dlvyBufferSlotIndex].warehouse = warehouse;
      dlvyQueue[dlvyBufferSlotIndex].in_s_0_CARRIER_ID = carrier_id;

      _ftime(&dlvyQueue[dlvyBufferSlotIndex].enqueueTime);

//take lock here

      //decrement the number of free slots in the buffer
      dlvyBufferFreeSlots--;

      //increment the index to the next dlvy queue slot.
      dlvyBufferSlotIndex++;

      DEBUGMSG("dlvy txn queued, slots available in queue:"<<dlvyBufferFreeSlots<<" queue slot index:"<<dlvyBufferSlotIndex
           <<"w_id:"<<warehouse<<" carrier:"<<carrier_id<<endl);

      DEBUGMSG("dlvy txn queued, slots available in queue: "<<dlvyBufferFreeSlots<<" queue slot index: "<<dlvyBufferSlotIndex
           <<" w_id: "<<warehouse<<" carrier: "<<carrier_id<<endl);

      if(dlvyBufferSlotIndex == dlvyQueueLen)
      {
        DEBUGMSG("queue slot index hit end of queue, reset to 0, current index:"<<dlvyBufferSlotIndex<<" free slots:"<<dlvyBufferFreeSlots<<endl);
        ERRORMSG("queue slot index hit end of queue, reset to 0, current index:"<<dlvyBufferSlotIndex<<" free slots:"<<dlvyBufferFreeSlots<<
          "Thread Worker Queue Index:"<<dlvyBufferThreadIndex<<endl);
        dlvyBufferSlotIndex=0;
      }
      //leave critical section
   }
   else
   {
      //no slots available in dlvy buffer, release critcal section and return an nord->in_nord.in_item
      LeaveCriticalSection(&dlvyQueueLock);
      ERRORMSG("dlvy queue buffer full, increase the dlvy queue length."<<endl);
      return ERR_DLVY_QUEUE_FULL;
   }

   LeaveCriticalSection(&dlvyQueueLock);

   //release semaphore to wake thread that there is work
   ReleaseSemaphore(dlvyThreadSemaphore,1,NULL);

   return OK;
}


/*
*****************************************************************
** Name        : doHtml
** Description :
**          HTML processing page entry point
** Parameters:
**          txn handle
** Returns      :
**          int - return code
** Comments     :
**
*****************************************************************
*/

void doHtml(TXN_HANDLE *txnHandle)
{
   DEBUGMSG("Entered doHtml(), parsing query string:"<< txnHandle->urlString << " into command block"<< endl);
// ERRORMSG("Entered doHtml(), parsing query string:"<< txnHandle->urlString << " into command block"<< endl);
   htmlPhrasercommandBlock(txnHandle->urlString);
   DEBUGMSG("Query string parsed.  command:"<< commandBlock.getCommandId() << " user's terminal id:" << commandBlock.get_TERM_ID() << endl);

   int terminalID = atoi(commandBlock.get_TERM_ID());
   int commandID = commandBlock.getCommandId();

   DEBUGMSG("User sent in a terimal id:"<<terminalID<<", checking to see if user has logged in before"<<endl);
   if(terminalID > 0)
   {
      DEBUGMSG("Terminal id > 0, user has logged in already, terminalID:"<<terminalID<<" retrieving warehouse district pair"<<endl);
      if(getTerminal(terminalID,txnHandle) != OK)
        return;
      DEBUGMSG("User had valid terminal id, user's login warehouse:"<<txnHandle->w_id<<" district:"<<txnHandle->d_id<<endl);
   }
   else
   {
      DEBUGMSG("User did not submit a terminal id or valid terminal id, ensure that the user is trying to log in."<<endl);
      if( (commandID != TXN_LOGIN) && (commandID != TXN_LOGIN_RESULTS) )
      {
        DEBUGMSG("ERROR : User has not logged in."<<endl);
        ERRORMSG("ERROR : User has not logged in."<<endl);
        sprintf(txnHandle->htmlPage,"ERROR : User has not logged in or did not submit a valid terminal.");
        return;
      }
      DEBUGMSG("User is in process of logging in, commandID:"<<commandID<<endl);
   }

   DEBUGMSG("Calling html page function:"<<commandBlock.getCommandId()<<endl);
   int rc = htmlPageFunctions[commandBlock.getCommandId()](&commandBlock,txnHandle);
   DEBUGMSG("Return from html page function:"<<commandBlock.getCommandId()<<endl);

   return;
}

/*
*****************************************************************
** Name        : getTerminal
** Description :
**          retrieves terminal information based on terminal id
** Parameters:
**          int       terminal id
**          TERM_HANDLE*  txn handle
** Returns      :
**          int - return code
** Comments     :
**
*****************************************************************
*/
```

```
int getTerminal(int terminal,TXN_HANDLE *txnHandle)
{
// ERRORMSG(">>getTerminal"<<endl);
   //check to see if terminal id is out of range
   if(terminal >= numUsers)
   {
      //terminal id not valid.
      sprintf(txnHandle->htmlPage,"ERROR : Client does not support
more than %d users, terminal id:%d",numUsers,terminal);
      ERRORMSG("ERROR : Client does not support more than
"<<numUsers<<" users, terminal id:"<<terminal<<endl);
      return ERR;
   }

   //check if terminal id is points to a not in use terminal
   if(!(termArray+terminal)->terminalInUse)
   {
      sprintf(txnHandle->htmlPage,"ERROR : Terminal id given points
to a not in use terminal.");
      ERRORMSG("ERROR :  Terminal id given points to a not in use
terminal."<<endl);
      return ERR;
   }

   DEBUGMSG("Storing terminal warehouse, district , and initial
term id for user:"<<terminal<<endl);

   //assign terminal values to txn_handle
   txnHandle->d_id = termArray[terminal].d_id;
   txnHandle->w_id = termArray[terminal].w_id;
   txnHandle->term_id = termArray[terminal].terminalID;

   DEBUGMSG("Users terminal:"<<terminal<<", stored
warehouse:"<<txnHandle->w_id<<
         " district:"<<txnHandle->d_id<<" termialID
stored:"<<txnHandle->term_id<<endl);

   return OK;
}

/*
******************************************************************
** Name         : assignTerminal
** Description :
**          assigns terminal index to user
** Parameters:
**          TERM_HANDLE*  txn handle
** Returns      :
**          int - return code
** Comments     :
**
******************************************************************
*/
int assignTerminal(TXN_HANDLE *txnHandle)
{
// ERRORMSG(">>assignTerminal"<<endl);
   EnterCriticalSection(&termLock);

   //check if terminal array is full.
   if(termNextFree == numUsers)
   {
      LeaveCriticalSection(&termLock);
      return ERR;
   }

   DEBUGMSG("Storing user warehouse:"<<txnHandle->w_id<<"
district:"<< txnHandle->d_id<<
         " in terminal slot:"<<termNextFree<<endl);

   //store users w_id and d_id
   termArray[termNextFree].d_id = txnHandle->d_id;
   termArray[termNextFree].w_id = txnHandle->w_id;

   //set terminal slot to be in use
   termArray[termNextFree].terminalInUse = true;
   termArray[termNextFree].terminalID = termNextFree;
   //in txn handle, set the terminal id
   txnHandle->term_id = termNextFree;

   //increment to next free terminal.
   termNextFree++;

   DEBUGMSG("User warehouse:"<<txnHandle->w_id<<"
district:"<< txnHandle->d_id <<
      " stored in terminal slot:"<<txnHandle->term_id<<" next terminal
free:"<<termNextFree<<endl);

   LeaveCriticalSection(&termLock);

   return OK;
}
```

tpccIsapi.rc

tpccIsapi.hpp

time.cpp

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <sys/timeb.h>
#include <time.h>

char *get_time_prefix(char *buffer)
{
   time_t cur_timet;
   char time_str[30];
   int len;

   cur_timet = time(&cur_timet);
   strftime(time_str, 29, "%X", localtime(&cur_timet));

   len = sprintf(buffer, "%s - ",
             time_str);
   if (len >= 30) {
      sprintf(buffer, "too small: %d\n",
            30, len);
   }
   return(buffer);
}
```

tpccIsapi.rc

```
// Microsoft Visual C++ generated resource script.
//
#include "resource.h"

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

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

#ifdef APSTUDIO_INVOKED
/////////////////////////////////////////////////////////////////////////////
//
```

```
// TEXTINCLUDE
//

1 TEXTINCLUDE
BEGIN
    "resource.h\0"
END

2 TEXTINCLUDE
BEGIN
    "#include ""winres.h""\r\n"
    "#include ""atlsrvres.h""\r\n"
    "\0"
END

3 TEXTINCLUDE
BEGIN

      "LANGUAGE LANG_ENGLISH, SUBLANG_ENGLISH_US\r\n"
   "#pragma code_page(1252)\r\n"
   "#include ""atlsrv.rc""\r\n"
      "\0"
END

#endif    // APSTUDIO_INVOKED



/////////////////////////////////////////////////////////////////////////////
//
// Version
//

VS_VERSION_INFO VERSIONINFO
 FILEVERSION 1,0,0,1
 PRODUCTVERSION 1,0,0,1
 FILEFLAGSMASK 0x3fL
#ifdef _DEBUG
 FILEFLAGS 0x1L
#else
 FILEFLAGS 0x0L
#endif
 FILEOS 0x4L
 FILETYPE 0x2L
 FILESUBTYPE 0x0L
BEGIN
    BLOCK "StringFileInfo"
    BEGIN
        BLOCK "040904e4"
        BEGIN
         VALUE "CompanyName", "TODO: <Company name>"
            VALUE "FileDescription", "TODO: <File description>"
            VALUE "FileVersion", "1.0.0.1"
            VALUE "InternalName", "isapi.dll"
            VALUE "LegalCopyright", "TODO: (c) <Company name>.  All
rights reserved."
            VALUE "OriginalFilename", "isapi.dll"
            VALUE "ProductName", "TODO: <Product name>"
            VALUE "ProductVersion", "1.0.0.1"
            VALUE "OLESelfRegister", ""
        END
    END
    BLOCK "VarFileInfo"
    BEGIN
      VALUE "Translation", 0x0409, 1252
    END
END



LANGUAGE 9, 1
#pragma code_page(1252)
/////////////////////////////////////////////////////////////////////////////
//
// String Table
//

STRINGTABLE
BEGIN
   IDS_PROJNAME            "tpccIsapi"
END

/////////////////////////////////////////////////////////////////////////////



#ifndef APSTUDIO_INVOKED
/////////////////////////////////////////////////////////////////////////////
//
// Generated from the TEXTINCLUDE 3 resource.
//
LANGUAGE LANG_ENGLISH, SUBLANG_ENGLISH_US
#pragma code_page(1252)
#include "atlsrv.rc"

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

tpccIsapi.hpp

```
/*
*******************************************************************
** Project    : AIX
** Component: Performance/TPC-W Benchmark
** Name         : tpccIsapi.hpp
** Title      : ISAPI interface for tpcc
*******************************************************************
** Copyright (c) 2001,2002 IBM Corporation
** All rights reserved
*******************************************************************
** History        :
**                Developed at IBM Austin by the AIX RS/6000
**                performance group.
**
** Comments       :
**
*******************************************************************
*/

#ifndef __tpccISAPI_hpp__
#define __tpccISAPI_hpp__

#include <windows.h>
#include <httpext.h>

#include "tpcc.h"
#include "htmlPhraser.h"

#include <iomanip>
#ifdef DB2
#include <db2tpcc.h>
#endif
#ifdef ORACLE
#include <oratpcc.h>
#endif

#include <comsvcs.h>

//////////////////////////////////////////////////////////////////////
// Terminal struct
//////////////////////////////////////////////////////////////////////
struct TERM_ENTRY
{
   int      terminalID;
```

```
  bool   terminalInUse;
#ifdef PARTITION
  int     part_serv;
#endif
  int      w_id;
  short  d_id;
};

///////////////////////////////////////////////////////////////////////////
// COM interface
///////////////////////////////////////////////////////////////////////////
struct COM_HANDLE
{
Itpcc_com0   *comHandle0;
#ifdef PARTITION
Itpcc_com1   *comHandle1;
Itpcc_com2   *comHandle2;
Itpcc_com3   *comHandle3;
Itpcc_com4   *comHandle4;
Itpcc_com5   *comHandle5;
Itpcc_com6   *comHandle6;
Itpcc_com7   *comHandle7;
Itpcc_com8   *comHandle8;
Itpcc_com9   *comHandle9;
Itpcc_com10   *comHandle10;
Itpcc_com11   *comHandle11;
Itpcc_com12   *comHandle12;
Itpcc_com13   *comHandle13;
Itpcc_com14   *comHandle14;
Itpcc_com15   *comHandle15;
Itpcc_com16   *comHandle16;
Itpcc_com17   *comHandle17;
Itpcc_com18   *comHandle18;
Itpcc_com19   *comHandle19;
Itpcc_com20   *comHandle20;
Itpcc_com21   *comHandle21;
Itpcc_com22   *comHandle22;
Itpcc_com23   *comHandle23;
Itpcc_com24   *comHandle24;
Itpcc_com25   *comHandle25;
Itpcc_com26   *comHandle26;
Itpcc_com27   *comHandle27;
Itpcc_com28   *comHandle28;
Itpcc_com29   *comHandle29;
Itpcc_com30   *comHandle30;
Itpcc_com31   *comHandle31;
Itpcc_com32   *comHandle32;
Itpcc_com33   *comHandle33;
Itpcc_com34   *comHandle34;
Itpcc_com35   *comHandle35;
Itpcc_com36   *comHandle36;
Itpcc_com37   *comHandle37;
Itpcc_com38   *comHandle38;
Itpcc_com39   *comHandle39;
Itpcc_com40   *comHandle40;
Itpcc_com41   *comHandle41;
Itpcc_com42   *comHandle42;
Itpcc_com43   *comHandle43;
Itpcc_com44   *comHandle44;
Itpcc_com45   *comHandle45;
Itpcc_com46   *comHandle46;
Itpcc_com47   *comHandle47;
Itpcc_com48   *comHandle48;
Itpcc_com49   *comHandle49;
Itpcc_com50   *comHandle50;
#endif
char      *txnBuffer;
  int         size;
};

///////////////////////////////////////////////////////////////////////////
// TXN handle
///////////////////////////////////////////////////////////////////////////
struct TXN_HANDLE
{
#ifdef PARTITION
  int      part_server;
#endif
  char   htmlPage[MAX_HTML_PAGE_LEN];
  char   htmlHeader[MAX_HTML_HEADER_LEN];
  char   *urlString;

  //user data
  int      w_id;
  int      d_id;
  int      sync_id;
  int      term_id;
  int      conn_id;

  COM_HANDLE comInterface;
};

///////////////////////////////////////////////////////////////////////////
// Definitions
///////////////////////////////////////////////////////////////////////////
#define    INVALID_ITEM    100
#define    HEADER          "Content-Type:text/html\r\nContent-
Length: %d\r\nConnection: Keep-Alive\r\n\r\n"
#define    TLS_NULL        0xFFFFFFFF
#define    ACCESS_TIMEOUT      3600000                        //One
hour in milli seconds

#define    DELIVERY_LOG_SUCCESS_STR   "--Tran %d Queue
%d.%03d Start %d.%03d\nW_ID: %d CARRIER_ID: %d %s\nend-
time: %d.%03d\n"

///////////////////////////////////////////////////////////////////////////
// Function Prototypes
///////////////////////////////////////////////////////////////////////////

int initDlvy();
int initTxnHandle(TXN_HANDLE **txnHandle);
int closeTxnHandle(TXN_HANDLE *txnHandle);
int readRegisteryValues();
int getTerminal(int terminal,TXN_HANDLE *txnHandle);
int assignTerminal(TXN_HANDLE *txnHandle);
int getDBInstance();

void doHtml(TXN_HANDLE *txnHandle);
int doLoginForm(htmlPhraser *commandBlock,TXN_HANDLE
*txnHandle);
int doLoginResults(htmlPhraser *commandBlock,TXN_HANDLE
*txnHandle);
int doNewOrderForm(htmlPhraser *commandBlock,TXN_HANDLE
*txnHandle);
int doNewOrderResults(htmlPhraser
*commandBlock,TXN_HANDLE *txnHandle);
int doPaymentForm(htmlPhraser *commandBlock,TXN_HANDLE
*txnHandle);
int doPaymentResults(htmlPhraser *commandBlock,TXN_HANDLE
*txnHandle);
int doOrderStatusForm(htmlPhraser *commandBlock,TXN_HANDLE
*txnHandle);
int doOrderStatusResults(htmlPhraser
*commandBlock,TXN_HANDLE *txnHandle);
int doDeliveryForm(htmlPhraser *commandBlock,TXN_HANDLE
*txnHandle);
int doDeliveryResults(htmlPhraser *commandBlock,TXN_HANDLE
*txnHandle);
int doStockForm(htmlPhraser *commandBlock,TXN_HANDLE
*txnHandle);
int doStockResults(htmlPhraser *commandBlock,TXN_HANDLE
*txnHandle);
int doExit(htmlPhraser *commandBlock,TXN_HANDLE *txnHandle);
```

```
int doLoginErrorPage(char *htmlPage,char *message);
int doNewOrderErrorPage(char *htmlPage,char
*message,htmlPhraser *commandBlock,TXN_HANDLE *txnHandle);
int doPaymentErrorPage(char *htmlPage,char
*message,htmlPhraser *commandBlock,TXN_HANDLE *txnHandle);
int doOrderStatusErrorPage(char *htmlPage,char
*message,htmlPhraser *commandBlock,TXN_HANDLE *txnHandle);
int doDeliveryErrorPage(char *htmlPage,char
*message,htmlPhraser *commandBlock,TXN_HANDLE *txnHandle);
int doStockErrorPage(char *htmlPage,char *message,htmlPhraser
*commandBlock,TXN_HANDLE *txnHandle);

void dlvyThreadEntry(void *);
int  queueDlvyTxn(int warehouse, short carrier_id);

int appendButtons(char *htmlPage);
int appendItems(char *htmlPage,short itemCount,short cmdIDStart);
int appendHiddenFields(char *htmlPage,TXN_HANDLE *txnHandle);

int displayStatus(char *htmlPage,int rc);

#endif
```

A.2 Transaction Code

pldel.cpp

```
#include "../../tpccisapi/tpcc.h"
#include "plora.h"
#include "ora_tpcc.h"

extern int sqlfile(FILE* server_logtrans,char *fnam, text *linebuf);
extern void oralogprintf(FILE* server_logtrans,char *format, ...);

extern char OracleHome[256];

#define DMLRETDEL

#define SQLTXT "BEGIN inittpcc.init_del ; END;"

#define SQLTXT1 "DELETE FROM nord WHERE no_d_id = :d_id \
             AND no_w_id = :w_id and rownum <= 1 \
            RETURNING no_o_id into :o_id "

#define SQLTXT3 "UPDATE ordr SET o_carrier_id = :carrier_id \
             WHERE o_id = :o_id and o_d_id = :d_id and o_w_id
= :w_id \
             returning o_c_id into :o_c_id"

#define SQLTXT4 "UPDATE ordl \
   SET ol_delivery_d = :cr_date \
   WHERE ol_w_id = :w_id AND ol_d_id = :d_id AND ol_o_id = :o_id
\
   RETURNING sum(ol_amount) into :ol_amount "

#define SQLTXT6 "UPDATE cust SET c_balance = c_balance
+ :amt, \
   c_delivery_cnt = c_delivery_cnt + 1 WHERE c_w_id = :w_id AND \
   c_d_id = :d_id AND c_id = :c_id"

#define NDISTS 10
#define ROWIDLEN 20



struct pldelctx {

   ub2 del_d_id_len[NDISTS];
   ub2 del_o_id_len[NDISTS];
   ub2 w_id_len;
   ub2 d_id_len[NDISTS];
   ub2 o_c_id_len[NDISTS];
   ub2 sums_len[NDISTS];
   ub2 carrier_id_len;
   ub2 ordcnt_len;
   ub2 del_date_len;

   int del_o_id[NDISTS];
   int del_d_id[NDISTS];
   int o_c_id[NDISTS];
#ifdef USE_IEEE_NUMBER
   float sums[NDISTS];
#else
   int sums[NDISTS];
#endif
   OCIDate del_date;
   int carrier_id;
   int ordcnt;

   ub4 del_o_id_rcnt;
   ub4 del_d_id_rcnt;
   ub4 o_c_id_rcnt;
   ub4 sums_rcnt;

   int retry;
   OCIStmt *curp1;
   OCIStmt *curp2;
   OCIBind *w_id_bp;
   OCIBind *d_id_bp;
   OCIBind *o_id_bp;
   OCIBind *o_c_id_bp;
   OCIBind *ordcnt_bp;
   OCIBind *sums_bp;
   OCIBind *del_date_bp;
   OCIBind *carrier_id_bp;
   OCIBind *retry_bp;

   int norow;

};
typedef struct pldelctx pldelctx;

#ifdef DMLRETDEL
struct amtctx {
  int ol_amt[NITEMS];
  sb2 ol_amt_ind[NITEMS];
  ub4 ol_amt_len[NITEMS];
  ub2 ol_amt_rcode[NITEMS];
  int ol_cnt;
};
typedef struct amtctx amtctx;

#endif


tkvcdinit (ora_cn_data_t *ora_SlotDataP)
{
   char sqlfilename[256];
   text stmbuf[SQL_BUF_SIZE];
   FILE *server_logtrans = ora_SlotDataP->server_logtrans;

   pldelctx *pldctx;
   dlvy_wrapper *delP;
   OCIEnv *tpcenv = ora_SlotDataP->tpcenv;
   OCIServer *tpcsrv = ora_SlotDataP->tpcsrv;
   dvoid *errhp = ora_SlotDataP->errhp;
   OCISvcCtx *tpcsvc = ora_SlotDataP->tpcsvc;
   OCISession *tpcusr = ora_SlotDataP->tpcusr;
   OCIStmt *curi = ora_SlotDataP->curi;
```

```
  delP = &ora_SlotDataP->delP;

    pldctx = (pldelctx *) malloc (sizeof(pldelctx));
    DISCARD memset(pldctx,(char)0,(ub4)sizeof(pldelctx));
    ora_SlotDataP->pldctx  = (void *)pldctx;
    /* Initialize */
    DISCARD OCIHandleAlloc(tpcenv, (dvoid**)&pldctx->curp1,
OCI_HTYPE_STMT, 0,
                         (dvoid**)0);
    DISCARD sprintf ((char *) stmbuf, SQLTXT);
    DISCARD OCIStmtPrepare(pldctx->curp1, (OCIError *)errhp,
stmbuf,
                         (ub4) strlen((char *)stmbuf),
                  OCI_NTV_SYNTAX, OCI_DEFAULT);
    DISCARD OCIERROR(errhp,
      OCIStmtExecute(tpcsvc,pldctx->curp1,(OCIError
*)errhp,1,0,NULLP(OCISnapshot),
                     NULLP(OCISnapshot), OCI_DEFAULT));


    DISCARD OCIHandleAlloc(tpcenv,(dvoid**) &pldctx->curp2,
OCI_HTYPE_STMT,
                  0, (dvoid**)0);
#if defined(ISO5) || defined(ISO6) || defined(ISO8)
  #if defined(ISO5)
    sprintf(sqlfilename,"%s%s",OracleHome,"/tpcc-
kit/benchrun/blocks/tkvcpdel_iso5.sql");
   sqlfile(ora_SlotDataP->server_logtrans,sqlfilename,stmbuf);
  #endif
  #if defined(ISO6)
    sprintf(sqlfilename,"%s%s",OracleHome,"/tpcc-
kit/benchrun/blocks/tkvcpdel_iso6.sql");
    sqlfile(ora_SlotDataP->server_logtrans,sqlfilename,stmbuf);
  #endif
  #if defined(ISO8)
    sprintf(sqlfilename,"%s%s",OracleHome,"/tpcc-
kit/benchrun/blocks/tkvcpdel_iso8.sql");
    sqlfile(ora_SlotDataP->server_logtrans,sqlfilename,stmbuf);
  #endif
#else
    sprintf(sqlfilename,"%s%s",OracleHome,"/tpcc-
kit/benchrun/blocks/tkvcpdel.sql");
    sqlfile(ora_SlotDataP->server_logtrans,sqlfilename,stmbuf);
#endif
    DISCARD OCIStmtPrepare(pldctx->curp2, (OCIError *)errhp,
stmbuf,
                  (ub4)strlen((char *)stmbuf), OCI_NTV_SYNTAX,
OCI_DEFAULT);
    OCIBNDPL(pldctx->curp2, pldctx->w_id_bp , (OCIError
*)errhp,":w_id",
      ADR(delP->in_dlvy.s_W_ID), SIZ(int), SQLT_INT,&pldctx-
>w_id_len);
    OCIBNDPL(pldctx->curp2, pldctx->ordcnt_bp , (OCIError
*)errhp,":ordcnt",
           ADR(pldctx->ordcnt), SIZ(int), SQLT_INT,&pldctx-
>ordcnt_len);

    OCIBNDPL(pldctx->curp2, pldctx->del_date_bp,(OCIError
*)errhp,":now",
           ADR(pldctx->del_date), SIZ(OCIDate),SQLT_ODT,&pldctx-
>del_date_len);

    OCIBNDPL(pldctx->curp2, pldctx->carrier_id_bp , (OCIError
*)errhp,
      ":carrier_id", ADR(delP->in_dlvy.s_O_CARRIER_ID), SIZ(int),
           SQLT_INT, &pldctx->carrier_id_len);

    OCIBNDPLA(pldctx->curp2, pldctx->d_id_bp, (OCIError
*)errhp,":d_id",
            pldctx->del_d_id, SIZ(int),SQLT_INT, pldctx->del_d_id_len,
            NDISTS, &pldctx->del_d_id_rcnt);
    OCIBNDPLA(pldctx->curp2, pldctx->o_id_bp, (OCIError
*)errhp,":order_id",
            pldctx->del_o_id,SIZ(int),SQLT_INT, pldctx-
>del_o_id_len,NDISTS,
            &pldctx->del_o_id_rcnt);
#ifdef USE_IEEE_NUMBER
    OCIBNDPLA(pldctx->curp2, pldctx->sums_bp, (OCIError
*)errhp,":sums",
            pldctx->sums,SIZ(float),SQLT_BFLOAT, pldctx-
>sums_len,NDISTS,
            &pldctx->sums_rcnt);
#else
    OCIBNDPLA(pldctx->curp2, pldctx->sums_bp, (OCIError
*)errhp,":sums",
            pldctx->sums,SIZ(int),SQLT_INT, pldctx-
>sums_len,NDISTS,
            &pldctx->sums_rcnt);
#endif
    OCIBNDPLA(pldctx->curp2, pldctx->o_c_id_bp, (OCIError
*)errhp,":o_c_id",
            pldctx->o_c_id,SIZ(int),SQLT_INT, pldctx-
>o_c_id_len,NDISTS,
            &pldctx->o_c_id_rcnt);
    OCIBND(pldctx->curp2, pldctx->retry_bp , (OCIError
*)errhp,":retry",
          ADR(pldctx->retry), SIZ(int),SQLT_INT);

  return (0);

}

tkvcd (ora_cn_data_t *ora_SlotDataP)
{
  ub4 i;
  FILE *server_logtrans = ora_SlotDataP->server_logtrans;

  pldelctx *pldctx = (pldelctx *)ora_SlotDataP->pldctx;
#ifdef DMLRETDEL /* VMM 1/13/98 */
  amtctx *actx = (amtctx *)ora_SlotDataP->actx;
#endif /* DMLRETDEL */
  dlvy_wrapper *delP = &ora_SlotDataP->delP;
  OCIEnv *tpcenv = ora_SlotDataP->tpcenv;
  OCIServer *tpcsrv = ora_SlotDataP->tpcsrv;
  dvoid *errhp = ora_SlotDataP->errhp;
  OCISvcCtx *tpcsvc = ora_SlotDataP->tpcsvc;
  OCISession *tpcusr = ora_SlotDataP->tpcusr;
  OCIStmt *curi = ora_SlotDataP->curi;

retry:
    pldctx->w_id_len = sizeof (int);
    pldctx->carrier_id_len = sizeof (int);
  for (i = 0; i < NDISTS; i++)
  {
     pldctx->del_o_id_len[i] = sizeof(int);
     delP->out_dlvy.s_O_ID[i] = 0;
  }
    pldctx->del_date_len = DEL_DATE_LEN;
   DISCARD memcpy(&pldctx->del_date,&delP-
>in_dlvy.cr_date,sizeof(OCIDate));

    pldctx->retry=0;

   delP->out_dlvy.terror = OCIStmtExecute(tpcsvc,pldctx-
>curp2,(OCIError *)errhp,1,0,NULLP(CONST OCISnapshot),
                 NULLP(OCISnapshot),OCI_DEFAULT);
   if((delP->out_dlvy.terror != OCI_SUCCESS) && (delP-
>out_dlvy.terror != OCI_NO_DATA))
    {
     DISCARD OCITransRollback(tpcsvc,(OCIError
*)errhp,OCI_DEFAULT);
     delP->out_dlvy.terror = OCIERROR((OCIError *)errhp,delP-
>out_dlvy.terror);
```

```
      if(delP->out_dlvy.terror == NOT_SERIALIZABLE)
       {
         delP->out_dlvy.retry++;
        goto retry;
       }
      else if (delP->out_dlvy.terror == RECOVERR)
       {
        delP->out_dlvy.retry++;
        goto retry;
       }
       else if (delP->out_dlvy.terror == SNAPSHOT_TOO_OLD)
       {
        delP->out_dlvy.retry++;
        goto retry;
       }
       else
       {
        return -1;
       }
     }
     for (i = 0; i < pldctx->del_o_id_rcnt; i++)
       delP->out_dlvy.s_O_ID[pldctx->del_d_id[i] - 1] = pldctx-
>del_o_id[i];
    return (0);

}


void tkvcddone (ora_cn_data_t *ora_SlotDataP)

{
   pldelctx *pldctx = (pldelctx *)ora_SlotDataP->pldctx;

     if (pldctx)
     {
       DISCARD OCIHandleFree((dvoid *)pldctx-
>curp1,OCI_HTYPE_STMT);
       DISCARD OCIHandleFree((dvoid *)pldctx-
>curp2,OCI_HTYPE_STMT);
       DISCARD free(pldctx);
     }
}
```

plnew.cpp

```
#include "../../tpccisapi/tpcc.h"
#include "plora.h"
#include "ora_tpcc.h"

#define SQLTXT2 "BEGIN inittpcc.init_no(:idx1arr); END;"

#define NITEMS 15
#define ROWIDLEN 20
#define OCIROWLEN 20

extern void oralogprintf(FILE *server_logtrans,char *format, ...);

extern char OracleHome[256];
extern int sqlfile(FILE *server_logtrans,char *fnam, text *linebuf);

struct newctx {

  ub2 nol_i_id_len[NITEMS];
  ub2 nol_supply_w_id_len[NITEMS];
  ub2 nol_quantity_len[NITEMS];
  ub2 nol_amount_len[NITEMS];
  ub2 s_quantity_len[NITEMS];
  ub2 i_name_len[NITEMS];
  ub2 i_price_len[NITEMS];
  ub2 s_dist_info_len[NITEMS];
  ub2 ol_o_id_len[NITEMS];
  ub2 ol_number_len[NITEMS];
  ub2 s_remote_len[NITEMS];
  ub2 s_quant_len[NITEMS];
  ub2 ol_dist_info_len[NITEMS];
  ub2 s_bg_len[NITEMS];
  int ol_o_id[NITEMS];
  int ol_number[NITEMS];
#ifdef USE_IEEE_NUMBER
  float s_remote[NITEMS];
#else
  int s_remote[NITEMS];
#endif /* USE_IEEE_NUMBER */
  char s_dist_info[NITEMS][25];
  OCIStmt *curn1;
  OCIBind *ol_i_id_bp;
  OCIBind *ol_supply_w_id_bp;
  OCIBind *i_price_bp;
  OCIBind *i_name_bp;
  OCIBind *s_bg_bp;
  ub4 nol_i_count;
  ub4 nol_s_count;
  ub4 nol_q_count;
  ub4 nol_item_count;
  ub4 nol_name_count;
  ub4 nol_qty_count;
  ub4 nol_bg_count;
  ub4 nol_am_count;
  ub4 s_remote_count;
  OCIStmt *curn2;
  OCIBind *ol_quantity_bp;
  OCIBind *s_remote_bp;
  OCIBind *s_quantity_bp;
  OCIBind *w_id_bp;
  OCIBind *d_id_bp;
  OCIBind *c_id_bp;
  OCIBind *o_all_local_bp;
  OCIBind *o_all_cnt_bp;
  OCIBind *w_tax_bp;
  OCIBind *d_tax_bp;
  OCIBind *o_id_bp;
  OCIBind *c_discount_bp;
  OCIBind *c_credit_bp;
  OCIBind *c_last_bp;
  OCIBind *retries_bp;
  OCIBind *cr_date_bp;
  OCIBind *ol_o_id_bp;
  OCIBind *ol_amount_bp;

  ub2 w_id_len; /* RP - may need to be (ub2), was (sb2) */
  ub2 d_id_len;
  ub2 c_id_len;
  ub2 o_all_local_len;
  ub2 o_ol_cnt_len;
  ub2 w_tax_len;
  ub2 d_tax_len;
  ub2 o_id_len;
  ub2 c_discount_len;
  ub2 c_credit_len;
  ub2 c_last_len;
  ub2 retries_len;
  ub2 cr_date_len;
};

typedef struct newctx newctx;

tkvcninit (ora_cn_data_t *ora_SlotDataP)
{
  char sqlfilename[256];
  text stmbuf[32*1024];
  FILE *server_logtrans = ora_SlotDataP->server_logtrans;

  newctx *nctx;
```

```
  OCIEnv *tpcenv = ora_SlotDataP->tpcenv;
  OCIServer *tpcsrv = ora_SlotDataP->tpcsrv;
  dvoid *errhp = ora_SlotDataP->errhp;
  OCISvcCtx *tpcsvc = ora_SlotDataP->tpcsvc;
  OCISession *tpcusr = ora_SlotDataP->tpcusr;
  OCIStmt *curi = ora_SlotDataP->curi;
  nord_wrapper *newP;

  oralogprintf(ora_SlotDataP->server_logtrans,">>tkvcninit\n");
  nctx = (newctx *) malloc (sizeof(newctx));
  DISCARD memset(nctx,(char)0,sizeof(newctx));
  ora_SlotDataP->nctx = (void *)nctx;

  memset(&ora_SlotDataP->globals,(char)0,sizeof(nord_wrapper));
  newP = &ora_SlotDataP->globals;

  nctx->w_id_len = sizeof(newP->in_nord.s_W_ID);
  nctx->d_id_len = sizeof(newP->in_nord.s_D_ID);
  nctx->c_id_len = sizeof(newP->in_nord.s_C_ID);
  nctx->o_all_local_len = sizeof(newP->in_nord.s_all_local);
  nctx->o_ol_cnt_len = sizeof(newP->out_nord.s_O_OL_CNT);
  nctx->w_tax_len = 0;
  nctx->d_tax_len = 0;
  nctx->o_id_len = sizeof(newP->out_nord.s_O_ID);
  nctx->c_discount_len = 0;
  nctx->c_credit_len = 0;
  nctx->c_last_len = 0;
  nctx->retries_len = sizeof(newP->out_nord.retry);
  nctx->cr_date_len = sizeof(newP->in_nord.cr_date);

  /* open first cursor */
  DISCARD OCIERROR((OCIError
*)errhp,OCIHandleAlloc(tpcenv,(dvoid **)(&nctx->curn1),
         OCI_HTYPE_STMT, 0, (dvoid**)0));
#if defined(ISO)
  sprintf(sqlfilename,"%s/tpcc-
kit/benchrun/blocks/tkvcpnew_iso.sql",OracleHome);
  sqlfile(ora_SlotDataP->server_logtrans,sqlfilename,stmbuf);
#else
#if defined(ISO7)
  sprintf(sqlfilename,"%s/tpcc-
kit/benchrun/blocks/tkvcpnew_iso7.sql",OracleHome);
  sqlfile(ora_SlotDataP->server_logtrans,sqlfilename,stmbuf);
#else
  sprintf(sqlfilename,"%s/tpcc-
kit/benchrun/blocks/tkvcpnew.sql",OracleHome);
  sqlfile(ora_SlotDataP->server_logtrans,sqlfilename,stmbuf);
#endif
#endif

  DISCARD OCIERROR((OCIError *)errhp,OCIStmtPrepare(nctx-
>curn1, (OCIError *)errhp, stmbuf,
         strlen((char *)stmbuf), OCI_NTV_SYNTAX, OCI_DEFAULT));

  /* bind variables */
  oralogprintf(ora_SlotDataP->server_logtrans,"--tkvcninit\n");

  OCIBNDPL(nctx->curn1, nctx->w_id_bp, (OCIError *)errhp,
":w_id",ADR(newP->in_nord.s_W_ID),SIZ(newP->in_nord.s_W_ID),
        SQLT_INT, &nctx->w_id_len);
  OCIBNDPL(nctx->curn1, nctx->d_id_bp, (OCIError *)errhp,
":d_id",ADR(newP->in_nord.s_D_ID),SIZ(newP->in_nord.s_D_ID),
        SQLT_INT, &nctx->d_id_len);
  OCIBNDPL(nctx->curn1, nctx->c_id_bp, (OCIError *)errhp,
":c_id",ADR(newP->in_nord.s_C_ID),SIZ(newP->in_nord.s_C_ID),
        SQLT_INT, &nctx->c_id_len);
  OCIBNDPL(nctx->curn1, nctx->o_all_local_bp, (OCIError *)errhp,
":o_all_local",
    ADR(newP->in_nord.s_all_local), SIZ(newP-
>in_nord.s_all_local),SQLT_INT, &nctx->o_all_local_len);
  OCIBNDPL(nctx->curn1, nctx->o_all_cnt_bp, (OCIError *)errhp,
":o_ol_cnt",ADR(newP->out_nord.s_O_OL_CNT),
    SIZ(newP->out_nord.s_O_OL_CNT),SQLT_INT, &nctx-
>o_ol_cnt_len);
  OCIBNDPL(nctx->curn1, nctx->w_tax_bp, (OCIError *)errhp,
":w_tax",ADR(newP->out_nord.s_W_TAX),SIZ(newP-
>out_nord.s_W_TAX),
        SQLT_FLT, &nctx->w_tax_len);
  OCIBNDPL(nctx->curn1, nctx->d_tax_bp, (OCIError *)errhp,
":d_tax",ADR(newP->out_nord.s_D_TAX),SIZ(newP-
>out_nord.s_D_TAX),
        SQLT_FLT, &nctx->d_tax_len);
  OCIBNDPL(nctx->curn1, nctx->o_id_bp, (OCIError *)errhp,
":o_id",ADR(newP->out_nord.s_O_ID),SIZ(newP-
>out_nord.s_O_ID),
        SQLT_INT, &nctx->o_id_len);
  OCIBNDPL(nctx->curn1, nctx->c_discount_bp, (OCIError *)errhp,
":c_discount",
    ADR(newP->out_nord.s_C_DISCOUNT), SIZ(newP-
>out_nord.s_C_DISCOUNT),SQLT_FLT, &nctx->c_discount_len);
  OCIBNDPL(nctx->curn1, nctx->c_credit_bp, (OCIError *)errhp,
":c_credit",newP->out_nord.s_C_CREDIT,
    SIZ(newP->out_nord.s_C_CREDIT),SQLT_CHR, &nctx-
>c_credit_len);
  OCIBNDPL(nctx->curn1, nctx->c_last_bp, (OCIError *)errhp,
":c_last",newP->out_nord.s_C_LAST,SIZ(newP-
>out_nord.s_C_LAST),
        SQLT_STR, &nctx->c_last_len);
  OCIBNDPL(nctx->curn1, nctx->retries_bp, (OCIError *)errhp,
":retry",ADR(newP->out_nord.retry),
        SIZ(newP->out_nord.retry),SQLT_INT, &nctx->retries_len);
  OCIBNDPL(nctx->curn1, nctx->cr_date_bp, (OCIError *)errhp,
":cr_date",&newP->in_nord.cr_date,
        SIZ(OCIDate), SQLT_ODT, &nctx->cr_date_len);

  OCIBNDPLA(nctx->curn1, nctx->ol_i_id_bp,(OCIError
*)errhp,":ol_i_id",newP->in_nord.s_OL_I_ID,
         SIZ(newP->in_nord.s_OL_I_ID[0]), SQLT_INT, nctx-
>nol_i_id_len,NITEMS,&nctx->nol_i_count);
  OCIBNDPLA(nctx->curn1, nctx->ol_supply_w_id_bp, (OCIError
*)errhp, ":ol_supply_w_id",
    newP->in_nord.s_OL_SUPPLY_W_ID,SIZ(newP-
>in_nord.s_OL_SUPPLY_W_ID[0]),SQLT_INT, nctx-
>nol_supply_w_id_len,
         NITEMS, &nctx->nol_s_count);
#ifdef USE_IEEE_NUMBER
  OCIBNDPLA(nctx->curn1, nctx->ol_quantity_bp,(OCIError
*)errhp,":ol_quantity",
         newP->in_nord.ol_quantity, SIZ(newP-
>in_nord.ol_quantity[0]),SQLT_FLT,nctx->nol_quantity_len,
         NITEMS,&nctx->nol_q_count);

  OCIBNDPLA(nctx->curn1, nctx->i_price_bp,(OCIError
*)errhp,":i_price",newP->out_nord.s_I_PRICE,SIZ(newP-
>out_nord.s_I_PRICE[0]),
         SQLT_FLT, nctx->i_price_len, NITEMS, &nctx-
>nol_item_count);
#else
  OCIBNDPLA(nctx->curn1, nctx->ol_quantity_bp,(OCIError
*)errhp,":ol_quantity",
    newP->in_nord.s_OL_QUANTITY, SIZ(newP-
>in_nord.s_OL_QUANTITY[0]),SQLT_INT,nctx->nol_quantity_len,
         NITEMS,&nctx->nol_q_count);
  OCIBNDPLA(nctx->curn1, nctx->i_price_bp,(OCIError
*)errhp,":i_price",newP->out_nord.s_I_PRICE,SIZ(newP-
>out_nord.s_I_PRICE[0]),
         SQLT_INT, nctx->i_price_len, NITEMS, &nctx-
>nol_item_count);
#endif
  OCIBNDPLA(nctx->curn1, nctx->i_name_bp,(OCIError
*)errhp,":i_name",newP->out_nord.s_I_NAME,
         SIZ(newP->out_nord.s_I_NAME[0]),SQLT_STR, nctx-
>i_name_len,NITEMS,
         &nctx->nol_name_count);
```

```
#ifdef USE_IEEE_NUMBER
  OCIBNDPLA(nctx->curn1, nctx->s_quantity_bp,(OCIError
*)errhp,":s_quantity",newP->out_nord.s_S_QUANTITY,
         SIZ(newP->out_nord.s_S_QUANTITY[0]), SQLT_FLT,nctx-
>s_quant_len,NITEMS,&nctx->nol_qty_count);
#else
  OCIBNDPLA(nctx->curn1, nctx->s_quantity_bp,(OCIError
*)errhp,":s_quantity",newP->out_nord.s_S_QUANTITY,
         SIZ(newP->out_nord.s_S_QUANTITY[0]), SQLT_INT,nctx-
>s_quant_len,NITEMS,&nctx->nol_qty_count);
#endif
  OCIBNDPLA(nctx->curn1, nctx->s_bg_bp,(OCIError
*)errhp,":brand_generic",newP->out_nord.s_brand_generic,
         SIZ(newP->out_nord.s_brand_generic[0]), SQLT_CHR,nctx-
>s_bg_len,NITEMS,&nctx->nol_bg_count);
#ifdef USE_IEEE_NUMBER
  OCIBNDPLA(nctx->curn1, nctx->ol_amount_bp,(OCIError
*)errhp,":ol_amount",newP->out_nord.s_OL_AMOUNT,
         SIZ(newP->out_nord.s_OL_AMOUNT[0]),SQLT_FLT, nctx-
>nol_amount_len,NITEMS,&nctx->nol_am_count);
  OCIBNDPLA(nctx->curn1, nctx->s_remote_bp,(OCIError
*)errhp,":s_remote",nctx->s_remote,
         SIZ(nctx->s_remote[15]),SQLT_FLT, nctx-
>s_remote_len,NITEMS,&nctx->s_remote_count);
#else
  OCIBNDPLA(nctx->curn1, nctx->ol_amount_bp,(OCIError
*)errhp,":ol_amount",newP->out_nord.s_OL_AMOUNT,
         SIZ(newP->out_nord.s_OL_AMOUNT[0]),SQLT_INT, nctx-
>nol_amount_len,NITEMS,&nctx->nol_am_count);
  OCIBNDPLA(nctx->curn1, nctx->s_remote_bp,(OCIError
*)errhp,":s_remote",nctx->s_remote,
         SIZ(nctx->s_remote[0]),SQLT_INT, nctx-
>s_remote_len,NITEMS,&nctx->s_remote_count);
#endif

  /* open second cursor */
  DISCARD OCIERROR((OCIError *)errhp,OCIHandleAlloc(tpcenv,
(dvoid **)(&nctx->curn2),
              OCI_HTYPE_STMT, 0, (dvoid**)0));
  DISCARD sprintf ((char *) stmbuf, SQLTXT2);
  DISCARD OCIERROR((OCIError *)errhp,OCIStmtPrepare(nctx-
>curn2, (OCIError *)errhp, stmbuf,
              strlen((char *)stmbuf), OCI_NTV_SYNTAX,
OCI_DEFAULT));


  /* execute second cursor to init newinit package */
  {
    int idx1arr[NITEMS];
    OCIBind *idx1arr_bp;
    ub2 idx1arr_len[NITEMS];
    sb2 idx1arr_ind[NITEMS];
    ub4 idx1arr_count;
    ub2 idx;

    for (idx = 0; idx < NITEMS; idx++) {
      idx1arr[idx] = idx + 1;
      idx1arr_ind[idx] = TRUE;
      idx1arr_len[idx] = sizeof(int);
    }
    idx1arr_count = NITEMS;
   newP->out_nord.s_O_OL_CNT = NITEMS;


    /* Bind array */
    OCIBNDPLA(nctx->curn2, idx1arr_bp,(OCIError
*)errhp,":idx1arr",idx1arr,
          SIZ(int), SQLT_INT, idx1arr_len, NITEMS,&idx1arr_count);

   newP->out_nord.terror = OCIStmtExecute(tpcsvc,nctx-
>curn2,(OCIError *)errhp,1,0,
              NULLP(CONST
OCISnapshot),NULLP(OCISnapshot),OCI_DEFAULT);
     if(newP->out_nord.terror != OCI_SUCCESS) {
      OCITransRollback(tpcsvc,(OCIError *)errhp,OCI_DEFAULT);
      newP->out_nord.terror = OCIERROR((OCIError *)errhp,newP-
>out_nord.terror);
      return -1;
    }
   }

  oralogprintf(ora_SlotDataP->server_logtrans,"<<tkvcninit\n");
  return (0);

}

tkvcn (ora_cn_data_t *ora_SlotDataP)
{

   int i;
   int rcount;
   int invalid=0;
   FILE *server_logtrans = ora_SlotDataP->server_logtrans;

   OCIEnv *tpcenv = ora_SlotDataP->tpcenv;
   OCIServer *tpcsrv = ora_SlotDataP->tpcsrv;
   dvoid *errhp = ora_SlotDataP->errhp;
   OCISvcCtx *tpcsvc = ora_SlotDataP->tpcsvc;
   OCISession *tpcusr = ora_SlotDataP->tpcusr;
   OCIStmt *curi = ora_SlotDataP->curi;
   nord_wrapper *newP = &ora_SlotDataP->globals;
   newctx *nctx = (newctx *)ora_SlotDataP->nctx;

retry:

   newP->out_nord.status = 0;                  /* number of invalid
items */

   /* get number of order lines, and check if all are local */

   newP->out_nord.s_O_OL_CNT = NITEMS;
   newP->in_nord.s_all_local = 1;
   for (i = 0; i < NITEMS; i++) {
      if (newP->in_nord.s_OL_I_ID[i] == 0) {
        newP->out_nord.s_O_OL_CNT = i;
        break;
      }
      if (newP->in_nord.s_OL_SUPPLY_W_ID[i] != newP-
>in_nord.s_W_ID) {
#ifdef USE_IEEE_NUMBER
        nctx->s_remote[i] = 1.0;
#else
        nctx->s_remote[i] = 1;
#endif
        newP->in_nord.s_all_local = 0;
      }
      else
        nctx->s_remote[i] = 0;
   }

   nctx->w_id_len = sizeof(newP->in_nord.s_W_ID);
   nctx->d_id_len = sizeof(newP->in_nord.s_D_ID);
   nctx->c_id_len = sizeof(newP->in_nord.s_C_ID);
   nctx->o_all_local_len = sizeof(newP->in_nord.s_all_local);
   nctx->o_ol_cnt_len = sizeof(newP->out_nord.s_O_OL_CNT);
   nctx->w_tax_len = 0;
   nctx->d_tax_len = 0;
   nctx->o_id_len = sizeof(newP->out_nord.s_O_ID);
   nctx->c_discount_len = 0;
   nctx->c_credit_len = 0;
   nctx->c_last_len = 0;
   nctx->retries_len = sizeof(newP->out_nord.retry);
   nctx->cr_date_len = sizeof(newP->in_nord.cr_date);
```

```
  /* this is the row count */
  rcount = newP->out_nord.s_O_OL_CNT;
  nctx->nol_i_count = newP->out_nord.s_O_OL_CNT;
  nctx->nol_q_count = newP->out_nord.s_O_OL_CNT;
  nctx->nol_s_count = newP->out_nord.s_O_OL_CNT;
  nctx->s_remote_count = newP->out_nord.s_O_OL_CNT;

  nctx->nol_qty_count  = 0;
  nctx->nol_bg_count = 0;
  nctx->nol_item_count = 0;
  nctx->nol_name_count = 0;
  nctx->nol_am_count   = 0;

  /* initialization for array operations */
  for (i = 0; i < newP->out_nord.s_O_OL_CNT; i++) {
     nctx->ol_number[i] = i + 1;
    nctx->nol_i_id_len[i] = sizeof(newP->in_nord.s_OL_I_ID[i]);
    nctx->nol_supply_w_id_len[i] = sizeof(newP-
>in_nord.s_OL_SUPPLY_W_ID[i]);
    nctx->nol_quantity_len[i] = sizeof(newP-
>in_nord.s_OL_QUANTITY[i]);
    nctx->nol_amount_len[i] = sizeof(newP-
>out_nord.s_OL_AMOUNT[i]);
    nctx->ol_o_id_len[i] = sizeof(newP->out_nord.s_O_ID);
     nctx->ol_number_len[i] = sizeof(int);
     nctx->ol_dist_info_len[i] = nctx->s_dist_info_len[i];
     nctx->s_remote_len[i] = sizeof(int);
     nctx->s_quant_len[i] = sizeof(int);
     nctx->i_name_len[i]=0;
     nctx->s_bg_len[i] = 0;
    invalid += newP->in_nord.s_OL_I_ID[i] > 100000 ? 1 : 0;
  }
  for (i = newP->out_nord.s_O_OL_CNT; i < NITEMS; i++) {
     nctx->nol_i_id_len[i] = 0;
     nctx->nol_supply_w_id_len[i] = 0;
     nctx->nol_quantity_len[i] = 0;
     nctx->nol_amount_len[i] = 0;
     nctx->ol_o_id_len[i] = 0;
     nctx->ol_number_len[i] = 0;
     nctx->ol_dist_info_len[i] = 0;
     nctx->s_remote_len[i] = 0;
     nctx->s_quant_len[i] = 0;
     nctx->i_name_len[i]=0;
     nctx->s_bg_len[i] = 0;
  }

  newP->out_nord.terror = OCIStmtExecute(tpcsvc,nctx-
>curn1,(OCIError *)errhp,1,0,0,0,
                         OCI_DEFAULT |
OCI_COMMIT_ON_SUCCESS);

  if(newP->out_nord.terror != OCI_SUCCESS) {
    OCITransRollback(tpcsvc,(OCIError *)errhp,OCI_DEFAULT);
    newP->out_nord.terror =
ocierror(server_logtrans,__FILE__,__LINE__,errhp,newP-
>out_nord.terror);
   oralogprintf(ora_SlotDataP->server_logtrans,"newP-
>out_nord.terror %d\n",newP->out_nord.terror);
    if(newP->out_nord.terror == NOT_SERIALIZABLE) {
      newP->out_nord.retry++;
      goto retry;
    } else if (newP->out_nord.terror == RECOVERR) {
      newP->out_nord.retry++;
      goto retry;
    } else if (newP->out_nord.terror == SNAPSHOT_TOO_OLD) {
      newP->out_nord.retry++;
      goto retry;
    } else {
      return -1;
    }
  }
```

```
  /* did the txn succeed ? */
  if (rcount != newP->out_nord.s_O_OL_CNT)
  {
      newP->out_nord.status = rcount - newP-
>out_nord.s_O_OL_CNT;
     newP->out_nord.s_O_OL_CNT = rcount;
     newP->out_nord.terror = 100;
  }

  newP->out_nord.s_total_amount = 0;
  for (i = 0; i < newP->out_nord.s_O_OL_CNT; i++)
  {
     newP->out_nord.s_total_amount += newP-
>out_nord.s_OL_AMOUNT[i];
  }
  newP->out_nord.s_total_amount *= ((float)(1.0 - newP-
>out_nord.s_C_DISCOUNT)) * (float)(1.0 + ((float)(newP-
>out_nord.s_D_TAX)) + ((float)(newP->out_nord.s_W_TAX)));
  newP->out_nord.s_total_amount = newP-
>out_nord.s_total_amount/100;

  return (newP->out_nord.terror);

}


void tkvcndone (ora_cn_data_t *ora_SlotDataP)

{
  newctx *nctx = (newctx *)ora_SlotDataP->nctx;


  if (nctx)
  {
    DISCARD OCIHandleFree((dvoid *)nctx-
>curn1,OCI_HTYPE_STMT);
    DISCARD OCIHandleFree((dvoid *)nctx-
>curn2,OCI_HTYPE_STMT);
    free (nctx);
  }
}
```

plord.cpp

```
#include "../../tpccisapi/tpcc.h"
#include "plora.h"
#include "ora_tpcc.h"
#include "tpccflags.h"

extern void oralogprintf(FILE *,char *format, ...);


/*-------------------------------------------------------------------------
                 PRIVATE TYPES AND CONSTANTS
 -------------------------------------------------------------------------*/

/*-------------------------------------------------------------------------
                 STATIC FUNCTION DECLARATIONS
 -------------------------------------------------------------------------*/





#define SQLCUR0 "SELECT rowid FROM cust \
            WHERE c_d_id = :d_id AND c_w_id = :w_id AND c_last
= :c_last \
            ORDER BY c_last, c_d_id, c_w_id, c_first"
```

```
#define SQLCUR1 "SELECT /*+ USE_NL(cust) INDEX_DESC(ordr
iordr2) */  \
              c_id, c_balance, c_first, c_middle, c_last, \
              o_id, o_entry_d, o_carrier_id, o_ol_cnt \
              FROM cust, ordr \
              WHERE cust.rowid = :cust_rowid \
              AND   o_d_id = c_d_id AND o_w_id = c_w_id AND
o_c_id = c_id \
              ORDER BY o_c_id DESC, o_d_id DESC, o_w_id DESC,
o_id DESC"

#define SQLCUR2 "SELECT /*+ USE_NL(cust)  INDEX_DESC (ordr
iordr2) */   \
              c_balance, c_first, c_middle, c_last, \
              o_id, o_entry_d, o_carrier_id, o_ol_cnt \
              FROM cust, ordr \
              WHERE c_id = :c_id AND c_d_id = :d_id AND c_w_id
= :w_id \
              AND o_d_id = c_d_id AND o_w_id = c_w_id AND o_c_id
= c_id \
              ORDER BY o_c_id DESC, o_d_id DESC, o_w_id DESC ,
o_id DESC"

#define SQLCUR3 "SELECT  /*+ INDEX(ordl) */ \
             ol_i_id, ol_supply_w_id, ol_quantity, ol_amount,
ol_delivery_d \
             FROM ordl \
             WHERE ol_o_id = :o_id AND  ol_d_id = :d_id AND
ol_w_id = :w_id"

#define SQLCUR4 "SELECT count(c_last) FROM cust \
              WHERE c_d_id = :d_id AND c_w_id = :w_id AND c_last
= :c_last "


struct ordctx {

   ub2 c_rowid_len[100];
   ub2 ol_supply_w_id_len[NITEMS];
   ub2 ol_i_id_len[NITEMS];
   ub2 ol_quantity_len[NITEMS];
   ub2 ol_amount_len[NITEMS];
   ub2 ol_delivery_d_len[NITEMS];
   ub2 ol_w_id_len;
   ub2 ol_d_id_len;
   ub2 ol_o_id_len;


   ub4 ol_supply_w_id_csize;
   ub4 ol_i_id_csize;
   ub4 ol_quantity_csize;
   ub4 ol_amount_csize;
   ub4 ol_delivery_d_csize;
   ub4 ol_w_id_csize;
   ub4 ol_d_id_csize;
   ub4 ol_o_id_csize;

   OCIStmt *curo0;
   OCIStmt *curo1;
   OCIStmt *curo2;
   OCIStmt *curo3;
   OCIStmt *curo4;
   OCIBind *c_id_bp;
   OCIBind *w_id_bp[4];
   OCIBind *d_id_bp[4];
   OCIBind *c_last_bp[2];
   OCIBind *o_id_bp;
   OCIBind *c_rowid_bp;
   OCIDefine *c_rowid_dp;
   OCIDefine *c_last_dp[2];
   OCIDefine *c_id_dp;
   OCIDefine *c_first_dp[2];
   OCIDefine *c_middle_dp[2];
   OCIDefine *c_balance_dp[2];
   OCIDefine *o_id_dp[2];
   OCIDefine *o_entry_d_dp[2];
   OCIDefine *o_cr_id_dp[2];
   OCIDefine *o_ol_cnt_dp[2];
   OCIDefine *ol_d_d_dp;
   OCIDefine *ol_i_id_dp;
   OCIDefine *ol_supply_w_id_dp;
   OCIDefine *ol_quantity_dp;
   OCIDefine *ol_amount_dp;
   OCIDefine *ol_d_base_dp;
   OCIDefine *c_count_dp;
   OCIRowid *c_rowid_ptr[100];
   OCIRowid *c_rowid_cust;
   int cs;
   int cust_idx;
   int norow;
   int rcount;
   int somerows;
};

typedef struct ordctx ordctx;

struct defctx
{
 boolean reexec;
 ub4 count;
};
typedef struct defctx defctx;

static ordcount = 0;

tkvcoinit (ora_cn_data_t *ora_SlotDataP)

{
   FILE *server_logtrans = ora_SlotDataP->server_logtrans;
   ordctx *octx;
   defctx *cbctx;

   int i;
   text stmbuf[SQL_BUF_SIZE];

   ords_wrapper *ordP;
   OCIEnv *tpcenv = ora_SlotDataP->tpcenv;
   OCIServer *tpcsrv = ora_SlotDataP->tpcsrv;
   dvoid *errhp = ora_SlotDataP->errhp;
   OCISvcCtx *tpcsvc = ora_SlotDataP->tpcsvc;
   OCISession *tpcusr = ora_SlotDataP->tpcusr;
   OCIStmt *curi = ora_SlotDataP->curi;

   octx = (ordctx *) malloc (sizeof(ordctx));
   DISCARD memset(octx,(char)0,sizeof(ordctx));
   octx->cs = 1;
   octx->norow = 0;
   octx->somerows = 10;
   ora_SlotDataP->octx = (void *)octx;

   cbctx = (defctx *) malloc (sizeof(defctx));
   DISCARD memset(cbctx,(char)0,sizeof(defctx));
   ora_SlotDataP->cbctx = (void *)cbctx;

   memset(&ora_SlotDataP->ordP,(char)0,sizeof(ords_wrapper));
   ordP = &ora_SlotDataP->ordP;

   for(i=0;i<100;i++) {
    DISCARD OCIERROR(errhp, OCIDescriptorAlloc(tpcenv,
             (dvoid**)&octx->c_rowid_ptr[i],
OCI_DTYPE_ROWID,0,(dvoid**)0));
  }
```

```
  DISCARD OCIERROR(errhp,
    OCIHandleAlloc(tpcenv,(dvoid**)&octx-
>curo0,OCI_HTYPE_STMT,0,(dvoid**)0));
  DISCARD OCIERROR(errhp,
    OCIHandleAlloc(tpcenv,(dvoid**)&octx-
>curo1,OCI_HTYPE_STMT,0,(dvoid**)0));
  DISCARD OCIERROR(errhp,
    OCIHandleAlloc(tpcenv,(dvoid**)&octx-
>curo2,OCI_HTYPE_STMT,0,(dvoid**)0));
  DISCARD OCIERROR(errhp,
    OCIHandleAlloc(tpcenv,(dvoid**)&octx-
>curo3,OCI_HTYPE_STMT,0,(dvoid**)0));
  DISCARD OCIERROR(errhp,
    OCIHandleAlloc(tpcenv,(dvoid**)&octx-
>curo4,OCI_HTYPE_STMT,0,(dvoid**)0));

/*  c_id = 0, use find customer by lastname. Get an array or rowid's
back*/
  DISCARD sprintf((char *) stmbuf, SQLCUR0);
  DISCARD OCIERROR(errhp,
    OCIStmtPrepare(octx->curo0,(OCIError
*)errhp,stmbuf,(ub4)strlen((char *)stmbuf),
              OCI_NTV_SYNTAX,OCI_DEFAULT));
  DISCARD OCIERROR(errhp,
    OCIAttrSet(octx->curo0,OCI_HTYPE_STMT,&octx->norow,0,
          OCI_ATTR_PREFETCH_ROWS,(OCIError *)errhp));
/* get order/customer info back based on rowid */
  DISCARD sprintf((char *) stmbuf, SQLCUR1);
  DISCARD OCIERROR(errhp,
    OCIStmtPrepare(octx->curo1,(OCIError
*)errhp,stmbuf,(ub4)strlen((char *)stmbuf),
              OCI_NTV_SYNTAX,OCI_DEFAULT));
  DISCARD OCIERROR(errhp,
    OCIAttrSet(octx->curo1,OCI_HTYPE_STMT,&octx->norow,0,
          OCI_ATTR_PREFETCH_ROWS,(OCIError *)errhp));

/*  c_id == 0, use lastname to find customer */
  DISCARD sprintf((char *) stmbuf, SQLCUR2);
  DISCARD OCIERROR(errhp,
    OCIStmtPrepare(octx->curo2,(OCIError
*)errhp,stmbuf,(ub4)strlen((char *)stmbuf),
              OCI_NTV_SYNTAX,OCI_DEFAULT));
  DISCARD OCIERROR(errhp,
    OCIAttrSet(octx->curo2,OCI_HTYPE_STMT,&octx->norow,0,
          OCI_ATTR_PREFETCH_ROWS,(OCIError *)errhp));

  DISCARD sprintf((char *) stmbuf, SQLCUR3);
  DISCARD OCIERROR(errhp,
    OCIStmtPrepare(octx->curo3,(OCIError
*)errhp,stmbuf,(ub4)strlen((char *)stmbuf),
              OCI_NTV_SYNTAX,OCI_DEFAULT));
  DISCARD OCIERROR(errhp,
    OCIAttrSet(octx->curo3,OCI_HTYPE_STMT,&octx->norow,0,
          OCI_ATTR_PREFETCH_ROWS,(OCIError *)errhp));

  DISCARD sprintf((char *) stmbuf, SQLCUR4);
  DISCARD OCIERROR(errhp,
    OCIStmtPrepare(octx->curo4,(OCIError
*)errhp,stmbuf,(ub4)strlen((char *)stmbuf),
              OCI_NTV_SYNTAX,OCI_DEFAULT));
  DISCARD OCIERROR(errhp,
    OCIAttrSet(octx->curo4,OCI_HTYPE_STMT,&octx->norow,0,
          OCI_ATTR_PREFETCH_ROWS,(OCIError *)errhp));

  for (i = 0; i < NITEMS; i++) {

    octx->ol_supply_w_id_len[i] = sizeof(int);
    octx->ol_i_id_len[i] = sizeof(int);
    octx->ol_quantity_len[i] = sizeof(int);
    octx->ol_amount_len[i] = sizeof(int);
    octx->ol_delivery_d_len[i] = sizeof(ordP-
>out_ords.s_OL_DELIVERY_D_base[0]);
  }
  octx->ol_supply_w_id_csize = NITEMS;
  octx->ol_i_id_csize = NITEMS;
  octx->ol_quantity_csize = NITEMS;
  octx->ol_amount_csize = NITEMS;
  octx->ol_delivery_d_csize = NITEMS;
  octx->ol_w_id_csize = NITEMS;
  octx->ol_o_id_csize = NITEMS;
  octx->ol_d_id_csize = NITEMS;
  octx->ol_w_id_len = sizeof(int);
  octx->ol_d_id_len = sizeof(int);
  octx->ol_o_id_len = sizeof(int);

  /* bind variables */

  /* c_id (customer id) is not known */
  OCIBND(octx->curo0,octx->w_id_bp[0],(OCIError
*)errhp,":w_id",ADR(ordP->in_ords.s_W_ID),
       SIZ(int),SQLT_INT);
  OCIBND(octx->curo0,octx->d_id_bp[0],(OCIError
*)errhp,":d_id",ADR(ordP->in_ords.s_D_ID),
       SIZ(int),SQLT_INT);
  OCIBND(octx->curo0,octx->c_last_bp[0],(OCIError
*)errhp,":c_last",ordP->in_ords.s_C_LAST,
     SIZ(ordP->in_ords.s_C_LAST), SQLT_STR);
  OCIDFNRA(octx->curo0,octx->c_rowid_dp,(OCIError
*)errhp,1,octx->c_rowid_ptr,
         SIZ(OCIRowid*), SQLT_RDD, NULL, octx->c_rowid_len,
NULL);


  OCIBND(octx->curo1,octx->c_rowid_bp,(OCIError
*)errhp,":cust_rowid", &octx->c_rowid_cust,
       sizeof( octx->c_rowid_ptr[0]),SQLT_RDD);
  OCIDEF(octx->curo1,octx->c_id_dp,(OCIError
*)errhp,1,ADR(ordP->in_ords.s_C_ID),SIZ(int),SQLT_INT);
#ifdef USE_IEEE_NUMBER
  OCIDEF(octx->curo1,octx->c_balance_dp[0],(OCIError
*)errhp,2,ADR(ordP->out_ords.s_C_BALANCE),
        SIZ(double),SQLT_BDOUBLE);
#else
  OCIDEF(octx->curo1,octx->c_balance_dp[0],(OCIError
*)errhp,2,ADR(ordP->out_ords.s_C_BALANCE),
        SIZ(double),SQLT_FLT);
#endif
  OCIDEF(octx->curo1,octx->c_first_dp[0],(OCIError *)errhp,3,ordP-
>out_ords.s_C_FIRST,SIZ(ordP->out_ords.s_C_FIRST)-1,
        SQLT_CHR);
  OCIDEF(octx->curo1,octx->c_middle_dp[0],(OCIError
*)errhp,4,ordP->out_ords.s_C_MIDDLE,
        SIZ(ordP->out_ords.s_C_MIDDLE)-1,SQLT_AFC);
  OCIDEF(octx->curo1,octx->c_last_dp[0],(OCIError *)errhp,5,ordP-
>out_ords.s_C_LAST,SIZ(ordP->out_ords.s_C_LAST)-1,
        SQLT_CHR);
  OCIDEF(octx->curo1,octx->o_id_dp[0],(OCIError
*)errhp,6,ADR(ordP->out_ords.s_O_ID),SIZ(int),SQLT_INT);
  OCIDEF(octx->curo1,octx->o_entry_d_dp[0],(OCIError *)errhp,7,
        &ordP-
>out_ords.s_OL_DELIVERY_D_base,SIZ(OCIDate),SQLT_ODT);
  OCIDEF(octx->curo1,octx->o_cr_id_dp[0],(OCIError
*)errhp,8,ADR(ordP->out_ords.s_O_CARRIER_ID),
        SIZ(int),SQLT_INT);
  OCIDEF(octx->curo1,octx->o_ol_cnt_dp[0],(OCIError
*)errhp,9,ADR(ordP->out_ords.s_ol_cnt),
        SIZ(int),SQLT_INT);


/* Bind for third cursor , no-zero customer id */
  OCIBND(octx->curo2,octx->w_id_bp[1],(OCIError
*)errhp,":w_id",ADR(ordP->in_ords.s_W_ID),
```

```
        SIZ(int),SQLT_INT);
  OCIBND(octx->curo2,octx->d_id_bp[1],(OCIError
*)errhp,":d_id",ADR(ordP->in_ords.s_D_ID),
        SIZ(int),SQLT_INT);
  OCIBND(octx->curo2,octx->c_id_bp,(OCIError
*)errhp,":c_id",ADR(ordP->in_ords.s_C_ID),
        SIZ(int),SQLT_INT);
#ifdef USE_IEEE_NUMBER
  OCIDEF(octx->curo2,octx->c_balance_dp[1],(OCIError
*)errhp,1,ADR(ordP->out_ords.s_C_BALANCE),
        SIZ(double),SQLT_BDOUBLE);
#else
  OCIDEF(octx->curo2,octx->c_balance_dp[1],(OCIError
*)errhp,1,ADR(ordP->out_ords.s_C_BALANCE),
        SIZ(double),SQLT_FLT);
#endif
  OCIDEF(octx->curo2,octx->c_first_dp[1],(OCIError *)errhp,2,ordP-
>out_ords.s_C_FIRST,SIZ(ordP->out_ords.s_C_FIRST)-1,
        SQLT_CHR);
  OCIDEF(octx->curo2,octx->c_middle_dp[1],(OCIError
*)errhp,3,ordP->out_ords.s_C_MIDDLE,
        SIZ(ordP->out_ords.s_C_MIDDLE)-1,SQLT_AFC);
  OCIDEF(octx->curo2,octx->c_last_dp[1],(OCIError *)errhp,4,ordP-
>out_ords.s_C_LAST,SIZ(ordP->out_ords.s_C_LAST)-1,
        SQLT_CHR);
  OCIDEF(octx->curo2,octx->o_id_dp[1],(OCIError
*)errhp,5,ADR(ordP->out_ords.s_O_ID),SIZ(int),SQLT_INT);
  OCIDEF(octx->curo2,octx->o_entry_d_dp[1],(OCIError *)errhp,6,
&ordP->out_ords.s_OL_DELIVERY_D_base,
        SIZ(OCIDate),SQLT_ODT);
  OCIDEF(octx->curo2, octx->o_cr_id_dp[1],(OCIError
*)errhp,7,ADR(ordP->out_ords.s_O_CARRIER_ID),
        SIZ(int), SQLT_INT);
  OCIDEF(octx->curo2,octx->o_ol_cnt_dp[1],(OCIError
*)errhp,8,ADR(ordP->out_ords.s_ol_cnt),
        SIZ(int),SQLT_INT);

/* Bind for last cursor */


  OCIBND(octx->curo3,octx->w_id_bp[2],(OCIError
*)errhp,":w_id",ADR(ordP->in_ords.s_W_ID), SIZ(int),SQLT_INT);
  OCIBND(octx->curo3,octx->d_id_bp[2],(OCIError
*)errhp,":d_id",ADR(ordP->in_ords.s_D_ID), SIZ(int),SQLT_INT);
  OCIBND(octx->curo3,octx->o_id_bp,(OCIError
*)errhp,":o_id",ADR(ordP->out_ords.s_O_ID), SIZ(int),SQLT_INT);
/*
  OCIBND(octx->curo3,octx->c_id_bp,(OCIError
*)errhp,":c_id",ADR(ordP->ordin.c_id), SIZ(int),SQLT_INT);
*/


  OCIDFNRA(octx->curo3, octx->ol_i_id_dp, (OCIError *)errhp, 1,
ordP->out_ords.s_OL_I_ID,SIZ(int),SQLT_INT,
         NULL,octx->ol_i_id_len, NULL);
  OCIDFNRA(octx->curo3,octx->ol_supply_w_id_dp,(OCIError
*)errhp,2, ordP->out_ords.s_OL_SUPPLY_W_ID,
         SIZ(int),SQLT_INT, NULL,
         octx->ol_supply_w_id_len, NULL);
#ifdef USE_IEEE_NUMBER
  OCIDFNRA(octx->curo3, octx->ol_quantity_dp,(OCIError *)errhp,3,
ordP->out_ords.s_OL_QUANTITY,SIZ(float),
         SQLT_FLT, NULL,octx->ol_quantity_len, NULL);
  OCIDFNRA(octx->curo3,octx->ol_amount_dp,(OCIError
*)errhp,4,ordP->out_ords.s_OL_AMOUNT, SIZ(float),
         SQLT_FLT,NULL, octx->ol_amount_len, NULL);
#else
  OCIDFNRA(octx->curo3, octx->ol_quantity_dp,(OCIError *)errhp,3,
ordP->out_ords.s_OL_QUANTITY,SIZ(int),
         SQLT_INT, NULL,octx->ol_quantity_len, NULL);
  OCIDFNRA(octx->curo3,octx->ol_amount_dp,(OCIError
*)errhp,4,ordP->out_ords.s_OL_AMOUNT, SIZ(int),
         SQLT_INT,NULL, octx->ol_amount_len, NULL);
#endif
  OCIDFNRA(octx->curo3,octx->ol_d_base_dp,(OCIError
*)errhp,5,ordP->out_ords.s_OL_DELIVERY_D_base,SIZ(OCIDate),
         SQLT_ODT, NULL,octx->ol_delivery_d_len,NULL);

  OCIBND(octx->curo4,octx->w_id_bp[3],(OCIError
*)errhp,":w_id",ADR(ordP->in_ords.s_W_ID),
        SIZ(int),SQLT_INT);
  OCIBND(octx->curo4,octx->d_id_bp[3],(OCIError
*)errhp,":d_id",ADR(ordP->in_ords.s_D_ID),
        SIZ(int),SQLT_INT);
  OCIBND(octx->curo4,octx->c_last_bp[1],(OCIError
*)errhp,":c_last",ordP->out_ords.s_C_LAST,
        SIZ(ordP->out_ords.s_C_LAST), SQLT_STR);
  OCIDEF(octx->curo4,octx->c_count_dp,(OCIError
*)errhp,1,ADR(octx->rcount),SIZ(int),
        SQLT_INT);

  return (0);

}

tkvco (ora_cn_data_t *ora_SlotDataP)

{
 FILE *server_logtrans = ora_SlotDataP->server_logtrans;

  int i;
  int rcount;

  ordctx *octx = (ordctx *)ora_SlotDataP->octx;
  defctx *cbctx = (defctx *)ora_SlotDataP->cbctx;
  ords_wrapper *ordP = &ora_SlotDataP->ordP;
  OCIEnv *tpcenv = ora_SlotDataP->tpcenv;
  OCIServer *tpcsrv = ora_SlotDataP->tpcsrv;
  dvoid *errhp = ora_SlotDataP->errhp;
  OCISvcCtx *tpcsvc = ora_SlotDataP->tpcsvc;
  OCISession *tpcusr = ora_SlotDataP->tpcusr;
  OCIStmt *curi = ora_SlotDataP->curi;


#if defined(ISO9)
  int secondread = 0;
  char sdate[30];
  ub4  datelen;
  sysdate(sdate);
  printf("Order Status started at: %s\n", sdate);
#endif

#ifdef DEBUG
  if (bylastname) tkvc_trace_on();
#endif

#ifdef BLANK_PAD_C_LAST
  for (i = strlen(c_last); i < sizeof(c_last)-1; i++)
  {
    c_last[i] = ' ';
  }
  c_last[i] = '\0';
#endif

  for (i = 0; i < NITEMS; i++) {
    octx->ol_supply_w_id_len[i] = sizeof(int);
    octx->ol_i_id_len[i] = sizeof(int);
   octx->ol_quantity_len[i] = sizeof(float);
    octx->ol_amount_len[i] = sizeof(float);
   octx->ol_quantity_len[i] = sizeof(int);
    octx->ol_amount_len[i] = sizeof(int);
   octx->ol_delivery_d_len[i] = sizeof(OCIDate);
  }
  octx->ol_supply_w_id_csize = NITEMS;
```

```
  octx->ol_i_id_csize = NITEMS;
  octx->ol_quantity_csize = NITEMS;
  octx->ol_amount_csize = NITEMS;
  octx->ol_delivery_d_csize = NITEMS;
retry:
  if(ordP->in_ords.bylastname)
  {
    ordcount++;
    cbctx->reexec = FALSE;
#undef STRIP_BLANKS_C_LAST
#ifdef STRIP_BLANKS_C_LAST
    for (i = strlen(ordP->in_ords.s_C_LAST)-1; i >= 0 && (ordP-
>in_ords.s_C_LAST[i] == ' '); i--)
    {
      ordP->in_ords.s_C_LAST[i] = '\0';
    }
#endif
    ordP->out_ords.terror=OCIStmtExecute(tpcsvc,octx-
>curo0,(OCIError *)errhp,100,0,
            NULLP(CONST
OCISnapshot),NULLP(OCISnapshot),OCI_DEFAULT);
    /* will get OCI_NO_DATA if <100 found */
    if ((ordP->out_ords.terror != OCI_NO_DATA) && (ordP-
>out_ords.terror != OCI_SUCCESS))
    {
      ordP->out_ords.terror=OCIERROR(errhp, ordP-
>out_ords.terror);
      if((ordP->out_ords.terror == NOT_SERIALIZABLE) || (ordP-
>out_ords.terror == RECOVERR))
      {
        DISCARD OCITransCommit(tpcsvc,(OCIError
*)errhp,OCI_DEFAULT);
        ordP->out_ords.retry++;
        goto retry;
      } else {
        return -1;
      }
    }
    if (ordP->out_ords.terror == OCI_NO_DATA) /* there are no more
rows */
    {
     /* get rowcount, find middle one */
      DISCARD OCIAttrGet(octx-
>curo0,OCI_HTYPE_STMT,&rcount,NULL,
                  OCI_ATTR_ROW_COUNT,(OCIError *)errhp);

      if (rcount <1)
      {
        oralogprintf(server_logtrans,"ORDERSTATUS:
rcount=%d\n",rcount);
        oralogprintf(server_logtrans,"ORDERSTATUS: c_d_id %d
c_w_id %d c_last %s\n",ordP->in_ords.s_D_ID,ordP-
>in_ords.s_W_ID,ordP->in_ords.s_C_LAST);
        return (-1);
      }
      octx->cust_idx=(rcount)/2 ;
    }
    else
    {
      /* count the number of rows */
      ordP->out_ords.terror=OCIStmtExecute(tpcsvc,octx-
>curo4,(OCIError *)errhp,1,0,
             NULLP(CONST
OCISnapshot),NULLP(OCISnapshot),OCI_DEFAULT);
      if ((ordP->out_ords.terror != OCI_NO_DATA) && (ordP-
>out_ords.terror != OCI_SUCCESS))
      {
        ordP->out_ords.terror=OCIERROR(errhp, ordP-
>out_ords.terror);
        if ((ordP->out_ords.terror == NOT_SERIALIZABLE) || (ordP-
>out_ords.terror == RECOVERR))
        {
          DISCARD OCITransCommit(tpcsvc,(OCIError
*)errhp,OCI_DEFAULT);
          ordP->out_ords.retry++;
          goto retry;
        } else {
          return -1;
        }
      }
      cbctx->reexec = TRUE;
      cbctx->count = (octx->rcount+1)/2 ;
      ordP->out_ords.terror=OCIStmtExecute(tpcsvc,octx-
>curo0,(OCIError *)errhp,cbctx->count,
                     0,NULLP(CONST OCISnapshot),
                     NULLP(OCISnapshot),OCI_DEFAULT);

      DISCARD OCIAttrGet(octx-
>curo0,OCI_HTYPE_STMT,&rcount,NULL,
                      OCI_ATTR_ROW_COUNT,(OCIError *)errhp);

      /* will get OCI_NO_DATA if <100 found */
      if (cbctx->count != rcount)
      {
        userlog ("did not get all rows ");
        return (-1);
      }

      if ((ordP->out_ords.terror != OCI_NO_DATA) && (ordP-
>out_ords.terror != OCI_SUCCESS))
      {
        ordP->out_ords.terror=OCIERROR(errhp, ordP-
>out_ords.terror);
        if((ordP->out_ords.terror == NOT_SERIALIZABLE) || (ordP-
>out_ords.terror == RECOVERR))
        {
          DISCARD OCITransCommit(tpcsvc,(OCIError
*)errhp,OCI_DEFAULT);
          ordP->out_ords.retry++;
          goto retry;
        } else {
          return -1;
        }
      }
      octx->cust_idx=cbctx->count - 1 ;
    }

    octx->c_rowid_cust = octx->c_rowid_ptr[octx->cust_idx];
    ordP->out_ords.terror=OCIStmtExecute(tpcsvc,octx-
>curo1,(OCIError *)errhp,1,0,
             NULLP(CONST
OCISnapshot),NULLP(OCISnapshot),OCI_DEFAULT);
    if (ordP->out_ords.terror != OCI_SUCCESS)
    {
      ordP->out_ords.terror=OCIERROR(errhp,ordP-
>out_ords.terror);
      DISCARD OCITransCommit(tpcsvc,(OCIError
*)errhp,OCI_DEFAULT);
      if((ordP->out_ords.terror == NOT_SERIALIZABLE) || (ordP-
>out_ords.terror == RECOVERR)
        || (ordP->out_ords.terror == SNAPSHOT_TOO_OLD))
      {
        ordP->out_ords.retry++;
        goto retry;
        } else {
        return -1;
      }
    }
  } /* lastname */
  else
  {
    ordP->out_ords.terror=OCIStmtExecute(tpcsvc,octx-
>curo2,(OCIError *)errhp,1,0,
```

```
                    NULLP(CONST
OCISnapshot),NULLP(OCISnapshot),
                    OCI_DEFAULT);
     if (ordP->out_ords.terror != OCI_SUCCESS)
     {
       ordP->out_ords.terror=OCIERROR(errhp,ordP-
>out_ords.terror);
      DISCARD OCITransCommit(tpcsvc,(OCIError
*)errhp,OCI_DEFAULT);
     if((ordP->out_ords.terror == NOT_SERIALIZABLE) || (ordP-
>out_ords.terror == RECOVERR)
        || (ordP->out_ords.terror == SNAPSHOT_TOO_OLD))
      {
        ordP->out_ords.retry++;
        goto retry;
      }
      else
      {
        return -1;
      }
     }
   }
   octx->ol_w_id_len = sizeof(int);
   octx->ol_d_id_len = sizeof(int);
   octx->ol_o_id_len = sizeof(int);

  ordP->out_ords.terror = OCIStmtExecute(tpcsvc,octx-
>curo3,(OCIError *)errhp,ordP->out_ords.s_ol_cnt,0,
                      NULLP(CONST
OCISnapshot),NULLP(OCISnapshot),
                      OCI_DEFAULT | OCI_COMMIT_ON_SUCCESS);
  if (ordP->out_ords.terror != OCI_SUCCESS )
   {
     ordP->out_ords.terror=OCIERROR(errhp,ordP->out_ords.terror);
     DISCARD OCITransCommit(tpcsvc,(OCIError
*)errhp,OCI_DEFAULT);
    if((ordP->out_ords.terror == NOT_SERIALIZABLE) || (ordP-
>out_ords.terror == RECOVERR)
       || (ordP->out_ords.terror == SNAPSHOT_TOO_OLD))
     {
       ordP->out_ords.retry++;
       goto retry;
     }
     else
     {
       return -1;
     }

   }
  /* clean up and convert the delivery dates */
   for (i = 0; i < ordP->out_ords.s_ol_cnt; i++)
   {
      ordP->out_ords.ol_del_len[i]=sizeof(ordP-
>out_ords.s_OL_DELIVERY_D_time[i]);
     DISCARD OCIERROR(errhp,OCIDateToText((OCIError
*)errhp,&ordP->out_ords.s_OL_DELIVERY_D_base[i],
       (const text*)SHORTDATE,(ub1)strlen(SHORTDATE),(text*)0,0,
        (ub4 *)&ordP->out_ords.ol_del_len[i], (text *)ordP-
>out_ords.s_OL_DELIVERY_D_time[i]));
   }
  ordP->out_ords.terror = 0;
  return (0);

}


void tkvcodone (ora_cn_data_t *ora_SlotDataP)
{

  if (ora_SlotDataP->octx) {
     free (ora_SlotDataP->octx);
     ora_SlotDataP->octx = NULL;
   }
}

/* end of file tkvcord.c */
```

plpay.cpp

```
#include "../../tpccisapi/tpcc.h"
#include "plora.h"
#include "ora_tpcc.h"

extern char OracleHome[256];
extern int sqlfile(FILE *server_logtrans,char *fnam, text *linebuf);

extern void oralogprintf(FILE *,char *format, ...);

#define SQLTXT_INIT "BEGIN inittpcc.init_pay; END;"

struct payctx {
  OCIStmt *curpi;
  OCIStmt *curp0;
  OCIStmt *curp1;
  OCIBind *w_id_bp[2];
  ub2 w_id_len;

  OCIBind *d_id_bp[2];
  ub2 d_id_len;

  OCIBind *c_w_id_bp[2];
  ub2 c_w_id_len;

  OCIBind *c_d_id_bp[2];
  ub2 c_d_id_len;

  OCIBind *c_id_bp[2];
  ub2 c_id_len;

  OCIBind *h_amount_bp[2];
  ub2 h_amount_len;

  OCIBind *c_last_bp[2];
  ub2 c_last_len;

  OCIBind *w_street_1_bp[2];
  ub2 w_street_1_len;

  OCIBind *w_street_2_bp[2];
  ub2 w_street_2_len;

  OCIBind *w_city_bp[2];
  ub2 w_city_len;

  OCIBind *w_state_bp[2];
  ub2 w_state_len;

  OCIBind *w_zip_bp[2];
  ub2 w_zip_len;

  OCIBind *d_street_1_bp[2];
  ub2 d_street_1_len;

  OCIBind *d_street_2_bp[2];
  ub2 d_street_2_len;

  OCIBind *d_city_bp[2];
  ub2 d_city_len;

  OCIBind *d_state_bp[2];
  ub2 d_state_len;
```

```
  OCIBind *d_zip_bp[2];
  ub2 d_zip_len;

  OCIBind *c_first_bp[2];
  ub2 c_first_len;

  OCIBind *c_middle_bp[2];
  ub2 c_middle_len;

  OCIBind *c_street_1_bp[2];
  ub2 c_street_1_len;

  OCIBind *c_street_2_bp[2];
  ub2 c_street_2_len;

  OCIBind *c_city_bp[2];
  ub2 c_city_len;

  OCIBind *c_state_bp[2];
  ub2 c_state_len;

  OCIBind *c_zip_bp[2];
  ub2 c_zip_len;

  OCIBind *c_phone_bp[2];
  ub2 c_phone_len;

  OCIBind *c_since_bp[2];
  ub2 c_since_len;

  OCIBind *c_credit_bp[2];
  ub2 c_credit_len;

  OCIBind *c_credit_lim_bp[2];
  ub2 c_credit_lim_len;

  OCIBind *c_discount_bp[2];
  ub2 c_discount_len;

  OCIBind *c_balance_bp[2];
  ub2 c_balance_len;

  OCIBind *c_data_bp[2];
  ub2 c_data_len;

  OCIBind *h_date_bp[2];
  ub2 h_date_len;

  OCIBind *retries_bp[2];
  ub2 retries_len;

  OCIBind *cr_date_bp[2];
  ub2 cr_date_len;

  OCIBind *byln_bp[2];
  ub2 byln_len;
};

typedef struct payctx payctx;

int tkvcpinit (ora_cn_data_t *ora_SlotDataP)
{
   char sqlfilename[256];
   FILE *server_logtrans = ora_SlotDataP->server_logtrans;
   /*  */
   payctx *pctx;
   paym_wrapper *payP;
   OCIEnv *tpcenv = ora_SlotDataP->tpcenv;
   OCIServer *tpcsrv = ora_SlotDataP->tpcsrv;
   dvoid *errhp = ora_SlotDataP->errhp;
   OCISvcCtx *tpcsvc = ora_SlotDataP->tpcsvc;
   OCISession *tpcusr = ora_SlotDataP->tpcusr;
   OCIStmt *curi = ora_SlotDataP->curi;

   oralogprintf(ora_SlotDataP->server_logtrans,">>tkvcpinit\n");
   text stmbuf[SQL_BUF_SIZE];

   pctx = (payctx *)malloc(sizeof(payctx));
   memset(pctx,(char)0,sizeof(payctx));
   ora_SlotDataP->pctx = (void *)pctx;

   payP = &ora_SlotDataP->payP;
   memset(&ora_SlotDataP->payP,(char)0,sizeof(paym_wrapper));

/* cursor for init */
   DISCARD OCIERROR(errhp,OCIHandleAlloc(tpcenv, (dvoid
**)(&(pctx->curpi)),
          OCI_HTYPE_STMT,0,(dvoid**)0));

   DISCARD OCIERROR(errhp,OCIHandleAlloc(tpcenv, (dvoid
**)(&(pctx->curp0)),
          OCI_HTYPE_STMT,0,(dvoid**)0));
   DISCARD OCIERROR(errhp,OCIHandleAlloc(tpcenv, (dvoid
**)(&(pctx->curp1)),
          OCI_HTYPE_STMT,0,(dvoid**)0));

   /*  build the init statement  and execute it */

   sprintf ((char*)stmbuf, SQLTXT_INIT);
   DISCARD OCIERROR(errhp,OCIStmtPrepare(pctx->curpi,
(OCIError *)errhp, stmbuf,
          strlen((char *)stmbuf), OCI_NTV_SYNTAX, OCI_DEFAULT));
   DISCARD OCIERROR(errhp, OCIStmtExecute(tpcsvc,pctx-
>curpi,(OCIError *)errhp,1,0,
                 NULLP(CONST
OCISnapshot),NULLP(OCISnapshot),OCI_DEFAULT));

   /* customer id !=  0, go by cust id */
   sprintf(sqlfilename,"%s/tpcc-
kit/benchrun/blocks/paynz.sql",OracleHome);
   sqlfile(ora_SlotDataP->server_logtrans,sqlfilename,stmbuf);
   DISCARD OCIERROR(errhp,OCIStmtPrepare(pctx->curp0,
(OCIError *)errhp, stmbuf,
          strlen((char *)stmbuf), OCI_NTV_SYNTAX, OCI_DEFAULT));

   /* customer id ==  0, go by last name */

   sprintf(sqlfilename,"%s/tpcc-
kit/benchrun/blocks/payz.sql",OracleHome);
   sqlfile(ora_SlotDataP->server_logtrans,sqlfilename,stmbuf);
   DISCARD OCIERROR(errhp,OCIStmtPrepare(pctx->curp1,
(OCIError *)errhp, stmbuf,
          strlen((char *)stmbuf), OCI_NTV_SYNTAX, OCI_DEFAULT));

  pctx->w_id_len = SIZ(payP->in_paym.s_W_ID);
  pctx->d_id_len = SIZ(payP->in_paym.s_D_ID);
  pctx->c_w_id_len = SIZ(payP->in_paym.s_C_W_ID);
  pctx->c_d_id_len = SIZ(payP->in_paym.s_C_D_ID);
  pctx->c_id_len = 0;
  pctx->h_amount_len = SIZ(float);
  pctx->c_last_len = 0;
  pctx->w_street_1_len = 0;
  pctx->w_street_2_len = 0;
  pctx->w_city_len = 0;
  pctx->w_state_len = 0;
  pctx->w_zip_len = 0;
  pctx->d_street_1_len = 0;
  pctx->d_street_2_len = 0;
  pctx->d_city_len = 0;
  pctx->d_state_len = 0;
  pctx->d_zip_len = 0;
  pctx->c_first_len = 0;
  pctx->c_middle_len = 0;
  pctx->c_street_1_len = 0;
```

```
  pctx->c_street_2_len = 0;
  pctx->c_city_len = 0;
  pctx->c_state_len = 0;
  pctx->c_zip_len = 0;
  pctx->c_phone_len = 0;
  pctx->c_since_len = 7;
  pctx->c_credit_len = 0;
  pctx->c_credit_lim_len = 0;
  pctx->c_discount_len = 0;
  pctx->c_balance_len = sizeof(double);
  pctx->c_data_len = 0;
  pctx->h_date_len = 0;
  pctx->retries_len =SIZ(payP->out_paym.retry) ;
  pctx->cr_date_len = 7;



   /* bind variables */


   OCIBNDPL(pctx->curp0, pctx->w_id_bp[0], (OCIError
*)errhp,":w_id",ADR(payP->in_paym.s_W_ID),SIZ(int),
         SQLT_INT, NULL);

   OCIBNDPL(pctx->curp0, pctx->d_id_bp[0], (OCIError
*)errhp,":d_id",ADR(payP->in_paym.s_D_ID),SIZ(int),
         SQLT_INT, NULL);
   OCIBND(pctx->curp0, pctx->c_w_id_bp[0], (OCIError
*)errhp,":c_w_id",ADR(payP->in_paym.s_C_W_ID),SIZ(int),
         SQLT_INT);
   OCIBND(pctx->curp0, pctx->c_d_id_bp[0], (OCIError
*)errhp,":c_d_id",ADR(payP->in_paym.s_C_D_ID),SIZ(int),
         SQLT_INT);
   OCIBND(pctx->curp0, pctx->c_id_bp[0], (OCIError
*)errhp,":c_id",ADR(payP->in_paym.s_C_ID),SIZ(int),
         SQLT_INT);

   OCIBNDPL(pctx->curp0, pctx->h_amount_bp[0], (OCIError
*)errhp,":h_amount",ADR(payP->in_paym.s_H_AMOUNT),
         SIZ(payP->in_paym.s_H_AMOUNT),SQLT_FLT,  &pctx-
>h_amount_len);

   OCIBNDPL(pctx->curp0, pctx->c_last_bp[0], (OCIError
*)errhp,":c_last",payP->out_paym.s_C_LAST,SIZ(payP-
>out_paym.s_C_LAST),
         SQLT_STR, &pctx->c_last_len);

   OCIBNDPL(pctx->curp0, pctx->w_street_1_bp[0], (OCIError
*)errhp,":w_street_1",payP->out_paym.s_W_STREET_1,
         SIZ(payP->out_paym.s_W_STREET_1),SQLT_STR, &pctx-
>w_street_1_len);
   OCIBNDPL(pctx->curp0, pctx->w_street_2_bp[0], (OCIError
*)errhp,":w_street_2",payP->out_paym.s_W_STREET_2,
         SIZ(payP->out_paym.s_W_STREET_2),SQLT_STR, &pctx-
>w_street_2_len);
   OCIBNDPL(pctx->curp0, pctx->w_city_bp[0], (OCIError
*)errhp,":w_city",payP->out_paym.s_W_CITY,SIZ(payP-
>out_paym.s_W_CITY),
         SQLT_STR, &pctx->w_city_len);
   OCIBNDPL(pctx->curp0, pctx->w_state_bp[0], (OCIError
*)errhp,":w_state",payP->out_paym.s_W_STATE,
         SIZ(payP->out_paym.s_W_STATE), SQLT_STR, &pctx-
>w_state_len);
   OCIBNDPL(pctx->curp0, pctx->w_zip_bp[0], (OCIError
*)errhp,":w_zip",payP->out_paym.s_W_ZIP,SIZ(payP-
>out_paym.s_W_ZIP),
         SQLT_STR, &pctx->w_zip_len);

   OCIBNDPL(pctx->curp0, pctx->d_street_1_bp[0], (OCIError
*)errhp,":d_street_1",payP->out_paym.s_D_STREET_1,
      SIZ(payP->out_paym.s_D_STREET_1),SQLT_STR, &pctx-
>d_street_1_len);
   OCIBNDPL(pctx->curp0, pctx->d_street_2_bp[0], (OCIError
*)errhp,":d_street_2",payP->out_paym.s_D_STREET_2,
      SIZ(payP->out_paym.s_D_STREET_2),SQLT_STR, &pctx-
>d_street_2_len);
   OCIBNDPL(pctx->curp0, pctx->d_city_bp[0], (OCIError
*)errhp,":d_city",payP->out_paym.s_D_CITY,SIZ(payP-
>out_paym.s_D_CITY),
         SQLT_STR, &pctx->d_city_len);
   OCIBNDPL(pctx->curp0, pctx->d_state_bp[0], (OCIError
*)errhp,":d_state",payP->out_paym.s_D_STATE,
      SIZ(payP->out_paym.s_D_STATE), SQLT_STR, &pctx-
>d_state_len);
   OCIBNDPL(pctx->curp0, pctx->d_zip_bp[0], (OCIError
*)errhp,":d_zip",payP->out_paym.s_D_ZIP,SIZ(payP-
>out_paym.s_D_ZIP),
         SQLT_STR, &pctx->d_zip_len);
   OCIBNDPL(pctx->curp0, pctx->c_first_bp[0], (OCIError
*)errhp,":c_first",payP->out_paym.s_C_FIRST,
      SIZ(payP->out_paym.s_C_FIRST), SQLT_STR, &pctx-
>c_first_len);
   OCIBNDPL(pctx->curp0, pctx->c_middle_bp[0], (OCIError
*)errhp,":c_middle",payP->out_paym.s_C_MIDDLE,2,
         SQLT_AFC, &pctx->c_middle_len);
   OCIBNDPL(pctx->curp0, pctx->c_street_1_bp[0], (OCIError
*)errhp,":c_street_1",payP->out_paym.s_C_STREET_1,
      SIZ(payP->out_paym.s_C_STREET_1),SQLT_STR, &pctx-
>c_street_1_len);
   OCIBNDPL(pctx->curp0, pctx->c_street_2_bp[0], (OCIError
*)errhp,":c_street_2",payP->out_paym.s_C_STREET_2,
      SIZ(payP->out_paym.s_C_STREET_2),SQLT_STR, &pctx-
>c_street_2_len);
   OCIBNDPL(pctx->curp0, pctx->c_city_bp[0], (OCIError
*)errhp,":c_city",payP->out_paym.s_C_CITY,SIZ(payP-
>out_paym.s_C_CITY),
         SQLT_STR, &pctx->c_city_len);
   OCIBNDPL(pctx->curp0, pctx->c_state_bp[0], (OCIError
*)errhp,":c_state",payP->out_paym.s_C_STATE,
      SIZ(payP->out_paym.s_C_STATE), SQLT_STR, &pctx-
>c_state_len);
   OCIBNDPL(pctx->curp0, pctx->c_zip_bp[0], (OCIError
*)errhp,":c_zip",payP->out_paym.s_C_ZIP,SIZ(payP-
>out_paym.s_C_ZIP),
         SQLT_STR,&pctx->c_zip_len);
   OCIBNDPL(pctx->curp0, pctx->c_phone_bp[0], (OCIError
*)errhp,":c_phone",payP->out_paym.s_C_PHONE,
      SIZ(payP->out_paym.s_C_PHONE), SQLT_STR, &pctx-
>c_phone_len);
   OCIBNDPL(pctx->curp0, pctx->c_since_bp[0], (OCIError
*)errhp,":c_since",&payP->out_paym.c_since,
         SIZ(OCIDate), SQLT_ODT, &pctx->c_since_len);
   OCIBNDPL(pctx->curp0, pctx->c_credit_bp[0], (OCIError
*)errhp,":c_credit",payP->out_paym.s_C_CREDIT,
         SIZ(payP->out_paym.s_C_CREDIT),SQLT_CHR, &pctx-
>c_credit_len);
   OCIBNDPL(pctx->curp0, pctx->c_credit_lim_bp[0], (OCIError
*)errhp,":c_credit_lim",
         ADR(payP->out_paym.s_C_CREDIT_LIM),SIZ(int),
SQLT_INT, &pctx->c_credit_lim_len);
   OCIBNDPL(pctx->curp0, pctx->c_discount_bp[0], (OCIError
*)errhp,":c_discount",
         ADR(payP->out_paym.s_C_DISCOUNT),SIZ(payP-
>out_paym.s_C_DISCOUNT), SQLT_FLT, &pctx->c_discount_len);
   OCIBNDPL(pctx->curp0, pctx->c_balance_bp[0], (OCIError
*)errhp,":c_balance",
         ADR(payP->out_paym.s_C_BALANCE),
SIZ(double),SQLT_FLT, &pctx->c_balance_len);

   OCIBNDPL(pctx->curp0, pctx->c_data_bp[0], (OCIError
*)errhp,":c_data",payP->out_paym.s_C_DATA,SIZ(payP-
>out_paym.s_C_DATA),
         SQLT_STR, &pctx->c_data_len);
```

```
  OCIBNDPL(pctx->curp0, pctx->retries_bp[0], (OCIError
*)errhp,":retry",ADR(payP->out_paym.retry),
        SIZ(int), SQLT_INT, &pctx->retries_len);

  OCIBNDPL(pctx->curp0, pctx->cr_date_bp[0], (OCIError
*)errhp,":cr_date",ADR(payP->in_paym.cr_date),
        SIZ(OCIDate),SQLT_ODT, &pctx->cr_date_len);

      /* ---- Binds for  the second cursor   */


  OCIBNDPL(pctx->curp1, pctx->w_id_bp[1], (OCIError
*)errhp,":w_id",ADR(payP->in_paym.s_W_ID),SIZ(int),
        SQLT_INT, &pctx->w_id_len);
  OCIBNDPL(pctx->curp1, pctx->d_id_bp[1], (OCIError
*)errhp,":d_id",ADR(payP->in_paym.s_D_ID),SIZ(int),
        SQLT_INT, &pctx->d_id_len);
  OCIBND(pctx->curp1, pctx->c_w_id_bp[1], (OCIError
*)errhp,":c_w_id",ADR(payP->in_paym.s_C_W_ID),SIZ(int),
        SQLT_INT);
  OCIBND(pctx->curp1, pctx->c_d_id_bp[1], (OCIError
*)errhp,":c_d_id",ADR(payP->in_paym.s_C_D_ID),SIZ(int),
        SQLT_INT);
  OCIBNDPL(pctx->curp1, pctx->c_id_bp[1], (OCIError
*)errhp,":c_id",ADR(payP->out_paym.s_C_ID),SIZ(int),
        SQLT_INT, &pctx->c_id_len);
#ifdef USE_IEEE_NUMBER
  OCIBNDPL(pctx->curp1, pctx->h_amount_bp[1], (OCIError
*)errhp,":h_amount",ADR(payP->in_paym.s_H_AMOUNT),
        SIZ(float),SQLT_FLT, &pctx->h_amount_len);
#else
  OCIBNDPL(pctx->curp1, pctx->h_amount_bp[1], (OCIError
*)errhp,":h_amount",ADR(payP->in_paym.s_H_AMOUNT),
        SIZ(int),SQLT_FLT, &pctx->h_amount_len);
#endif
  OCIBND(pctx->curp1, pctx->c_last_bp[1], (OCIError
*)errhp,":c_last",payP->in_paym.s_C_LAST,SIZ(payP-
>in_paym.s_C_LAST),
        SQLT_STR);
  OCIBNDPL(pctx->curp1, pctx->w_street_1_bp[1], (OCIError
*)errhp,":w_street_1",payP->out_paym.s_W_STREET_1,
     SIZ(payP->out_paym.s_W_STREET_1),SQLT_STR, &pctx-
>w_street_1_len);
  OCIBNDPL(pctx->curp1, pctx->w_street_2_bp[1], (OCIError
*)errhp,":w_street_2",payP->out_paym.s_W_STREET_2,
     SIZ(payP->out_paym.s_W_STREET_2),SQLT_STR, &pctx-
>w_street_2_len);
  OCIBNDPL(pctx->curp1, pctx->w_city_bp[1], (OCIError
*)errhp,":w_city",payP->out_paym.s_W_CITY,SIZ(payP-
>out_paym.s_W_CITY),
        SQLT_STR, &pctx->w_city_len);
  OCIBNDPL(pctx->curp1, pctx->w_state_bp[1], (OCIError
*)errhp,":w_state",payP->out_paym.s_W_STATE,
     SIZ(payP->out_paym.s_W_STATE), SQLT_STR, &pctx-
>w_state_len);
  OCIBNDPL(pctx->curp1, pctx->w_zip_bp[1], (OCIError
*)errhp,":w_zip",payP->out_paym.s_W_ZIP,SIZ(payP-
>out_paym.s_W_ZIP),
        SQLT_STR, &pctx->w_zip_len);
  OCIBNDPL(pctx->curp1, pctx->d_street_1_bp[1], (OCIError
*)errhp,":d_street_1",payP->out_paym.s_D_STREET_1,
     SIZ(payP->out_paym.s_D_STREET_1),SQLT_STR, &pctx-
>d_street_1_len);
  OCIBNDPL(pctx->curp1, pctx->d_street_2_bp[1], (OCIError
*)errhp,":d_street_2",payP->out_paym.s_D_STREET_2,
     SIZ(payP->out_paym.s_D_STREET_2),SQLT_STR, &pctx-
>d_street_2_len);
  OCIBNDPL(pctx->curp1, pctx->d_city_bp[1], (OCIError
*)errhp,":d_city",payP->out_paym.s_D_CITY,SIZ(payP-
>out_paym.s_D_CITY),
        SQLT_STR, &pctx->d_city_len);
  OCIBNDPL(pctx->curp1, pctx->d_state_bp[1], (OCIError
*)errhp,":d_state",payP->out_paym.s_D_STATE,
        SIZ(payP->out_paym.s_D_STATE), SQLT_STR, &pctx-
>d_state_len);
  OCIBNDPL(pctx->curp1, pctx->d_zip_bp[1], (OCIError
*)errhp,":d_zip",payP->out_paym.s_D_ZIP,SIZ(payP-
>out_paym.s_D_ZIP),
        SQLT_STR, &pctx->d_zip_len);
  OCIBNDPL(pctx->curp1, pctx->c_first_bp[1], (OCIError
*)errhp,":c_first",payP->out_paym.s_C_FIRST,
     SIZ(payP->out_paym.s_C_FIRST), SQLT_STR, &pctx-
>c_first_len);
  OCIBNDPL(pctx->curp1, pctx->c_middle_bp[1], (OCIError
*)errhp,":c_middle",payP->out_paym.s_C_MIDDLE,2,
        SQLT_AFC, &pctx->c_middle_len);

  OCIBNDPL(pctx->curp1, pctx->c_street_1_bp[1], (OCIError
*)errhp,":c_street_1",payP->out_paym.s_C_STREET_1,
     SIZ(payP->out_paym.s_C_STREET_1),SQLT_STR, &pctx-
>c_street_1_len);
  OCIBNDPL(pctx->curp1, pctx->c_street_2_bp[1], (OCIError
*)errhp,":c_street_2",payP->out_paym.s_C_STREET_2,
     SIZ(payP->out_paym.s_C_STREET_2),SQLT_STR, &pctx-
>c_street_2_len);
  OCIBNDPL(pctx->curp1, pctx->c_city_bp[1], (OCIError
*)errhp,":c_city",payP->out_paym.s_C_CITY,
     SIZ(payP->out_paym.s_C_CITY),SQLT_STR, &pctx-
>c_city_len);
  OCIBNDPL(pctx->curp1, pctx->c_state_bp[1], (OCIError
*)errhp,":c_state",payP->out_paym.s_C_STATE,
     SIZ(payP->out_paym.s_C_STATE), SQLT_STR, &pctx-
>c_state_len);
  OCIBNDPL(pctx->curp1, pctx->c_zip_bp[1], (OCIError
*)errhp,":c_zip",payP->out_paym.s_C_ZIP,SIZ(payP-
>out_paym.s_C_ZIP),
        SQLT_STR, &pctx->c_zip_len);
  OCIBNDPL(pctx->curp1, pctx->c_phone_bp[1], (OCIError
*)errhp,":c_phone",payP->out_paym.s_C_PHONE,
     SIZ(payP->out_paym.s_C_PHONE), SQLT_STR, &pctx-
>c_phone_len);
  OCIBNDPL(pctx->curp1, pctx->c_since_bp[1], (OCIError
*)errhp,":c_since",&payP->out_paym.c_since,
        SIZ(OCIDate), SQLT_ODT, &pctx->c_since_len);
  OCIBNDPL(pctx->curp1, pctx->c_credit_bp[1], (OCIError
*)errhp,":c_credit",payP->out_paym.s_C_CREDIT,
        SIZ(payP->out_paym.s_C_CREDIT),SQLT_CHR, &pctx-
>c_credit_len);
  OCIBNDPL(pctx->curp1, pctx->c_credit_lim_bp[1], (OCIError
*)errhp,":c_credit_lim",
        ADR(payP->out_paym.s_C_CREDIT_LIM),SIZ(int),
SQLT_INT, &pctx->c_credit_lim_len);
  OCIBNDPL(pctx->curp1, pctx->c_discount_bp[1], (OCIError
*)errhp,":c_discount",
        ADR(payP->out_paym.s_C_DISCOUNT),SIZ(double),
SQLT_FLT, &pctx->c_discount_len);
#ifdef USE_IEEE_NUMBER
  OCIBNDPL(pctx->curp1, pctx->c_balance_bp[1], (OCIError
*)errhp,":c_balance",
        ADR(payP->out_paym.s_C_BALANCE),
SIZ(double),SQLT_BDOUBLE, &pctx->c_balance_len);
#else
  OCIBNDPL(pctx->curp1, pctx->c_balance_bp[1], (OCIError
*)errhp,":c_balance",
     ADR(payP->out_paym.s_C_BALANCE),
SIZ(double),SQLT_FLT, &pctx->c_balance_len);
#endif
  OCIBNDPL(pctx->curp1, pctx->c_data_bp[1], (OCIError
*)errhp,":c_data",payP->out_paym.s_C_DATA,SIZ(payP-
>out_paym.s_C_DATA),
        SQLT_STR, &pctx->c_data_len);
  OCIBNDPL(pctx->curp1, pctx->retries_bp[1], (OCIError
*)errhp,":retry",ADR(payP->out_paym.retry),
```

```
        SIZ(int), SQLT_INT, &pctx->retries_len);
  OCIBNDPL(pctx->curp1, pctx->cr_date_bp[1], (OCIError
*)errhp,":cr_date",ADR(payP->in_paym.cr_date),
        SIZ(OCIDate),SQLT_ODT, &pctx->cr_date_len);
  oralogprintf(ora_SlotDataP->server_logtrans,"<<tkvcpinit\n");
  return (0);

}


tkvcp (ora_cn_data_t *ora_SlotDataP)

{
  FILE *server_logtrans = ora_SlotDataP->server_logtrans;

 /*  */
 payctx *pctx = (payctx *)ora_SlotDataP->pctx;
 paym_wrapper *payP = &ora_SlotDataP->payP;
 OCIEnv *tpcenv = ora_SlotDataP->tpcenv;
 OCIServer *tpcsrv = ora_SlotDataP->tpcsrv;
 dvoid *errhp = ora_SlotDataP->errhp;
 OCISvcCtx *tpcsvc = ora_SlotDataP->tpcsvc;
 OCISession *tpcusr = ora_SlotDataP->tpcusr;
 OCIStmt *curi = ora_SlotDataP->curi;

retry:
 pctx->w_id_len = SIZ(payP->in_paym.s_W_ID);
 pctx->d_id_len = SIZ(payP->in_paym.s_D_ID);
 pctx->c_w_id_len = 0;
 pctx->c_d_id_len = 0;
 pctx->c_id_len = 0;
 pctx->h_amount_len = SIZ(payP->in_paym.s_H_AMOUNT);
 pctx->c_last_len = SIZ(payP->in_paym.s_C_LAST);
 pctx->w_street_1_len = 0;
 pctx->w_street_2_len = 0;
 pctx->w_city_len = 0;
 pctx->w_state_len = 0;
 pctx->w_zip_len = 0;
 pctx->d_street_1_len = 0;
 pctx->d_street_2_len = 0;
 pctx->d_city_len = 0;
 pctx->d_state_len = 0;
 pctx->d_zip_len = 0;
 pctx->c_first_len = 0;
 pctx->c_middle_len = 0;
 pctx->c_street_1_len = 0;
 pctx->c_street_2_len = 0;
 pctx->c_city_len = 0;
 pctx->c_state_len = 0;
 pctx->c_zip_len = 0;
 pctx->c_phone_len = 0;
 pctx->c_since_len = 7;
 pctx->c_credit_len = 0;
 pctx->c_credit_lim_len = 0;
 pctx->c_discount_len = 0;
 pctx->c_balance_len = sizeof(double);
 pctx->c_data_len = 0;
 pctx->h_date_len = 0;
 pctx->retries_len = SIZ(payP->out_paym.retry);
 pctx->cr_date_len = 7;

 if(payP->in_paym.bylastname) {
   payP->out_paym.terror=OCIStmtExecute(tpcsvc,pctx-
>curp1,(OCIError *)errhp,1,0,
          NULLP(CONST OCISnapshot),NULLP(OCISnapshot),
          OCI_DEFAULT|OCI_COMMIT_ON_SUCCESS);
 } else {
   payP->out_paym.terror=OCIStmtExecute(tpcsvc,pctx-
>curp0,(OCIError *)errhp,1,0,
          NULLP(CONST OCISnapshot),NULLP(OCISnapshot),
          OCI_DEFAULT|OCI_COMMIT_ON_SUCCESS);
 }
 if(payP->out_paym.terror != OCI_SUCCESS) {
   oralogprintf(ora_SlotDataP->server_logtrans,"payP-
>out_paym.terror = %d\n",payP->out_paym.terror);
   OCITransRollback(tpcsvc,(OCIError *)errhp,OCI_DEFAULT);
   payP->out_paym.terror = OCIERROR(errhp,payP-
>out_paym.terror);
   oralogprintf(ora_SlotDataP->server_logtrans,"payP-
>out_paym.terror = %d\n",payP->out_paym.terror);
   if(payP->out_paym.terror == NOT_SERIALIZABLE) {
      payP->out_paym.retry++;
      goto retry;
   } else if (payP->out_paym.terror == RECOVERR) {
      payP->out_paym.retry++;
      goto retry;
   } else if (payP->out_paym.terror == SNAPSHOT_TOO_OLD) {
      payP->out_paym.retry++;
      goto retry;
    } else {
      return -1;
    }
  }
  return 0;
}



void tkvcpdone (ora_cn_data_t *ora_SlotDataP)

{
 if(ora_SlotDataP->pctx) {
   free(ora_SlotDataP->pctx);
   ora_SlotDataP->pctx = NULL;
 }
}
```

plsto.cpp

```
#include "../../tpccisapi/tpcc.h"
#include "plora.h"
#include "ora_tpcc.h"

extern void oralogprintf(FILE *,char *format, ...);

#ifdef PLSQLSTO
#define SQLTXT "BEGIN stocklevel.getstocklevel
(:w_id, :d_id, :threshold, \
  :low_stock); END;"
#else
#define SQLTXT "SELECT /*+ nocache (stok) */ count (DISTINCT
s_i_id) \
         FROM ordl, stok, dist \
         WHERE d_id = :d_id AND d_w_id = :w_id AND \
              d_id = ol_d_id AND d_w_id = ol_w_id AND \
              ol_i_id = s_i_id AND ol_w_id = s_w_id AND \
              s_quantity < :threshold AND \
              ol_o_id BETWEEN (d_next_o_id - 20) AND (d_next_o_id
- 1) \
       order by ol_o_id desc"
#endif

struct stoctx {
 OCIStmt *curs;
 OCIBind *w_id_bp;
 OCIBind *d_id_bp;
 OCIBind *threshold_bp;
#ifdef PLSQLSTO
 OCIBind *low_stock_bp;
#else
 OCIDefine *low_stock_bp;
#endif
```

```
  int norow;
};

typedef struct stoctx stoctx;

tkvcsinit (ora_cn_data_t *ora_SlotDataP)

{
   FILE *server_logtrans = ora_SlotDataP->server_logtrans;

   /*  */
   stoctx *sctx;
   stok_wrapper *stoP;
   OCIEnv *tpcenv = ora_SlotDataP->tpcenv;
   OCIServer *tpcsrv = ora_SlotDataP->tpcsrv;
   dvoid *errhp = ora_SlotDataP->errhp;
   OCISvcCtx *tpcsvc = ora_SlotDataP->tpcsvc;
   OCISession *tpcusr = ora_SlotDataP->tpcusr;
   OCIStmt *curi = ora_SlotDataP->curi;

   text stmbuf[SQL_BUF_SIZE];
   sctx = (stoctx *)malloc(sizeof(stoctx));
   memset(sctx,(char)0,sizeof(stoctx));
   ora_SlotDataP->sctx = (void *)sctx;

   memset(&ora_SlotDataP->stoP,(char)0,sizeof(stok_wrapper));
   stoP = &ora_SlotDataP->stoP;

   sctx->norow=0;

   OCIERROR((OCIError *)errhp,
      OCIHandleAlloc(tpcenv,(dvoid**)&sctx-
>curs,OCI_HTYPE_STMT,0,(dvoid**)0));
   sprintf ((char *) stmbuf, SQLTXT);
   OCIERROR((OCIError *)errhp,OCIStmtPrepare(sctx-
>curs,(OCIError *)errhp,stmbuf,strlen((char *)stmbuf),
               OCI_NTV_SYNTAX,OCI_DEFAULT));
#ifndef PLSQLSTO
   OCIERROR((OCIError *)errhp,
      OCIAttrSet(sctx->curs,OCI_HTYPE_STMT,(dvoid*)&sctx-
>norow,0,
               OCI_ATTR_PREFETCH_ROWS,(OCIError *)errhp));
#endif

   /* bind variables */

   OCIBND(sctx->curs,sctx->w_id_bp,(OCIError *)errhp, ":w_id",
ADR(stoP->in_stok.s_W_ID),sizeof(int),
         SQLT_INT);
   OCIBND(sctx->curs,sctx->d_id_bp,(OCIError *)errhp, ":d_id",
ADR(stoP->in_stok.s_D_ID),sizeof(int),
      SQLT_INT);
#ifdef USE_IEEE_NUMBER
   OCIBND(sctx->curs,sctx->threshold_bp,(OCIError *)errhp,
":threshold", ADR(stoP->in_stok.s_threshold),
      sizeof(float),SQLT_FLT);
#else
   OCIBND(sctx->curs,sctx->threshold_bp,(OCIError *)errhp,
":threshold", ADR(stoP->in_stok.s_threshold),
      sizeof(int),SQLT_INT);
#endif
#ifdef PLSQLSTO
   OCIBND(sctx->curs,sctx->low_stock_bp,(OCIError
*)errhp,":low_stock" , ADR(stoP->out_stok.s_low_stock),
      sizeof(int), SQLT_INT);
#else
   OCIDEFINE(sctx->curs,sctx->low_stock_bp,(OCIError *)errhp, 1,
ADR(stoP->out_stok.s_low_stock),
      sizeof(int), SQLT_INT);
#endif

   return (0);
}

tkvcs (ora_cn_data_t *ora_SlotDataP)
{
   FILE *server_logtrans = ora_SlotDataP->server_logtrans;
   stoctx *sctx = (stoctx *)ora_SlotDataP->sctx;
   stok_wrapper *stoP = &ora_SlotDataP->stoP;
   OCIEnv *tpcenv = ora_SlotDataP->tpcenv;
   OCIServer *tpcsrv = ora_SlotDataP->tpcsrv;
   dvoid *errhp = ora_SlotDataP->errhp;
   OCISvcCtx *tpcsvc = ora_SlotDataP->tpcsvc;
   OCISession *tpcusr = ora_SlotDataP->tpcusr;
   OCIStmt *curi = ora_SlotDataP->curi;

retry:
   stoP->out_stok.terror= OCIStmtExecute(tpcsvc,sctx-
>curs,(OCIError *)errhp,1,0,0,0,
      OCI_COMMIT_ON_SUCCESS | OCI_DEFAULT);
   if (stoP->out_stok.terror != OCI_SUCCESS)
   {
      stoP->out_stok.terror=OCIERROR((OCIError *)errhp,stoP-
>out_stok.terror);
      OCITransRollback(tpcsvc,(OCIError *)errhp,OCI_DEFAULT);
      if((stoP->out_stok.terror == NOT_SERIALIZABLE) || (stoP-
>out_stok.terror == RECOVERR)
         || (stoP->out_stok.terror == SNAPSHOT_TOO_OLD))
      {
         stoP->out_stok.retry++;
         goto retry;
      } else {
         return -1;
      }
   }

   return (0);
}


void tkvcsdone (ora_cn_data_t *ora_SlotDataP)

{
  /*  */
  stoctx *sctx = (stoctx *)ora_SlotDataP->sctx;
  if (sctx) {
    free(sctx);
    ora_SlotDataP->sctx = NULL;
  }

}
```

stdafx.cpp

```
// stdafx.cpp : source file that includes just the standard includes
// tpccOracleGlue.pch will be the pre-compiled header
// stdafx.obj will contain the pre-compiled type information

#include "stdafx.h"

// TODO: reference any additional headers you need in STDAFX.H
// and not in this file
```

tpccOracleGlue.cpp

```
// tpccOracleGlue.cpp : Defines the entry point for the DLL
application.
//

#include "stdafx.h"
#include "../tpccCom/tpccCom.h"
#include "../tpccCom/tpccCom_i.c"
```

```
#include "tpccOracleGlue.h"
#include <time.h>
#include <winsock.h>
#include "../tpccisapi/tpccisapi.hpp"

CRITICAL_SECTION debugMutex;
CRITICAL_SECTION errorMutex;
char OracleHome[256];

int loc_count = 0;
CRITICAL_SECTION crit_sec;

#define INVALID_ITEM 100

#ifdef _DEBUG
  int debugFlag = 1;
#else
  int debugFlag = 0;
#endif

  void print_time_prefix(FILE *file)
{
   time_t cur_timet;
   char time_str[30];

   cur_timet = time(&cur_timet);
   strftime(time_str, 29, "%X", localtime(&cur_timet));

   fprintf(file, "%s - ",
          time_str);
}

char *get_time_prefix(char *buffer)
{
   time_t cur_timet;
   char time_str[30];
   int len;

   cur_timet = time(&cur_timet);
   strftime(time_str, 29, "%X", localtime(&cur_timet));

   len = sprintf(buffer, "%s - ",
              time_str);
   if (len >= TIME_PREFIX_LEN) {
     fprintf(stderr, "TIME_PREFIX_LEN (%d) too small: %d\n",
            TIME_PREFIX_LEN, len);
     exit(12);
   }
   return(buffer);
}

void oralogprintf(FILE* server_logtrans,char *format, ...)
{
   char formatBuffer[200];
   char *fmt = formatBuffer;
   int fmtLen;
   va_list ap;
   va_start(ap, format);

   fmtLen = TIME_PREFIX_LEN + (int)strlen(format) + 2;
   if (fmtLen > sizeof(formatBuffer)) {
      fmt = (char *)malloc(fmtLen);
   }
   get_time_prefix(fmt);
   strcat(fmt, format);
  if (server_logtrans) {
      vfprintf(server_logtrans, fmt, ap);
      fflush(server_logtrans);
   } else {
      vfprintf(stderr, fmt, ap);
   }
   if (fmt != formatBuffer) free(fmt);
   va_end(ap);
}

/*
 * gettimeofday is not available in the Microsoft C/C++ Run Time
 * and the Win32 API.
 */

/*
 * It is not used and just for unix compatibility.
 */
struct timezone {
       char a;
};

void get_time_init();

int gettimeofday(struct timeval *curTimeP, struct timezone
*timezoneP);

#define Li2Double(x) ((double)((x).HighPart) * 4.294967296E9 +
(double)((x).LowPart))

LARGE_INTEGER pFreq;
double sFreq;

void get_time_init()
{
    QueryPerformanceFrequency(&pFreq);
    sFreq=Li2Double(pFreq);
}

void get_local_time(struct timeval *timeP)
{
   double cur_t;
   LARGE_INTEGER counter;

   QueryPerformanceCounter(&counter);
   cur_t = Li2Double(counter) / sFreq;
   timeP->tv_sec = (long)cur_t;
   timeP->tv_usec = ((long)cur_t - timeP->tv_sec) * 1000000;
}

int gettimeofday(struct timeval *curTimeP, struct timezone
*timezoneP)
{
   get_local_time(curTimeP);
   return 1;
}

BOOL APIENTRY DllMain( HANDLE hModule,
                  DWORD  ul_reason_for_call,
                  LPVOID lpReserved
              )
{
  switch (ul_reason_for_call)
  {
  case DLL_PROCESS_ATTACH:
     loc_count = 0;
     InitializeCriticalSection(&crit_sec);


  if(RegOpenKeyEx(HKEY_LOCAL_MACHINE,REGISTERY_SUB_
KEY,0,KEY_READ,&registeryKey) == ERROR_SUCCESS)
     {
        regValueSize = 256;
        if
(RegQueryValueEx(registeryKey,"OracleHome",0,&regType,(BYTE
*)&value,&regValueSize) == ERROR_SUCCESS) {
           strcpy(OracleHome,value);
        }
        regValueSize = sizeof(value);
```

```
        if
(RegQueryValueEx(registeryKey,"dbUserName",0,&regType,(BYTE
*) &value,&regValueSize)== ERROR_SUCCESS )
            strcpy(userName,value);
        else
            return ERR_INVALID_USERNAME;

        regValueSize = sizeof(value);
        if
(RegQueryValueEx(registeryKey,"dbPassword",0,&regType,(BYTE *)
&value,&regValueSize)== ERROR_SUCCESS )
            strcpy(userPassword,value);
        else
            return ERR_INVALID_PASSWORD;
      }
      else
      {
        return ERR_INVALID_REGISTERY_KEY;
      }
      break;
   case DLL_THREAD_ATTACH:
   case DLL_THREAD_DETACH:
   case DLL_PROCESS_DETACH:
      break;
   }
    return TRUE;
}

extern "C" TPCCORACLEGLUE_API int connect_db(char
*dbName,void **ctx)
{
   FILE    *server_logtrans;

   InitializeCriticalSection(&crit_sec);
   LeaveCriticalSection(&crit_sec);

   server_logtrans =
fopen("C:\\inetpub\\wwwroot\\tpcc\\my_debug_gluecode.txt", "w+");
   oralogprintf(server_logtrans,"Opening logfile\n");
   fflush(server_logtrans);
   fclose(server_logtrans);

// Sleep(30000);
   *ctx = (void *)get_db_ready((ora_cn_data_t *)*ctx, userName,
userPassword, dbName);
// char buf[256];
// sprintf(buf,"context handler %0X\n",(long long)*ctx);
// oralogprintf(server_logtrans,buf);
   ora_cn_data_t *curP = (ora_cn_data_t *)ctx;
   if (ctx == NULL)
   {
      oralogprintf(curP->server_logtrans,"Object get_db_ready()
failed\n");

      return ERR_SAVING_CONTEXT;
   }
   return OK;
}

extern "C" TPCCORACLEGLUE_API int disconnect_db(void *ctx)
{
   ora_cn_data_t *curP = (ora_cn_data_t *)ctx;
   clean_connection(curP->server_logtrans, ctx);
   return OK;
}

extern "C" TPCCORACLEGLUE_API int do_nord(nord_wrapper
*nord,void *ctx)
{
   ora_cn_data_t *curP = (ora_cn_data_t *)ctx;
   static int numCalls = 0;
```

```
   memcpy(&curP->globals,nord,sizeof(nord_wrapper));
   int rc = TPCnew((void *)curP);
   if (rc != 0 && rc != INVALID_ITEM)
   {
      int i;
      oralogprintf(curP->server_logtrans,"Error TPCnew : terror %d, rc
%d, retry %d, w_id %d, d_id %d, c_id %d, o_ol_cnt %d (out cnt
%d)\n",
         curP->globals.out_nord.terror, rc, curP->globals.out_nord.retry,
         curP->globals.in_nord.s_W_ID, curP->globals.in_nord.s_D_ID,
          curP->globals.in_nord.s_C_ID, curP-
>globals.in_nord.s_O_OL_CNT, curP-
>globals.out_nord.s_O_OL_CNT);
      for (i=0; i<15; i++)
      {
         oralogprintf(curP->server_logtrans,"ol_i_id %d,
ol_supply_w_id %d, ol_quantity %d\n",
            curP->globals.in_nord.s_OL_I_ID[i], curP-
>globals.in_nord.s_OL_SUPPLY_W_ID[i],
            curP->globals.in_nord.s_OL_QUANTITY[i]);
      }
   }
   memcpy(nord,&curP->globals,sizeof(nord_wrapper));
   nord->out_nord.s_transtatus = rc == 0 ? TPCC_SUCCESS : curP-
>globals.out_nord.terror;
   if (++numCalls % 10000 == 0) {
       oralogprintf(curP->server_logtrans,"doNewOrder so far %d\n",
numCalls);
    }

   return OK;
}

extern "C" TPCCORACLEGLUE_API int do_pymt(paym_wrapper
*pymt,void *ctx)
{
   ora_cn_data_t *curP = (ora_cn_data_t *)ctx;
   static int numCalls = 0;

   pymt->in_paym.bylastname = ((pymt->in_paym.s_C_ID == 0) ? 1 :
0);
   memcpy(&curP->payP,pymt,sizeof(paym_wrapper));

   int rc = TPCpay((void *)curP);
   if (rc != 0)
   {
      oralogprintf(curP->server_logtrans,"Error TPCpay: terror %d, rc
%d, retry %d, w_id %d, D_id %d, C_w_id %d, c_id %d, bylastname
%d, amount %.2f\n",
         curP->payP.out_paym.terror, rc, curP->payP.out_paym.retry,
         curP->payP.in_paym.s_W_ID,
         curP->payP.in_paym.s_D_ID,
         curP->payP.in_paym.s_C_W_ID,
         curP->payP.in_paym.s_C_ID,
         curP->payP.in_paym.bylastname,
         curP->payP.in_paym.s_H_AMOUNT);
   }
   memcpy(pymt,&curP->payP,sizeof(paym_wrapper));
   pymt->out_paym.s_transtatus = rc == 0 ? TPCC_SUCCESS :
curP->payP.out_paym.terror;
   if (++numCalls % 10000 == 0) {
       oralogprintf(curP->server_logtrans,"doPayment so far %d\n",
numCalls);
    }

   return OK;
}
extern "C"  TPCCORACLEGLUE_API int do_ords(ords_wrapper
*ords,void *ctx)
{
   ora_cn_data_t *curP = (ora_cn_data_t *)ctx;
   static int numCalls = 0;
```

```
   // oralogprintf(curP->server_logtrans,"OrderStatus, I'm tid
%d\n",ThreadNum);
   ords->in_ords.bylastname = ((ords->in_ords.s_C_ID == 0) ? 1 : 0);
   memcpy(&curP->ordP,ords,sizeof(ords_wrapper));
   int rc = TPCord((void *)curP);
   if (rc != 0)
   {
      oralogprintf(curP->server_logtrans,"Error TPCord: terror %d, rc
%d, retry %d, w_id %d, d_id %d,c_id %d, bylastname %d, c_last
%s\n ",
         curP->ordP.out_ords.terror, rc, curP->ordP.out_ords.retry,
         curP->ordP.in_ords.s_W_ID, curP->ordP.in_ords.s_D_ID,
curP->ordP.in_ords.s_C_ID,
         curP->ordP.in_ords.bylastname, curP-
>ordP.in_ords.s_C_LAST);
   }
   memcpy(ords,&curP->ordP,sizeof(ords_wrapper));
   ords->out_ords.s_transtatus = rc == 0 ? TPCC_SUCCESS : curP-
>ordP.out_ords.terror;
   if (++numCalls % 10000 == 0) {
       oralogprintf(curP->server_logtrans,"doOrderStatus so far %d\n",
numCalls);
    }

   return OK;
}


extern "C" TPCCORACLEGLUE_API int do_dlvy(dlvy_wrapper
*dlvy,void *ctx)
{
   ora_cn_data_t *curP = (ora_cn_data_t *)ctx;
   dlvy_wrapper *delP=&(curP->delP);
   FILE *server_logtrans = curP->server_logtrans;
   dvoid *errhp = curP->errhp;
   int rc;
   static int numCalls = 0;

   memcpy(&curP->delP,dlvy,sizeof(dlvy_wrapper));
   delP->out_dlvy.retry = 0;
   delP->in_dlvy.plsqlflag = 1;

   OCIERROR(errhp,OCIDateSysDate((OCIError *)errhp,&delP-
>in_dlvy.cr_date));

   if (rc = tkvcd (curP)) {
      if(delP->out_dlvy.terror == DEL_ERROR)
         return DEL_ERROR;
      return (-1);
   }
   memcpy(dlvy,&curP->delP,sizeof(dlvy_wrapper));
   dlvy->out_dlvy.s_transtatus = rc == 0 ? TPCC_SUCCESS : delP-
>out_dlvy.terror;
   if (++numCalls % 10000 == 0) {
      oralogprintf(curP->server_logtrans,"doOrderStatus so far %d\n",
numCalls);
   }

   return OK;
}

extern "C" TPCCORACLEGLUE_API int do_stok(stok_wrapper
*stok,void *ctx)
{
   ora_cn_data_t *curP = (ora_cn_data_t *)ctx;
   static int numCalls = 0;
   FILE *server_logtrans = curP->server_logtrans;
   memcpy(&curP->stoP,stok,sizeof(stok_wrapper));
   // oralogprintf(curP->server_logtrans,"StockLevel, I'm tid
%d\n",ThreadNum);
   //call stock level txn
   int rc = TPCsto((void *)curP);
   if ( rc != 0 ) {
      oralogprintf(curP->server_logtrans,"Error TPCsto : terror %d, rc
%d, retry %d, w_id %d, d_id %d, threshold %d\n",
         curP->stoP.out_stok.terror, rc, curP->stoP.out_stok.retry,
         curP->stoP.in_stok.s_W_ID, curP->stoP.in_stok.s_D_ID,
         curP->stoP.in_stok.s_threshold);
   }
   memcpy(stok,&curP->stoP,sizeof(stok_wrapper));
   stok->out_stok.s_transtatus = rc == 0 ? TPCC_SUCCESS : curP-
>stoP.out_stok.terror;
   if (++numCalls % 10000 == 0) {
       oralogprintf(curP->server_logtrans,"doStockLevel so far %d\n",
numCalls);
    }

   return OK;
}
```

ora_tpcc.h

```
/*
 * $Header: tpcc.h 7030100.1 95/07/19 15:10:55 plai Generic<base>
$ Copyr (c) 1993 Oracle
 */
/*==================================================
================+
 |        Copyright (c) 1995  Oracle Corp, Redwood Shores, CA      |
 |                 OPEN SYSTEMS PERFORMANCE GROUP
|
 |                      All Rights Reserved                       |

+==================================================
===============+
 | FILENAME
 |    tpcc.h
 | DESCRIPTION
 |    Include file for TPC-C benchmark programs.

+==================================================
===============*/

#ifndef TPCC_H
#define TPCC_H


#ifndef FALSE
# define FALSE 0
#endif

#ifndef TRUE
# define TRUE 1
#endif

#include <stdio.h>
#include <stdlib.h>
#include <ctype.h>
#include <string.h>

#ifndef boolean
#define boolean int
#endif

#include <tpccflags.h>

#include <oratypes.h>
#include <oci.h>
#include <ocidfn.h>
/*
#ifdef __STDC__
```

```
#include "ociapr.h"
#else
#include "ocikpr.h"
#endif
*/

typedef struct cda_def csrdef;
typedef struct cda_def ldadef;

typedef __int16 int16_t;
typedef __int32 int32_t;
typedef __int64 int64_t;


/* TPC-C transaction functions */

extern int TPCinit ();
extern int TPCnew ();
extern int TPCpay ();
extern int TPCord ();
extern int TPCdel ();
extern int TPCsto ();
extern void TPCexit ();
extern int TPCdumpinit ();
extern void TPCdumpnew ();
extern void TPCdumppay ();
extern void TPCdumpord ();
extern void TPCdumpdel ();
extern void TPCdumpsto ();
extern void TPCdumpexit ();
extern void userlog(char* fmtp, ...);


/* Error codes */

#define RECOVERR -10
#define IRRECERR -20
#define NOERR    111
#define DEL_ERROR -666
#define DEL_DATE_LEN 7
#define NDISTS 10
#define NITEMS 15
#define SQL_BUF_SIZE 8192

#define FULLDATE "dd-mon-yy.hh24:mi:ss"
#define SHORTDATE "dd-mm-yyyy"

#define DELRT 80.0


extern int tkvcss (); /* for alter session to get memory size and trace
*/
extern boolean multitranx;
extern int ord_init;


extern void errrpt ();
extern int ocierror(FILE *server_logtrans,char *fname, int
lineno,dvoid *errhp, sword status);
//extern int sqlfile(char *fname, text *linebuf);

extern FILE *lfp;
//extern FILE *fopen ();
extern int proc_no;
extern int doid[];

/* Miscellaneous */

#ifndef DISCARD
# define DISCARD (void)
#endif
```

```
#ifndef sword
# define sword int
#endif

#define VER7           2

#define NA             -1      /* ANSI SQL NULL */
#define NLT             1       /* length for string null terminator */
#define DEADLOCK        60      /* ORA-00060: deadlock */
#define NO_DATA_FOUND   1403    /* ORA-01403: no data found
*/
#define NOT_SERIALIZABLE  8177  /* ORA-08177: transaction not
serializable */
#define SNAPSHOT_TOO_OLD  1555  /* ORA-01555: snapshot too
old */

#ifndef NULLP
# define NULLP(x)  (x  *)NULL
#endif /* NULLP */

#define ADR(object) ((ub1 *)&(object))
#define SIZ(object) ((sword)sizeof(object))

typedef char date[24+NLT];
typedef char varchar2;

#define min(x,y)  (((x) < (y)) ? (x) : (y))

#define OCIERROR(errp,function)\
       ocierror(server_logtrans,__FILE__,__LINE__,(dvoid
*)(errp),(function));

#define OCIBND(stmp, bndp, errp, sqlvar, progv, progvl, ftype)\
      ocierror(server_logtrans,__FILE__,__LINE__,(errp), \

OCIHandleAlloc((stmp),(dvoid**)&(bndp),OCI_HTYPE_BIND,0,(dvoi
d**)0)); \
      ocierror(server_logtrans,__FILE__,__LINE__, (errp), \
           OCIBindByName((stmp), &(bndp), (errp), \
          (text *)(sqlvar), strlen((sqlvar)),\
          (progv), (progvl), (ftype),0,0,0,0,0,OCI_DEFAULT));

/* bind arrays for sql */
#define
OCIBNDRA(stmp,bndp,errp,sqlvar,progv,progvl,ftype,indp,alen,arco
de) \
      DISCARD ocierror(server_logtrans,__FILE__,__LINE__,(errp), \

OCIHandleAlloc((stmp),(dvoid**)&(bndp),OCI_HTYPE_BIND,0,(dvoi
d**)0)); \
      DISCARD ocierror(server_logtrans,__FILE__,__LINE__,(errp), \
        OCIBindByName((stmp),&(bndp),(errp),(text
*)(sqlvar),strlen((sqlvar)),\

(progv),(progvl),(ftype),(indp),(alen),(arcode),0,0,OCI_DEFAULT));

/* use with callback data */
#define OCIBNDRAD(stmp,bndp,errp,sqlvar,progvl,ftype,indp,ctxp,\
              cbf_nodata,cbf_data) \
      DISCARD ocierror(server_logtrans,__FILE__,__LINE__,(errp), \

OCIHandleAlloc((stmp),(dvoid**)&(bndp),OCI_HTYPE_BIND,0,(dvoi
d**)0)); \
      DISCARD ocierror(server_logtrans,__FILE__,__LINE__,(errp), \
          OCIBindByName((stmp),&(bndp),(errp),(text *)(sqlvar), \
                     strlen((sqlvar)),0,(progvl),(ftype), \
                     indp,0,0,0,0,OCI_DATA_AT_EXEC)); \
      DISCARD ocierror(server_logtrans,__FILE__,__LINE__,(errp), \

OCIBindDynamic((bndp),(errp),(ctxp),(cbf_nodata),(ctxp),(cbf_data))
);
```

```
/* bind in/out for plsql without indicator and rcode */
#define OCIBNDPL(stmp,bndp,errp,sqlvar,progv,progvl,ftype,alen) \
   DISCARD ocierror(server_logtrans,__FILE__,__LINE__,(errp), \

OCIHandleAlloc((stmp),(dvoid**)&(bndp),OCI_HTYPE_BIND,0,(dvoid**)0)); \
   DISCARD ocierror(server_logtrans,__FILE__,__LINE__,(errp), \
     OCIBindByName((stmp),&(bndp),(errp),(CONST text *)(sqlvar), \
       (sb4)strlen((CONST char *)(sqlvar)),
(dvoid*)(progv),(progvl),(ftype),\
          NULLP(dvoid),(alen), NULLP(ub2),
0,NULLP(ub4),OCI_DEFAULT));

/* bind  in values for plsql with indicator and rcode */
#define
OCIBNDR(stmp,bndp,errp,sqlvar,progv,progvl,ftype,indp,alen,arcode) \
      DISCARD ocierror(server_logtrans,__FILE__,__LINE__,(errp), \

OCIHandleAlloc((stmp),(dvoid**)&(bndp),OCI_HTYPE_BIND,0,(dvoid**)0)); \
      DISCARD ocierror(server_logtrans,__FILE__,__LINE__,(errp), \
       OCIBindByName((stmp),&(bndp),(errp),(text
*)(sqlvar),strlen((sqlvar)),\
         (progv),(progvl),(ftype),(indp),(alen),(arcode),0,0, \
                  OCI_DEFAULT));

/* bind in/out for plsql arrays witout indicator and rcode */
#define
OCIBNDPLA(stmp,bndp,errp,sqlvar,progv,progvl,ftype,alen,ms,cu) \
      DISCARD ocierror(server_logtrans,__FILE__,__LINE__, (errp),
\

OCIHandleAlloc((stmp),(dvoid**)&(bndp),OCI_HTYPE_BIND,0,(dvoid**)0));\
      DISCARD ocierror(server_logtrans,__FILE__,__LINE__,(errp),\
        OCIBindByName((stmp),&(bndp),(errp),(CONST text *)(sqlvar),
\
           (sb4)strlen((CONST char *) (sqlvar)),(void *)(progv), \

(progvl),(ftype),NULL,(alen),NULL,(ms),(cu),OCI_DEFAULT));

/* bind in/out values for plsql with indicator and rcode */
#define
OCIBNDRAA(stmp,bndp,errp,sqlvar,progv,progvl,ftype,indp,alen,arcode,\
              ms,cu) \
      ocierror(server_logtrans,__FILE__,__LINE__, (errp), \

OCIHandleAlloc((stmp),(dvoid**)&(bndp),OCI_HTYPE_BIND,0,(dvoid**)0));\
      ocierror(server_logtrans,__FILE__,__LINE__,(errp),\
        OCIBindByName((stmp),&(bndp),(errp),(text
*)(sqlvar),strlen((sqlvar)),\

(progv),(progvl),(ftype),(indp),(alen),(arcode),(ms),(cu),OCI_DEFAULT));

#define OCIDEFINE(stmp,dfnp,errp,pos,progv,progvl,ftype)\

OCIDefineByPos((stmp),&(dfnp),(errp),(pos),(progv),(progvl),(ftype),\
          0,0,0,OCI_DEFAULT);


#define OCIDEF(stmp,dfnp,errp,pos,progv,progvl,ftype) \

OCIHandleAlloc((stmp),(dvoid**)&(dfnp),OCI_HTYPE_DEFINE,0,\
              (dvoid**)0);\
      OCIDefineByPos((stmp),&(dfnp),(errp),(pos),(progv),(progvl),\
                    (ftype),NULL,NULL,NULL,OCI_DEFAULT); \

#define
OCIDFNRA(stmp,dfnp,errp,pos,progv,progvl,ftype,indp,alen,arcode)
\

OCIHandleAlloc((stmp),(dvoid**)&(dfnp),OCI_HTYPE_DEFINE,0,\
              (dvoid**)0);\
      OCIDefineByPos((stmp),&(dfnp),(errp),(pos),(progv),\
              (progvl),(ftype),(indp),(alen),\
              (arcode),OCI_DEFAULT);

#define
OCIDFNDYN(stmp,dfnp,errp,pos,progv,progvl,ftype,indp,ctxp,cbf_data) \
      ocierror(server_logtrans,__FILE__,__LINE__,(errp), \

OCIHandleAlloc((stmp),(dvoid**)&(dfnp),OCI_HTYPE_DEFINE,0,\
              (dvoid**)0));\
      ocierror(server_logtrans,__FILE__,__LINE__,(errp), \
      OCIDefineByPos((stmp),&(dfnp),(errp),(pos),(progv),
(progvl),(ftype),\
                         (indp),NULL,NULL,
OCI_DYNAMIC_FETCH));\
      ocierror(server_logtrans,__FILE__,__LINE__,(errp), \
      OCIDefineDynamic((dfnp),(errp),(ctxp),(cbf_data)));


struct out_stocklev_struct {
   int32_t terror;
   int32_t s_low_stock;
   int32_t retry;
   int16_t  s_transtatus;
};

struct in_stocklev_struct {
   int32_t  s_threshold;
   int32_t  s_D_ID;
   int32_t    s_W_ID;
};


struct in_neword_struct {
  int32_t  s_OL_I_ID[15];
  int32_t  s_OL_SUPPLY_W_ID[15];
  int32_t  s_OL_QUANTITY[15];
  int32_t  s_C_ID;
  int32_t  s_W_ID;
  int32_t  s_D_ID;
  int32_t  s_O_OL_CNT;
  int32_t  s_all_local;
  int32_t  duplicate_items;
  OCIDate cr_date;
};

struct out_neword_struct {
  int32_t  s_I_PRICE[15];
  int32_t  s_OL_AMOUNT[15];
  int32_t  s_S_QUANTITY[15];
  char     s_I_NAME[15][25];
  char     s_brand_generic[15];
  char  s_O_ENTRY_D_time[22];
  float  s_W_TAX;
  float  s_D_TAX;
  float  s_C_DISCOUNT;
  float  s_total_amount;
  int32_t  s_O_ID;
  int32_t  s_O_OL_CNT;
  int16_t  s_transtatus;
  int16_t  deadlocks;
  int16_t  datelen;
  char     s_C_LAST[17];
  char     s_C_CREDIT[3];
  int32_t  terror;
```

```
  int32_t  status;
  int32_t  retry;
  int16_t  items_valid;
};

struct in_payment_struct {
  float  s_H_AMOUNT;
  int32_t  s_W_ID;
  int32_t  s_C_W_ID;
  int32_t  s_C_ID;
  int32_t  s_C_D_ID;
  int32_t  s_D_ID;
  char     s_C_LAST[17];
  int32_t  bylastname;
  OCIDate cr_date;
};

struct out_payment_struct {
  char  s_H_DATE_time[22];
  OCIDate c_since;
  char c_since_d[12];
  double  s_C_CREDIT_LIM;
  double  s_C_BALANCE;
  float  s_C_DISCOUNT;
  int32_t  s_C_ID;
  int16_t  s_transtatus;
  int16_t  since_len;
  int32_t  terror;
  int16_t  hlen;
  int32_t  retry;
  char     s_W_STREET_1[21];
  char     s_W_STREET_2[21];
  char     s_W_CITY[21];
  char     s_W_STATE[3];
  char     s_W_ZIP[10];
  char     s_D_STREET_1[21];
  char     s_D_STREET_2[21];
  char     s_D_CITY[21];
  char     s_D_STATE[3];
  char     s_D_ZIP[10];
  char     s_C_FIRST[17];
  char     s_C_MIDDLE[3];
  char     s_C_LAST[17];
  char     s_C_STREET_1[21];
  char     s_C_STREET_2[21];
  char     s_C_CITY[21];
  char     s_C_STATE[3];
  char     s_C_ZIP[10];
  char     s_C_PHONE[17];
  char     s_C_CREDIT[3];
  char     s_C_DATA[201];
};

struct in_ordstat_struct {
  int32_t  s_C_ID;
  int32_t  s_W_ID;
  int32_t  s_D_ID;
  int32_t  bylastname;
  char     s_C_LAST[17];
  OCIDate  cr_date;
};

struct out_ordstat_struct {
  double   s_C_BALANCE;
  char     s_O_ENTRY_D_time[22];
  int32_t  s_C_ID;
  int32_t  s_O_ID;
  int32_t  s_O_CARRIER_ID;
  int32_t  s_ol_cnt;
  int32_t  terror;
  char     s_OL_DELIVERY_D_time[15][22];
  OCIDate  s_OL_DELIVERY_D_base[15];
  int32_t  s_OL_AMOUNT[15];
  int32_t  s_OL_I_ID[15];
  int32_t  s_OL_SUPPLY_W_ID[15];
  int32_t  s_OL_QUANTITY[15];
  int32_t  ol_del_len[15];
  int16_t  s_transtatus;
  int32_t  retry;
  char     s_C_FIRST[17];
  char     s_C_MIDDLE[3];
  char     s_C_LAST[17];
};

struct in_delivery_struct {
  double  s_O_DELIVERY_D_time;
  int32_t  s_W_ID;
  int32_t  s_O_CARRIER_ID;
  int16_t  plsqlflag;
  OCIDate cr_date;
};

struct out_delivery_struct {
  int32_t  s_O_ID[10];
  int32_t  terror;
  int16_t  s_transtatus;
  int32_t  retry;
};

#endif
```

oratpcc.h

```
#ifndef ORATPCC_H
#define ORATPCC_H
   typedef struct {
      long int sec;
      long int usec;
   } time_type;
   typedef struct  {
      OCIDate cr_date;
      int  dtype;
      int  returncode;
      long int   sql_code;
      long int   isam_code;
      long int   num_rms;

      short int  stats;       /*  For instrument only */
      time_type  start_time;  /*  For Debug Purposes only  */
      time_type  end_time;    /*  For Debug Purposes only  */
   } data_header;

   struct stoinstruct {
      int w_id;
      int d_id;
#ifdef USE_IEEE_NUMBER
      float threshold;
#else
      int threshold;
#endif

   };

   struct stooutstruct {
      int terror;
      int low_stock;
      int retry;
   };

   struct stostruct {
      data_header header;
      struct stoinstruct stoin;
      struct stooutstruct stoout;
      int out_s_transtatus;
```

```
  };

  struct newinstruct {
    int w_id;
    int d_id;
    int c_id;
    int ol_i_id[15];
    int ol_supply_w_id[15];
#ifdef USE_IEEE_NUMBER
    float ol_quantity[15];
#else
    int ol_quantity[15];
#endif
  };

  struct newoutstruct {
    int terror;
    int o_id;
    int o_ol_cnt;
    char c_last[17];
    char c_credit[3];
    float c_discount;
    float w_tax;
    float d_tax;
    char o_entry_d[20];
    int datelen;
#ifdef USE_IEEE_NUMBER
    float i_price[15];
    float ol_amount[15];
    float s_quantity[15];
#else
    int i_price[15];
    int ol_amount[15];
    int s_quantity[15];
#endif
    float total_amount;
    char i_name[15][25];
    char brand_generic[15];
    int status;
    int retry;
    int o_all_local;
  };

  struct newstruct {
    data_header header;
    struct newinstruct newin;
    struct newoutstruct newout;
    int out_s_transtatus;
    int items_valid;
  };

  struct payinstruct {
    int w_id;
    int d_id;
    int c_w_id;
    int c_d_id;
    int c_id;
    int bylastname;
#ifdef USE_IEEE_NUMBER
    float h_amount;
#else
    int h_amount;
#endif
    char c_last[17];
  };

  struct payoutstruct {
    int terror;
    int hlen;
    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];
    int  c_id;
    char c_first[17];
    char c_middle[3];
    char c_last[17];
    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];
    OCIDate c_since;
    char c_since_d[11];
    int since_len;
    char c_credit[3];
    double c_credit_lim;
    float  c_discount;
    double c_balance;
    char c_data[201];
    char h_date[20];
    int retry;
  };

  struct paystruct {
    data_header header;
    struct payinstruct payin;
    struct payoutstruct payout;
    int out_s_transtatus;
  };

  struct ordinstruct {
    int w_id;
    int d_id;
    int c_id;
    int bylastname;
    char c_last[17];
  };

  struct ordoutstruct {
    int terror;
    int c_id;
    char c_last[17];
    char c_first[17];
    char c_middle[3];
    double c_balance;
    int o_id;
    OCIDate o_entry_d_base;
    OCIDate ol_d_base[15];
    char o_entry_d[20];
    int o_carrier_id;
    int o_ol_cnt;
    int ol_supply_w_id[15];
    int ol_i_id[15];
#ifdef USE_IEEE_NUMBER
    float ol_quantity[15];
    float ol_amount[15];
#else
    int ol_quantity[15];
    int ol_amount[15];
#endif
    char ol_delivery_d[15][11];
    int ol_del_len[15];
    int retry;
  };

  struct ordstruct {
```

```
      data_header header;
      struct ordinstruct ordin;
      struct ordoutstruct ordout;
      int out_s_transtatus;
   };

struct delinstruct {
   int w_id;
   int o_carrier_id;
   double qtime;
   int in_timing_int;
   int plsqlflag;
};

struct deloutstruct {
   int del_o_id[10];
   int terror;
   int retry;
};

struct delstruct {
    data_header header;
   struct delinstruct delin;
   struct deloutstruct delout;
   OCIDate cr_date;
   int out_s_transtatus;
};
```

#endif /* ORATPCC_H */ plora.h

```
/*
 * $Header: plora.h for Encina
 */
/*==================================================
================+
 |                    All Rights Reserved                    |

+==================================================
===============+
 | FILENAME
 |    plora.h
 | DESCRIPTION
 |    Include file for TPC-C benchmark programs.

+==================================================
===============*/


#ifndef TPCC_PLORA_H
#define TPCC_PLORA_H

#define serverDebug 1
//extern void logprintf(char *format, ...);
//#define DEBUGP(list) if (serverDebug) logprintf list
#define TIME_PREFIX_LEN 50
//extern FILE *server_logtrans;

#define NEWO_TRANS (1)
#define PAYMENT_TRANS (2)
#define ORDER_STAT_TRANS (3)
#define DELIVERY_TRANS (4)
#define STOCK_TRANS (5)
#define MAX_TRAN_TYPE (5)

/* Oracle handles and rest of thread specific vars(thread slot data ) */

struct ora_cn_data_t {
  OCIEnv *tpcenv;
  OCIServer *tpcsrv;
  dvoid *errhp;
  OCISvcCtx *tpcsvc;
  OCISession *tpcusr;
  OCIStmt *curi;
  dvoid *xmem;

  nord_wrapper globals;
  ords_wrapper ordP;
  stok_wrapper stoP;
  paym_wrapper payP;
  dlvy_wrapper delP;

  int tid;
  FILE* server_logtrans;

  void *nctx;
  void *pctx;
  void *octx;
  void *sctx;
  void *dctx;
  void *pldctx;
  void *actx;  /* for #ifdef DMLRETDEL */
  void *cbctx; /* for orderstatus */
};

struct thread_info
{
   ora_cn_data_t        *curP;
   FILE                 *server_logtrans;
   int                  tid;
   int                  server_null_test;
   char                 oracle_home[255];
   char                 dbName[20];
};

typedef struct ora_cn_data_t ora_cn_data_t;
extern int tkvcninit (ora_cn_data_t *ora_SlotDataP);
extern int tkvcpinit (ora_cn_data_t *ora_SlotDataP);
extern int tkvcoinit (ora_cn_data_t *ora_SlotDataP);
extern int tkvcdinit (ora_cn_data_t *ora_SlotDataP);
extern int tkvcsinit (ora_cn_data_t *ora_SlotDataP);

extern int tkvcn (ora_cn_data_t *ora_SlotDataP);
extern int tkvcp (ora_cn_data_t *ora_SlotDataP);
extern int tkvco (ora_cn_data_t *ora_SlotDataP);
extern int tkvcd (ora_cn_data_t *ora_SlotDataP);
extern int tkvcs (ora_cn_data_t *ora_SlotDataP);

extern void tkvcndone (ora_cn_data_t *ora_SlotDataP);
extern void tkvcpdone (ora_cn_data_t *ora_SlotDataP);
extern void tkvcodone (ora_cn_data_t *ora_SlotDataP);
extern void tkvcddone (ora_cn_data_t *ora_SlotDataP);
extern void tkvcsdone (ora_cn_data_t *ora_SlotDataP);

#endif /* TPCC_PLORA_H */
```

stdafx.h

```
// stdafx.h : include file for standard system include files,
// or project specific include files that are used frequently, but
// are changed infrequently
//

#pragma once


#define WIN32_LEAN_AND_MEAN     // Exclude rarely-used stuff from Windows headers
// Windows Header Files:
#include <windows.h>

// TODO: reference additional headers your program requires here
```

tpccflags.h

```
#define PLSQLNO
#define DMLRETDEL
```

tpcc_info.h

```
/*
 * $Header: tpcc_info.h 7030100.1 95/07/19 15:11:37 plai
Generic<base> $ Copyr (c) 1995 Oracle
 */
/*==================================================
================+
 |        Copyright (c) 1995  Oracle Corp, Redwood Shores, CA      |
 |                  OPEN SYSTEMS PERFORMANCE GROUP
|
 |                      All Rights Reserved                     |

+==================================================
===============+
 | FILENAME
 |    tpcc_info.h
 | DESCRIPTION
 |    Include file for TPC-C benchmark programs.

+==================================================
===============*/

#ifndef TPCC_INFO_H
#define TPCC_INFO_H

/* this set is duplicated in c_Defs.h, c_Defs.h is used for batch driver
*/
#define MENTXN    0          /* menu txn */
#define NEWTXN    1          /* new order transaction */
#define PAYTXN    2          /* payment transaction */
#define ORDTXN    3          /* order status transaction */
#define DELTXN    4          /* delivery transaction */
#define STOTXN    5          /* stock level transaction */
#define ALLTXN    6          /* for processing all txns */
#define ALLTXNNODEL 7        /* for processing all txns except
delivery */
#endif
```

tpccOracleGlue.h

```
// The following ifdef block is the standard way of creating macros
which make exporting
// from a DLL simpler. All files within this DLL are compiled with the
TPCCORACLEGLUE_EXPORTS
// symbol defined on the command line. this symbol should not be
defined on any project
// that uses this DLL. This way any other project whose source files
include this file see
// TPCCORACLEGLUE_API functions as being imported from a DLL,
whereas this DLL sees symbols
// defined with this macro as being exported.
#ifdef TPCCORACLEGLUE_EXPORTS
#define TPCCORACLEGLUE_API __declspec(dllexport)
#else
#define TPCCORACLEGLUE_API __declspec(dllimport)
#endif

#include "../tpccisapi/tpcc.h"
#include "ora10_mt/ora_tpcc.h"
#include "ora10_mt/plora.h"

//////////////////////////////////////////////////////////////////////////
// Error/Debug log file defines
//////////////////////////////////////////////////////////////////////////
ofstream debugStream;
ofstream errorStream;

//////////////////////////////////////////////////////////////////////////
// Registery Values
//////////////////////////////////////////////////////////////////////////
#define    DB_USER_NAME               "dbUserName"
#define    DB_USER_PASSWORD           "dbPassword"
#define    DB_NAME                    "dbName"

char userName[16] = {NULL};
char userPassword[16] = {NULL};

HKEY   registeryKey;
DWORD  regType;
char   value[MAX_STRING_LEN];
DWORD  regValueSize = MAX_STRING_LEN;

//////////////////////////////////////////////////////////////////////////
// Oracle Glue Function Prototypes
//////////////////////////////////////////////////////////////////////////
extern "C" TPCCORACLEGLUE_API int connect_db(char
*dbName,void **ctx);
extern "C" TPCCORACLEGLUE_API int getContext(void **ctx);
extern "C" TPCCORACLEGLUE_API int detachContext(void *ctx);
extern "C" TPCCORACLEGLUE_API int attachContext(void *ctx);
extern "C" TPCCORACLEGLUE_API int disconnect_db(void *ctx);

extern "C" TPCCORACLEGLUE_API int do_nord(nord_wrapper
*nord,void *ctx);
extern "C" TPCCORACLEGLUE_API int do_pymt(paym_wrapper
*pymt,void *ctx);
extern "C" TPCCORACLEGLUE_API int do_ords(ords_wrapper
*ords,void *ctx);
extern "C" TPCCORACLEGLUE_API int do_dlvy(dlvy_wrapper
*dlvy,void *ctx);
extern "C" TPCCORACLEGLUE_API int do_stok(stok_wrapper
*stok,void *ctx);

//////////////////////////////////////////////////////////////////////////
// Function Prototypes
//////////////////////////////////////////////////////////////////////////
extern ora_cn_data_t *get_db_ready(ora_cn_data_t *ctx, char *uid,
char *pwd, char *dbName);
extern void clean_connection(FILE* server_logtrans,void *ptr);

extern int TPCnew (void *cnP);
extern int TPCpay (void *cnP);
extern int TPCord (void *cnP);
extern int TPCsto (void *cnP);
extern int TPCdel (void *cnP);

extern CRITICAL_SECTION debugMutex;

#define TPCC_SUCCESS 0

// This class is exported from the tpccOracleGlue.dll
class TPCCORACLEGLUE_API CtpccOracleGlue {
public:
   CtpccOracleGlue(void);

   // TODO: add your methods here.
};
```

tpccpl.h

```
/*
 * $Header: tpccpl.h 7030100.1 96/04/02 18:03:35 plai
Generic<base> $ Copyr (c) 1994 Oracle
 */
/*==================================================
================+
 |        Copyright (c) 1994  Oracle Corp, Redwood Shores, CA       |
```

```
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|
 |                      All Rights Reserved                      |

+==================================================
==============+
 | FILENAME
 |    tpccpl.h
 | DESCRIPTION
 |    Header file for TPC-C transactions in PL/SQL.

+==================================================
==============*/

#ifndef TPCCPL_H
#define TPCCPL_H

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

#ifdef TUX
#define DELRT 5.0
#else
#define DELRT 80.0
#endif

extern int plnewinit ();
extern int plpayinit ();
extern int plordinit ();
extern int pldelinit ();
extern int plstoinit ();

extern int plnew ();
extern int plpay ();
extern int plord ();
extern int pldel ();
extern int plsto ();

extern void plnewdone ();
extern void plpaydone ();
extern void plorddone ();
extern void pldeldone ();
extern void plstodone ();

extern errrpt ();
extern void logerr();
extern int ocierror(FILE *server_logtrans,char *fname, int
lineno,OCIError *errhp, sword status);


extern int sqlfile(char *fname, text *linebuf);

extern void cvtdmy ( unsigned char *orady, char *outdate);
extern void cvtdmyhms (unsigned char *orady, char *outdate);

extern FILE *lfp;
extern FILE *fopen ();
extern int proc_no;
extern int doid[];
extern int execstatus;
extern int errcode;

#ifndef DISCARD
# define DISCARD (void)
#endif

#ifndef sword
# define sword int
#endif

#define VER7           2
#define NA             -1      /* ANSI SQL NULL */
#define NLT             1      /* length for string null terminator */
#define DEADLOCK        60      /* ORA-00060: deadlock */
#define NO_DATA_FOUND   1403    /* ORA-01403: no data found
*/
#define NOT_SERIALIZABLE  8177  /* ORA-08177: transaction not
serializable */
#define SNAPSHOT_TOO_OLD  1555  /* ORA-01555: snapshot too
old */


#ifndef NULLP
# define NULLP (void *)NULL
#endif /* NULLP */

#define ADR(object) ((ub1 *)&(object))
#define SIZ(object) ((sword)sizeof(object))

typedef char date[24+NLT];
typedef char varchar2;

#define OCIERROR(errp,function)\
   ocierror(FILE *server_logtrans,__FILE__,__LINE__,(void
*)(errp),(function));

#define OCIBND(stmp, bndp, errp, sqlvar, progv, progvl, ftype)\
      ocierror(FILE *server_logtrans,__FILE__,__LINE__,(errp), \

OCIHandleAlloc((stmp),(dvoid**)&(bndp),OCI_HTYPE_BIND,0,(dvoi
d**)0)); \
      ocierror(FILE *server_logtrans,__FILE__,__LINE__, (errp), \
       OCIBindByName((stmp), &(bndp), (errp), \
          (text *)(sqlvar), strlen((sqlvar)),\
          (progv), (progvl), (ftype),0,0,0,0,0,OCI_DEFAULT));

#define
OCIBNDRA(stmp,bndp,errp,sqlvar,progv,progvl,ftype,indp,alen,arco
de) \
      ocierror(FILE *server_logtrans,__FILE__,__LINE__,(errp), \

OCIHandleAlloc((stmp),(dvoid**)&(bndp),OCI_HTYPE_BIND,0,(dvoi
d**)0)); \
      ocierror(FILE *server_logtrans,__FILE__,__LINE__,(errp), \
      OCIBindByName((stmp),&(bndp),(errp),(text
*)(sqlvar),strlen((sqlvar)),\

(progv),(progvl),(ftype),(indp),(alen),(arcode),0,0,OCI_DEFAULT));
#define
OCIBNDRAD(stmp,bndp,errp,sqlvar,progvl,ftype,indp,ctxp,cbf_noda
ta,cbf_data) \
      ocierror(FILE *server_logtrans,__FILE__,__LINE__,(errp), \

OCIHandleAlloc((stmp),(dvoid**)&(bndp),OCI_HTYPE_BIND,0,(dvoi
d**)0)); \
      ocierror(FILE *server_logtrans,__FILE__,__LINE__,(errp), \
      OCIBindByName((stmp),&(bndp),(errp),(text *)(sqlvar), \
          strlen((sqlvar)),0,(progvl),(ftype), \
          indp,0,0,0,0,OCI_DATA_AT_EXEC)); \
      ocierror(FILE *server_logtrans,__FILE__,__LINE__,(errp), \

OCIBindDynamic((bndp),(errp),(ctxp),(cbf_nodata),(ctxp),(cbf_data))
);


#define
OCIBNDR(stmp,bndp,errp,sqlvar,progv,progvl,ftype,indp,alen,arcod
e) \
      ocierror(FILE *server_logtrans,__FILE__,__LINE__,(errp), \

OCIHandleAlloc((stmp),(dvoid**)&(bndp),OCI_HTYPE_BIND,0,(dvoi
d**)0)); \
      ocierror(FILE *server_logtrans,__FILE__,__LINE__,(errp), \
```

```
     OCIBindByName((stmp),&(bndp),(errp),(text
*)(sqlvar),strlen((sqlvar)),\

(progv),(progvl),(ftype),(indp),(alen),(arcode),0,0,OCI_DEFAULT));

#define
OCIBNDRAA(stmp,bndp,errp,sqlvar,progv,progvl,ftype,indp,alen,arc
ode,ms,cu) \
      ocierror(FILE *server_logtrans,__FILE__,__LINE__, (errp), \

OCIHandleAlloc((stmp),&(bndp),OCI_HTYPE_BIND,0,(dvoid**)0)); \
      ocierror(FILE *server_logtrans,__FILE__,__LINE__,(errp),\
    OCIBindByName((stmp),&(bndp),(errp),(text
*)(sqlvar),strlen((sqlvar)),\

(progv),(progvl),(ftype),(indp),(alen),(arcode),(ms),(cu),OCI_DEFAU
LT));


#define OCIDEFINE(stmp,dfnp,errp,pos,progv,progvl,ftype)\

OCIDefineByPos((stmp),&(dfnp),(errp),(pos),(progv),(progvl),(ftype),\
           0,0,0,OCI_DEFAULT);


#define OCIDEF(stmp,dfnp,errp,pos,progv,progvl,ftype) \

OCIHandleAlloc((stmp),(dvoid**)&(dfnp),OCI_HTYPE_DEFINE,0,\
               (dvoid**)0);\
      OCIDefineByPos((stmp),&(dfnp),(errp),(pos),(progv),(progvl),\
           (ftype),NULL,NULL,NULL,OCI_DEFAULT); \

#define
OCIDFNRA(stmp,dfnp,errp,pos,progv,progvl,ftype,indp,alen,arcode)
\

OCIHandleAlloc((stmp),(dvoid**)&(dfnp),OCI_HTYPE_DEFINE,0,\
               (dvoid**)0);\
      OCIDefineByPos((stmp),&(dfnp),(errp),(pos),(progv),\
               (progvl),(ftype),(indp),(alen),\
               (arcode),OCI_DEFAULT);\
/*
      OCIDefineArrayOfStruct((dfnp),(errp),(progvl),\
                  sizeof((indp)[0]),\
                  sizeof((alen)[0]),\
                  sizeof((arcode)[0]));
*/
/*
#define
OCIDFNRA(stmp,dfnp,errp,pos,progv,progvl,ftype,indp,alen,arcode)
\
      ocierror(FILE *server_logtrans,__FILE__,__LINE__,(errp), \
       OCIHandleAlloc(tpcenv,&(dfnp),OCI_HTYPE_DEFINE,0,\
               (dvoid**)0));\
      ocierror(FILE *server_logtrans,__FILE__,__LINE__,(errp), \
       OCIDefineByPos((stmp),&(dfnp),(errp),(pos),(progv),\
               (progvl),(ftype),(indp),(alen),\
               (arcode),OCI_DEFAULT));\
      ocierror(FILE *server_logtrans,__FILE__,__LINE__,(errp),\
       OCIDefineArrayOfStruct((dfnp),(errp),(progvl),\
                  sizeof((indp)[0]),\
                  sizeof((alen)[0]),\
                  sizeof((arcode)[0])));
*/

#define OBNDRV(lda,cursor,sqlvar,progv,progvl,ftype)\
    if
(obndrv((cursor),(text*)(sqlvar),NA,(ub1*)(progv),(progvl),(ftype),NA,\
      (sb2 *)0, (text *)0, NA, NA))\
      {errrpt(lda,cursor);return(-1);}\
    else\
      DISCARD 0

#define
OBNDRA(lda,cursor,sqlvar,progv,progvl,ftype,indp,alen,arcode)\
    if
(obndra((cursor),(text*)(sqlvar),NA,(ub1*)(progv),(progvl),(ftype),NA,\
      (indp),(alen),(arcode),(ub4)0,(ub4*)0,(text*)0,NA,NA))\
      {errrpt(lda,cursor);return(-1);}\
    else\
      DISCARD 0

#define
OBNDRAA(lda,cursor,sqlvar,progv,progvl,ftype,indp,alen,arcode,ms
,cs)\
    if
(obndra((cursor),(text*)(sqlvar),NA,(ub1*)(progv),(progvl),(ftype),NA,\
      (indp),(alen),(arcode),(ub4)(ms),(ub4*)(cs),(text*)0,NA,NA))\
      {errrpt(lda,cursor);return(-1);}\
    else\
      DISCARD 0

#define
ODEFIN(lda,cursor,pos,buf,bufl,ftype,scale,indp,fmt,fmtl,fmtt,rlen,rco
de)\
    if (odefin((cursor),(pos),(ub1*)(buf),(bufl),(ftype),(scale),(indp),\
      (text*)(fmt),(fmtl),(fmtt),(rlen),(rcode)))\
      {errrpt(lda,cursor);return(-1);}\
    else\
      DISCARD 0

#define OEXFET(lda,cursor,nrows,cancel,exact)\
    if (oexfet((cursor),(nrows),(cancel),(exact)))\
      {if ((cursor)->rc == 1403) \
    {i=errrpt(lda,cursor); orol(lda); return(-1);} \
   else if (errrpt(lda,cursor)==RECOVERR) \
     {orol(lda);return(RECOVERR);} \
   else{orol(lda);return(-1);}}\
    else\
      DISCARD 0

#define OOPEN(lda,cursor)\
    if (oopen((cursor),(lda),(text*)0,NA,NA,(text*)0,NA))\
      {errrpt(lda,cursor);return(-1);}\
    else\
      DISCARD 0

#define OPARSE(lda,cursor,sqlstm,sqll,defflg,lngflg)\
    if (oparse((cursor),(sqlstm),(sb4)(sqll),(defflg),(ub4)(lngflg)))\
      {errrpt(lda,cursor);return(-1);}\
    else\
      DISCARD 0

#define OFEN(lda,cursor,nrows)\
    if (ofen((cursor),(nrows)))\
      {if (errrpt(lda,cursor)==RECOVERR) \
     {orol(lda);return(RECOVERR);} \
   else{orol(lda);return(-1);}}\
    else\
      DISCARD 0

#define OEXEC(lda,cursor)\
    if (oexec((cursor)))\
      {if (errrpt(lda,cursor)==RECOVERR) \
     {orol(lda);return(RECOVERR);} \
   else{orol(lda);return(-1);}}\
    else\
      DISCARD 0


#define OCOM(lda,cursor)\
    if (ocom((lda))) \
      {errrpt(lda,cursor);orol(lda);return(-1);}\
    else\
```

```
    DISCARD 0

#define OEXN(lda,cursor,iters,rowoff)\
    if (oexn((cursor),(iters),(rowoff))) \
      {if (errrpt(lda,cursor)==RECOVERR) \
      {orol(lda);return(RECOVERR);} \
   else{orol(lda);return(-1);}}\
    else\
      DISCARD 0

#endif
```

tpccpl.cpp

```
#include "../stdafx.h"
#define ORA_NT
#include <stdio.h>
#include <time.h>
#include "../../tpccisapi/tpcc.h"
#include "plora.h"
#include "ora_tpcc.h"
#include <stdarg.h>

extern int server_null_test;

extern CRITICAL_SECTION debugMutex;

#define INVALID_ITEM 100

#define SQLTXT "alter session set isolation_level = serializable"
#define SQLTXTTRC "alter session set sql_trace = true"
#define SQLTXTTIM "alter session set timed_statistics = true"
#define SQLTXTIMU "alter session set \"_in_memory_undo\" = true"
#define SQLTXTNCP "alter session set
plsql_compiler_flags=anonymous_block_native"

#ifdef ORA_NT
#undef boolean
#include "dpbcore.h"
#define gettime dpbtimef
#else
extern double gettime ();
#endif

static int init_cn_data(struct ora_cn_data_t *dataP);
static void initOCIhandles(struct ora_cn_data_t *cn_dataP, char*
uid, char *pwd);

extern void oralogprintf(FILE *,char *format, ...);

int proc_no;
static char *db_uid;
static char *db_pwd;

#ifndef AVOID_DEADLOCK
void swap(nord_wrapper *newP, int i, int j, int *indx, int in);
void q_sort(nord_wrapper *newP,int left, int right, int *indx, int in);
#endif

#ifndef TUX
void userlog (char* fmtp, ...)
{
  va_list va;
  va_start(va,fmtp);
  vfprintf(stderr,fmtp,va);
  va_end(va);
}
#endif

/* vmm313 void ocierror(fname, lineno, errhp, status)  */
int ocierror(FILE *server_logtrans,char *fname, int lineno, dvoid
*errhp, sword status)
{
  text errbuf[512];
  sb4 errcode;
  sb4 lstat;
  ub4 recno=2;


  switch (status) {
  case OCI_SUCCESS:
    break;
  case OCI_SUCCESS_WITH_INFO:
    oralogprintf(server_logtrans,"Module %s Line %d\n", fname,
lineno);
    oralogprintf(server_logtrans,"Error -
OCI_SUCCESS_WITH_INFO\n");
    lstat = OCIErrorGet ((OCIError *)errhp, recno++, (text *) NULL,
&errcode, errbuf,
                   (ub4) sizeof(errbuf), OCI_HTYPE_ERROR);
    oralogprintf(server_logtrans,"Error - %s\n", errbuf);
    break;
  case OCI_NEED_DATA:
    oralogprintf(server_logtrans,"Module %s Line %d\n", fname,
lineno);
    oralogprintf(server_logtrans,"Error - OCI_NEED_DATA\n");
    return (IRRECERR);
  case OCI_NO_DATA:
    oralogprintf(server_logtrans,"Module %s Line %d\n", fname,
lineno);
    oralogprintf(server_logtrans,"Error - OCI_NO_DATA\n");
    return (IRRECERR);
  case OCI_ERROR:
    lstat = OCIErrorGet ((OCIError *)errhp, (ub4) 1,
         (text *) NULL, &errcode, errbuf,
         (ub4) sizeof(errbuf), OCI_HTYPE_ERROR);
    if (errcode == NOT_SERIALIZABLE) return (errcode);
    if (errcode == SNAPSHOT_TOO_OLD) return (errcode);
    while (lstat != OCI_NO_DATA)
    {
      oralogprintf(server_logtrans,"Module %s Line %d\n", fname,
lineno);
      oralogprintf(server_logtrans,"Error - %s\n", errbuf);
      lstat = OCIErrorGet ((OCIError *)errhp, recno++, (text *) NULL,
&errcode, errbuf,
                   (ub4) sizeof(errbuf), OCI_HTYPE_ERROR);
    }
    return (errcode);
/* vmm313    TPCexit(1); */
/* vmm313    exit(1); */
  case OCI_INVALID_HANDLE:
    oralogprintf(server_logtrans,"Module %s Line %d\n", fname,
lineno);
    oralogprintf(server_logtrans,"Error - OCI_INVALID_HANDLE\n");
    TPCexit();
    exit(-1);
  case OCI_STILL_EXECUTING:
    oralogprintf(server_logtrans,"Module %s Line %d\n", fname,
lineno);
    oralogprintf(server_logtrans,"Error - OCI_STILL_EXECUTE\n");
    return (IRRECERR);
  case OCI_CONTINUE:
    oralogprintf(server_logtrans,"Module %s Line %d\n", fname,
lineno);
    oralogprintf(server_logtrans,"Error - OCI_CONTINUE\n");
    return (IRRECERR);
  default:
    oralogprintf(server_logtrans,"Module %s Line %d\n", fname,
lineno);
    oralogprintf(server_logtrans,"Status - %s\n", status);
```

```
    return (IRRECERR);
  }
  return (RECOVERR);
}


FILE  *vopen(char *fnam,char *mode)
{
FILE *fd;

#ifdef  DEBUG
  fprintf(stderr, "tkvuopen() fnam: %s,   mode: %s\n", fnam, mode);
#endif

    fd = fopen((char *)fnam,(char *)mode);
    if (!fd){
        fprintf(stderr," fopen on %s failed\n",fnam);
        exit(-1);
    }
    return(fd);
}

int sqlfile(FILE* server_logtrans,char *fnam, text *linebuf)
{
FILE *fd;
int nulpt = 0;
char realfile[512];

//DEBUGP(( "%s: %d sqlfile() fnam: %s,  linebuf: %#x\n", __FILE__,
__LINE__, fnam, linebuf));

/*
    sprintf(realfile,"%s/bench/tpc/tpcc/blocks/%s",oracle_home,fnam);
*/
    sprintf(realfile,"%s",fnam);
   if ((fd = vopen(realfile,"r")) == NULL) {
      oralogprintf(server_logtrans,"%s: %d >sqlfile vopen failed\n",
__FILE__, __LINE__);
      return(-1);
   }
    while (fgets((char *)linebuf+nulpt, SQL_BUF_SIZE,fd))
    {
        nulpt = (int)strlen((char *)linebuf);
    }
   oralogprintf(server_logtrans,"%s: %d <sqlfile\n", __FILE__,
__LINE__);
    return(nulpt);
}

#ifdef NOT
void vgetdate (unsigned char *oradt)
{
 struct tm *loctime;
 time_t  int_time;

 struct ORADATE {
 unsigned char   century;
 unsigned char   year;
 unsigned char   month;
 unsigned char   day;
 unsigned char   hour;
 unsigned char   minute;
 unsigned char   second;
 } Date;
int century;
int cnvrtOK;

/* assume convert is successful */
cnvrtOK = 1;

/* get the current date and time as an integer */
time( &int_time);

/* Convert the current date and time into local time */
loctime = localtime( &int_time);

century = (1900+loctime->tm_year) / 100;

Date.century = (unsigned char)(century + 100);
if (Date.century < 119 || Date.century > 120) cnvrtOK = 0;
Date.year  = (unsigned char)(loctime->tm_year+100);
if (Date.year < 100 || Date.year > 199) cnvrtOK = 0;
Date.month = (unsigned char)(loctime->tm_mon + 1);
if (Date.month < 1 || Date.month > 12) cnvrtOK = 0;
Date.day   = (unsigned char)loctime->tm_mday;
if (Date.day < 1 || Date.day > 31) cnvrtOK = 0;
Date.hour  = (unsigned char)(loctime->tm_hour + 1);
if (Date.hour < 1 || Date.hour > 24) cnvrtOK = 0;
Date.minute= (unsigned char)(loctime->tm_min + 1);
if (Date.minute < 1 || Date.minute > 60) cnvrtOK = 0;
Date.second= (unsigned char)(loctime->tm_sec + 1);
if (Date.second < 1 || Date.second > 60) cnvrtOK = 0;


if (cnvrtOK)
  memcpy(oradt,&Date,7);
  else
    *oradt = '\0';

 return;

}
void cvtdmy (unsigned char *oradt, char *outdate)
{

        struct ORADATE {
                unsigned char   century;
                unsigned char   year;
                unsigned char   month;
                unsigned char   day;
                unsigned char   hour;
                unsigned char   minute;
                unsigned char   second;
        } Date;


        int day,month,year;

        memcpy(&Date,oradt,7);

        year = (Date.century-100)*100 + Date.year-100;
        month = Date.month;
        day = Date.day;
        sprintf(outdate,"%02d-%02d-%4d\0",day,month,year);

        return;
}

void cvtdmyhms (unsigned char *oradt, char *outdate)
{

        struct ORADATE {
                unsigned char   century;
                unsigned char   year;
                unsigned char   month;
                unsigned char   day;
                unsigned char   hour;
                unsigned char   minute;
                unsigned char   second;
        } Date;


        int day,month,year;
        int hour,min,sec;
```

```
        memcpy(&Date,oradt,7);

        year = (Date.century-100)*100 + Date.year-100;
        month = Date.month;
        day = Date.day;
        hour = Date.hour - 1;
        min = Date.minute - 1;
        sec = Date.second - 1;

        sprintf(outdate,"%02d-%02d-%4d %02d:%02d:%02d\0",
                  day,month,year,hour,min,sec);

        return;
}
#endif


void TPCexit (void)
{
// free(Ctpcc_com::get_cur());
}

void clean_connection(FILE* server_logtrans,void *ptr)
{

   /* free trans specific cursor handles first and later the ora handles
*/
   ora_cn_data_t *cn_dataP = (ora_cn_data_t *)ptr;

   if (cn_dataP != NULL) {
        OCIServer *tpcsrv;
        OCISession *tpcusr;
        OCIEnv *tpcenv;
        dvoid *errhp;
        OCISvcCtx *tpcsvc;

        oralogprintf(server_logtrans, "clean_connection, Freeing OCI
handles\n");

       tkvcpdone(cn_dataP);
        tkvcsdone(cn_dataP);
        tkvcodone(cn_dataP);
        tkvcndone(cn_dataP);
        /* free OCI handles */
        if (tpcusr = cn_dataP->tpcusr) {
              oralogprintf(server_logtrans, "free_handles>
OCIHandleFree tpcusr\n");
              OCIHandleFree((dvoid *)tpcusr, OCI_HTYPE_SESSION);
        }
        if (tpcsvc = cn_dataP->tpcsvc) {
              oralogprintf(server_logtrans, "free_handles>
OCIHandleFree tpcsvc\n");
              OCIHandleFree((dvoid *)tpcsvc, OCI_HTYPE_SVCCTX);
        }
        if (errhp = cn_dataP->errhp) {
              oralogprintf(server_logtrans, "free_handles>
OCIHandleFree errhp\n");
              OCIHandleFree((OCIError *)errhp,
OCI_HTYPE_ERROR);
        }
        if (tpcsrv = cn_dataP->tpcsrv) {
              oralogprintf(server_logtrans, "free_handles>
OCIHandleFree tpcsrv\n");
              OCIHandleFree((OCIError *)tpcsrv,
OCI_HTYPE_SERVER);
        }
        if (tpcenv = cn_dataP->tpcenv) {
              oralogprintf(server_logtrans, "free_handles>
OCIHandleFree tpcenv\n");
              OCIHandleFree((OCIError *)tpcenv, OCI_HTYPE_ENV);
        }
        oralogprintf(server_logtrans, "free_handles> free cn_dataP\n");
   }
}



static void initOCIhandles(struct ora_cn_data_t *cn_dataP, char
*uid, char *pwd,char *dbName)
{

   int tracelevel = 0;  /* new define */
   OCIDate cr_date;
   text stmbuf[100];
   OCIEnv *tpcenv=NULL;
   OCIServer *tpcsrv=NULL;
   OCIError *errhp;
   OCISvcCtx *tpcsvc;
   OCISession *tpcusr;
   OCIStmt *curi;

   oralogprintf(cn_dataP->server_logtrans,">> initOCIhandles uid %s
pwd %s dbName %s\n",uid,pwd,dbName);
   OCIEnvCreate (&tpcenv,OCI_OBJECT|OCI_THREADED, (dvoid
*)0, 0, 0, 0, (size_t)0, (dvoid **)0);
   if (tpcenv==NULL) {
     oralogprintf(cn_dataP->server_logtrans,"Cannot get handle to
environment, OCIEnvCreate failed\n");
   }
   OCIHandleAlloc((dvoid *)tpcenv, (dvoid **)&tpcsrv,
OCI_HTYPE_SERVER, 0 , (dvoid **)0);

   OCIHandleAlloc((dvoid *)tpcenv, (dvoid **)&errhp,
OCI_HTYPE_ERROR, 0 , (dvoid **)0);
   OCIHandleAlloc((dvoid *)tpcenv, (dvoid **)&tpcsvc,
OCI_HTYPE_SVCCTX, 0 , (dvoid **)0);
//EnterCriticalSection(&debugMutex);
   ocierror(cn_dataP->server_logtrans,__FILE__,__LINE__,errhp,
OCIServerAttach(tpcsrv, (OCIError *)errhp, (text
*)dbName,0,OCI_DEFAULT));
   if (tpcsrv==NULL) {
     oralogprintf(cn_dataP->server_logtrans,"Cannot get handle to
server, OCIServerAttach failed\n");
   }
   oralogprintf(cn_dataP->server_logtrans,"OCIServerAttach
returned %x\n",tpcsrv);
//LeaveCriticalSection(&debugMutex);
   OCIAttrSet((dvoid *)tpcsvc, OCI_HTYPE_SVCCTX, (dvoid
*)tpcsrv, (ub4)0,OCI_ATTR_SERVER, (OCIError *)errhp);

   OCIHandleAlloc((dvoid *)tpcenv, (dvoid **)&tpcusr,
OCI_HTYPE_SESSION, 0 , (dvoid **)0);

   OCIAttrSet((dvoid *)tpcusr, OCI_HTYPE_SESSION, (dvoid *)uid,
(ub4)4,OCI_ATTR_USERNAME, (OCIError *)errhp);

   OCIAttrSet((dvoid *)tpcusr, OCI_HTYPE_SESSION, (dvoid *)pwd,
(ub4)4,
          OCI_ATTR_PASSWORD, (OCIError *)errhp);
   ocierror(cn_dataP->server_logtrans,__FILE__,__LINE__,errhp,
OCISessionBegin(tpcsvc, (OCIError *)errhp, tpcusr,
OCI_CRED_RDBMS, OCI_DEFAULT));

   OCIAttrSet(tpcsvc, OCI_HTYPE_SVCCTX, tpcusr, 0,
OCI_ATTR_SESSION, (OCIError *)errhp);

   /* run all transaction in serializable mode */

   OCIHandleAlloc(tpcenv, (dvoid **)&curi, OCI_HTYPE_STMT, 0,
(dvoid**)0);
   sprintf ((char *) stmbuf, SQLTXT);
```

```
  OCIStmtPrepare(curi, (OCIError *)errhp, stmbuf, strlen((char
*)stmbuf), OCI_NTV_SYNTAX, OCI_DEFAULT);
  ocierror(cn_dataP-
>server_logtrans,__FILE__,__LINE__,errhp,OCIStmtExecute(tpcsvc
, curi, (OCIError *)errhp,1,0,0,0,OCI_DEFAULT));
  OCIHandleFree(curi, OCI_HTYPE_STMT);


  if (getenv("USE_IMU")) {
    printf("Use in_memory_undo\n");
    OCIHandleAlloc(tpcenv, (dvoid **)&curi, OCI_HTYPE_STMT, 0,
(dvoid**)0);
    sprintf ((char *) stmbuf, SQLTXTIMU);
    OCIStmtPrepare(curi, (OCIError *)errhp, stmbuf, strlen((char
*)stmbuf), OCI_NTV_SYNTAX, OCI_DEFAULT);
    ocierror(cn_dataP-
>server_logtrans,__FILE__,__LINE__,errhp,OCIStmtExecute(tpcsvc
, curi, (OCIError *)errhp,1,0,0,0,OCI_DEFAULT));
    OCIHandleFree(curi, OCI_HTYPE_STMT);
  }

  if (getenv("USE_NCOMP")) {
    printf("Use NCOMP\n");
    OCIHandleAlloc(tpcenv, (dvoid **)&curi, OCI_HTYPE_STMT, 0,
(dvoid**)0);
    sprintf ((char *) stmbuf, SQLTXTNCP);
    OCIStmtPrepare(curi, (OCIError *)errhp, stmbuf, strlen((char
*)stmbuf), OCI_NTV_SYNTAX, OCI_DEFAULT);
    ocierror(cn_dataP-
>server_logtrans,__FILE__,__LINE__,errhp,OCIStmtExecute(tpcsvc
, curi, (OCIError *)errhp,1,0,0,0,OCI_DEFAULT));
    OCIHandleFree(curi, OCI_HTYPE_STMT);
  }

  if (tracelevel == 3) {
   OCIHandleAlloc(tpcenv, (dvoid **)&curi, OCI_HTYPE_STMT, 0,
(dvoid**)0);
   memset(stmbuf,0,100);
   sprintf ((char *) stmbuf, SQLTXTTIM);
   OCIStmtPrepare(curi, (OCIError *)errhp, stmbuf, strlen((char
*)stmbuf),
                  OCI_NTV_SYNTAX, OCI_DEFAULT);
   ocierror(cn_dataP->server_logtrans,__FILE__,__LINE__,errhp,
OCIStmtExecute(tpcsvc, curi, (OCIError
*)errhp,1,0,0,0,OCI_DEFAULT));
   OCIHandleFree((dvoid *)curi, OCI_HTYPE_STMT);
  }


  ocierror(cn_dataP-
>server_logtrans,__FILE__,__LINE__,errhp,OCIDateSysDate((OCI
Error *)errhp,&cr_date));

   /*  Store the handles just initialized in the thread slot
   */
  cn_dataP->tpcenv = tpcenv;
  cn_dataP->tpcsrv = tpcsrv;
  cn_dataP->errhp  = errhp;
  cn_dataP->tpcsvc = tpcsvc;
  cn_dataP->tpcusr = tpcusr;
  cn_dataP->curi   = curi;
  oralogprintf(cn_dataP->server_logtrans,"<< initOCIhandles\n");
}

/*
 *  init_cn_data
 *     Initializes all the transactions for a single connection
 */
static int init_cn_data(ora_cn_data_t *cnP,char *uid,char *pwd,char
*dbName)
{
   int status;

   oralogprintf(cnP->server_logtrans,">> init_cn_data\n");
   initOCIhandles(cnP, uid,pwd,dbName);

   if (status = tkvcninit (cnP)) {
      fprintf(stderr, "tkvcninit failed: %d\n", status);
      TPCexit ();
      return (status);
   }

   if (status = tkvcpinit (cnP)) {
     fprintf(stderr, "tkvcpinit failed: %d\n", status);
      TPCexit ();
      return (status);
   }

   if (status = tkvcoinit (cnP)) {
      fprintf(stderr, "tkvcoinit failed: %d\n", status);
      TPCexit ();
      return (status);
   }

  if (status = tkvcdinit (cnP)) {
      fprintf(stderr, "tkvcdinit failed: %d\n", status);
      TPCexit ();
      return (status);
   }

  if (status = tkvcsinit (cnP)) {
      fprintf(stderr, "tkvcsinit failed: %d\n", status);
      TPCexit ();
      return (status);
   }
return 0;
}


void *create_ora_connection(char *uid, char *pwd, char *dbName) {
  HKEY Key;
  char   value[256];
  DWORD  regValueSize = 256;
  DWORD  regType;
  FILE    *server_logtrans;

  ora_cn_data_t *cnP = (ora_cn_data_t
*)malloc(sizeof(ora_cn_data_t));

  if
(RegOpenKeyEx(HKEY_LOCAL_MACHINE,"SOFTWARE\\TPCC",
0, KEY_READ, &Key) == ERROR_SUCCESS)
  {
    regValueSize = 256;
    if
(RegQueryValueEx(Key,"OraComServLog",0,&regType,(BYTE
*)&value,&regValueSize) == ERROR_SUCCESS)
    {
      server_logtrans = fopen(value, "w+");
      oralogprintf(server_logtrans,"Opening logfile %s\n",value);
    }
  }
  cnP->server_logtrans = server_logtrans;
   oralogprintf(server_logtrans,">> create_ora_connection\n");
  if (cnP!=NULL)
    init_cn_data(cnP,uid,pwd,dbName);
  else
    oralogprintf(server_logtrans,"Cannot allocate ora_cn_data_t.\n");
   return (void *)cnP;
}

ora_cn_data_t *get_db_ready(ora_cn_data_t *curP, char *uid, char
*pwd, char *dbName)
{
```

```
    curP = (ora_cn_data_t
*)create_ora_connection(uid,pwd,dbName);
    if (curP==NULL) {
        oralogprintf(curP->server_logtrans,"create_ora_connection
failed!\n");
    }

    return(curP);
}

TPCnew (void *cnP)
{
   int i;
   ora_cn_data_t *cn_dataP = (ora_cn_data_t *)cnP;
   FILE *server_logtrans = cn_dataP->server_logtrans;
   nord_wrapper *newP = &cn_dataP->globals;
   int indx[NITEMS], ordl_cnt=newP->out_nord.s_O_OL_CNT;
   dvoid *errhp = cn_dataP->errhp;

   newP->out_nord.retry = 0;

#ifndef AVOID_DEADLOCK

   for (i = NITEMS; i > 0; i--) {
      if (newP->in_nord.s_OL_I_ID[i-1] > 0) {
         ordl_cnt = i;
         break;
      }
   }

   for (i = 0; i < NITEMS; i++) indx[i] = i;

    q_sort(newP, 0, ordl_cnt-1, indx, 1);

#endif


   OCIERROR(errhp,OCIDateSysDate((OCIError *)errhp,&newP-
>in_nord.cr_date));

   if (tkvcn (cn_dataP)) {
      if (newP->out_nord.terror != RECOVERR)
      {
        if (newP->out_nord.status) {
          return(newP->out_nord.terror);
        }
        else {
          newP->out_nord.terror = INVALID_STATUS;
           return (INVALID_STATUS);
        }
      }
   }


   newP->out_nord.datelen = sizeof(newP-
>out_nord.s_O_ENTRY_D_time);
    OCIERROR(errhp,
        OCIDateToText((OCIError *)errhp,&newP-
>in_nord.cr_date,(text*)FULLDATE,SIZ(FULLDATE),(text*)0,0,
      (ub4 *)&newP->out_nord.datelen,(text *)newP-
>out_nord.s_O_ENTRY_D_time));



#ifndef AVOID_DEADLOCK
    q_sort(newP, 0, ordl_cnt-1, indx, 0);
#endif
   newP->out_nord.terror = 0;
   return (0);
}

TPCpay (void *cnP)
{
   ora_cn_data_t *cn_dataP = (ora_cn_data_t *)cnP;
   FILE *server_logtrans = cn_dataP->server_logtrans;
   paym_wrapper *payP = &cn_dataP->payP;
   dvoid *errhp = cn_dataP->errhp;
   char months[13][4] = {"",
"JAN","FEB","MAR","APR","MAY","JUN","JUL","AUG","SEP","OCT",
"NOV","DEC"};

   OCIERROR(errhp,OCIDateSysDate((OCIError *)errhp,&payP-
>in_paym.cr_date));

   sprintf(payP->out_paym.s_H_DATE_time,"%d-%s-%d
%d:%d:%d",payP->in_paym.cr_date.OCIDateDD,
   months[payP->in_paym.cr_date.OCIDateMM], payP-
>in_paym.cr_date.OCIDateYYYY,
   payP->in_paym.cr_date.OCIDateTime.OCITimeHH,  payP-
>in_paym.cr_date.OCIDateTime.OCITimeMI,
   payP->in_paym.cr_date.OCIDateTime.OCITimeSS);

   if (payP->in_paym.bylastname) {
      payP->in_paym.s_C_ID = 0;
   }
   else {
      payP->in_paym.s_C_LAST[0] = ' ';
   }

   if (tkvcp (cn_dataP)) {
      if (payP->out_paym.terror != RECOVERR)
        payP->out_paym.terror = IRRECERR;
      return (-1);
   }

   sprintf(payP->out_paym.c_since_d,"%d-%s-%d",payP-
>out_paym.c_since.OCIDateDD,months[payP-
>out_paym.c_since.OCIDateMM],
   payP->out_paym.c_since.OCIDateYYYY);

   payP->out_paym.terror = 0;

   return (0);

}


TPCord (void *cnP)
{
   ora_cn_data_t *cn_dataP = (ora_cn_data_t *)cnP;
   ords_wrapper *ordP = &cn_dataP->ordP;

   if (tkvco (cn_dataP)) {
      if (ordP->out_ords.terror != RECOVERR)
        ordP->out_ords.terror = IRRECERR;
      return (-1);
   }

   ordP->out_ords.terror = 0;
   if ( ordP->out_ords.s_O_CARRIER_ID == 11 )
      ordP->out_ords.s_O_CARRIER_ID = 0;

   return (0);

}

int TPCdel (void *cnP)
{
   ora_cn_data_t *cn_dataP = (ora_cn_data_t *)cnP;
   FILE *server_logtrans = cn_dataP->server_logtrans;
   dlvy_wrapper *str = &cn_dataP->delP;
   dvoid *errhp = cn_dataP->errhp;
   OCIDate cr_date;
```

```
  OCIERROR(errhp,OCIDateSysDate((OCIError *)errhp,&cr_date));

  if (tkvcd (cn_dataP)) {
    if(str->out_dlvy.terror == DEL_ERROR)
      return DEL_ERROR;
     if (str->out_dlvy.terror != RECOVERR)
        str->out_dlvy.terror = IRRECERR;
     return (-1);
  }

  str->out_dlvy.terror = 0;
  return (0);
}


TPCsto (void *cnP)
{
  ora_cn_data_t *cn_dataP = (ora_cn_data_t *)cnP;
  stok_wrapper *stoP = &cn_dataP->stoP;

  stoP->out_stok.retry = 0;

  if (tkvcs (cn_dataP)) {
     if (stoP->out_stok.terror != RECOVERR)
        stoP->out_stok.terror = IRRECERR;
     return (-1);
  }

  stoP->out_stok.terror = 0;

  return (0);

}

#ifndef AVOID_DEADLOCK

void q_sort(nord_wrapper *newP,int left, int right, int *indx, int in)
{
 int i, last;

 if(left >= right)
   return;
 swap(newP,left,(left+right)/2, indx, in);
 last = left;
 for(i=left+1;i<=right;i++)
    if(newP->in_nord.s_OL_I_ID[i] < newP->in_nord.s_OL_I_ID[left])
     swap(newP,last,i, indx, in);
 swap(newP, left,last, indx, in);
 q_sort(newP,left,last-1, indx, in);
 q_sort(newP,last+1,right, indx, in);
}

void swap(struct nord_wrapper *newP, int i, int j, int *indx, int in)
{
 int tempd;
 int tempi;
 char tmpstr[25];
 char tmpch;

 tempi = indx[i];
 indx[i] = indx[j];
 indx[j] = tempi;

 if (in) {

    tempi = newP->in_nord.s_OL_I_ID[i];
      newP->in_nord.s_OL_I_ID[i] = newP->in_nord.s_OL_I_ID[j];
      newP->in_nord.s_OL_I_ID[j] = tempi;
      tempi = newP->in_nord.s_OL_SUPPLY_W_ID[i];
      newP->in_nord.s_OL_SUPPLY_W_ID[i] = newP-
>in_nord.s_OL_SUPPLY_W_ID[j];
      newP->in_nord.s_OL_SUPPLY_W_ID[j] = tempi;

      tempi = newP->in_nord.s_OL_QUANTITY[i];
      newP->in_nord.s_OL_QUANTITY[i] = newP-
>in_nord.s_OL_QUANTITY[j];
      newP->in_nord.s_OL_QUANTITY[j] = (short)tempi;
  } else {
      strcpy(tmpstr,newP->out_nord.s_I_NAME[i]);
      strcpy(newP->out_nord.s_I_NAME[i],newP-
>out_nord.s_I_NAME[j]);
      strcpy(newP->out_nord.s_I_NAME[j],tmpstr);

     tempi = newP->out_nord.s_S_QUANTITY[i];
      newP->out_nord.s_S_QUANTITY[i] = newP-
>out_nord.s_S_QUANTITY[j];
      newP->out_nord.s_S_QUANTITY[j] = (short)tempi;

     tmpch = newP->out_nord.s_brand_generic[i];
      newP->out_nord.s_brand_generic[i] = newP-
>out_nord.s_brand_generic[j];

      newP->out_nord.s_brand_generic[j] = tmpch;

     tempd = newP->out_nord.s_I_PRICE[i];
      newP->out_nord.s_I_PRICE[i] = newP-
>out_nord.s_I_PRICE[j];
      newP->out_nord.s_I_PRICE[j] = tempd;

     tempd = newP->out_nord.s_OL_AMOUNT[i];
      newP->out_nord.s_OL_AMOUNT[i] = newP-
>out_nord.s_OL_AMOUNT[j];
      newP->out_nord.s_OL_AMOUNT[j] = tempd;
  }
}

#endif
```

Appendix - B: Tunable Parameters

B.1 Database Parameters

p_run.ora

compatible = 10.2.0.1.0
timed_statistics = FALSE

resource_manager_plan=''
query_rewrite_enabled=false
db_name = tpcc
control_files = (/home/oracle/bench/tpcc_P64way/dbf/control_001,/home/oracle/bench/tpcc_P64way/dbf/control_002)

recovery_parallelism = 32
dml_locks = 500
log_buffer = 8388608

parallel_max_servers = 16

db_files = 300

db_cache_size = 30000M
db_8k_cache_size = 256M
db_16k_cache_size = 20700M
db_2k_cache_size = 120600M
db_keep_cache_size = 20M
db_recycle_cache_size = 9500M
shared_pool_size = 6000M
sessions = 530
transactions = 530
processes = 346
db_block_size = 4096
undo_management = auto
UNDO_TABLESPACE = undo_1

trace_enabled = FALSE
db_block_checksum = FALSE
trace_enabled = FALSE
statistics_level = basic

plsql_optimize_level = 2
pga_aggregate_target = 0

undo_retention = 1
fast_start_mttr_target = 0

db_writer_processes = 2
log_checkpoint_interval = 0
log_checkpoints_to_alert = TRUE
log_checkpoint_timeout = 0
java_pool_size = 0
remote_login_passwordfile = shared
disk_asynch_io = TRUE
db_block_checking = FALSE
cursor_space_for_time = TRUE
replication_dependency_tracking = FALSE
db_file_multiblock_read_count = 1
aq_tm_processes = 0
open_cursors=2000
job_queue_processes = 0
background_dump_dest=/dump1/oradump
user_dump_dest=/dump1/oradump

B.2 Transaction Monitor Parameters

tpcc_com_settings.txt

Transactions not supported
Enable object pooling
Minimum pool size 14
Maximum pool size 14
Creation timeout 180,000
Enable Object Construction

inet_registry.reg

Windows Registry Editor Version 5.00

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\InetInfo]

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\InetInfo\Parameters]
"ListenBackLog"=dword:000000fa
"DispatchEntries"=hex(7):4c,00,44,00,41,00,50,00,53,00,56,00,43,00,00,00,00,00
"MaxConnections"=dword:000061a8
"PoolThreadLimit"=dword:000000c8
"ThreadTimeout"=dword:00015180
"MaxConcurrency"=dword:ffffffff

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\InetInfo\Performance]
"Library"="infoctrs.dll"
"Open"="OpenINFOPerformanceData"
"Close"="CloseINFOPerformanceData"
"Collect"="CollectINFOPerformanceData"
"Last Counter"=dword:00000842
"Last Help"=dword:00000843
"First Counter"=dword:00000802
"First Help"=dword:00000803
"Library Validation Code"=hex:fe,5d,92,b7,40,81,c3,01,10,25,00,00,00,00,00,00
"WbemAdapFileTime"=hex:00,70,c1,b0,95,36,c3,01
"WbemAdapFileSize"=dword:00002510
"WbemAdapStatus"=dword:00000000

tcpip_parameters_registry.reg

Windows Registry Editor Version 5.00

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters]
"NV Hostname"="client1"
"DataBasePath"=hex(2):25,00,53,00,79,00,73,00,74,00,65,00,6d,00,52,00,6f,00,6f,\

00,74,00,25,00,5c,00,53,00,79,00,73,00,74,00,65,00,6d,00,33,00,32,00,5c,00,\

64,00,72,00,69,00,76,00,65,00,72,00,73,00,5c,00,65,00,74,00,63,00,00,00
"NameServer"=""
"ForwardBroadcasts"=dword:00000000
"IPEnableRouter"=dword:00000000
"Domain"=""
"Hostname"="client1"
"SearchList"=""
"UseDomainNameDevolution"=dword:00000001
"EnableICMPRedirect"=dword:00000001

```
"DeadGWDetectDefault"=dword:00000001
"DontAddDefaultGatewayDefault"=dword:00000000
"EnableSecurityFilters"=dword:00000000
"EnableTCPA"=dword:00000001
"EnableRSS"=dword:00000001
"EnableTCPChimney"=dword:00000001

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters\Adapters]

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters\Adapters\NdisWanIp]
"LLInterface"="WANARP"
"IpConfig"=hex(7):54,00,63,00,70,00,69,00,70,00,5c,00,50,00,61,00,72,00,61,00,\

6d,00,65,00,74,00,65,00,72,00,73,00,5c,00,49,00,6e,00,74,00,65,00,72,00,66,\

00,61,00,63,00,65,00,73,00,5c,00,7b,00,34,00,35,00,41,00,42,00,30,00,37,00,\

35,00,34,00,2d,00,43,00,44,00,45,00,45,00,2d,00,34,00,33,00,39,00,35,00,2d,\

00,39,00,31,00,45,00,44,00,2d,00,45,00,33,00,31,00,41,00,31,00,43,00,41,00,\

42,00,31,00,38,00,42,00,37,00,7d,00,00,00,54,00,63,00,70,00,69,00,70,00,5c,\

00,50,00,61,00,72,00,61,00,6d,00,65,00,74,00,65,00,72,00,73,00,5c,00,49,00,\

6e,00,74,00,65,00,72,00,66,00,61,00,63,00,65,00,73,00,5c,00,7b,00,36,00,37,\

00,42,00,36,00,39,00,44,00,38,00,32,00,2d,00,43,00,34,00,35,00,32,00,2d,00,\

34,00,46,00,45,00,46,00,2d,00,38,00,45,00,33,00,36,00,2d,00,41,00,46,00,45,\

00,34,00,32,00,33,00,38,00,34,00,32,00,44,00,45,00,30,00,7d,00,00,00,00,00,00
"NumInterfaces"=dword:00000002
"IpInterfaces"=hex:54,07,ab,45,ee,cd,95,43,91,ed,e3,1a,1c,ab,18,b7,82,9d,b6,67,\
  52,c4,ef,4f,8e,36,af,e4,23,84,2d,e0

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters\Adapters\{D2B6240B-2F3E-429B-B914-682B88BB1250}]
"LLInterface"=""
"IpConfig"=hex(7):54,00,63,00,70,00,69,00,70,00,5c,00,50,00,61,00,72,00,61,00,\

6d,00,65,00,74,00,65,00,72,00,73,00,5c,00,49,00,6e,00,74,00,65,00,72,00,66,\

00,61,00,63,00,65,00,73,00,5c,00,7b,00,44,00,32,00,42,00,36,00,32,00,34,00,\

30,00,42,00,2d,00,32,00,46,00,33,00,45,00,2d,00,34,00,32,00,39,00,42,00,2d,\

00,42,00,39,00,31,00,34,00,2d,00,36,00,38,00,32,00,42,00,38,00,38,00,42,00,\
  42,00,31,00,32,00,35,00,30,00,7d,00,00,00,00,00,00

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters\Adapters\{FAA76442-2F4A-4DAE-8DB9-1C047BCD60DE}]
"LLInterface"=""
"IpConfig"=hex(7):54,00,63,00,70,00,69,00,70,00,5c,00,50,00,61,00,72,00,61,00,\

6d,00,65,00,74,00,65,00,72,00,73,00,5c,00,49,00,6e,00,74,00,65,00,72,00,66,\

00,61,00,63,00,65,00,73,00,5c,00,7b,00,46,00,41,00,41,00,37,00,36,00,34,00,\

34,00,32,00,2d,00,32,00,46,00,34,00,41,00,2d,00,34,00,44,00,41,00,45,00,2d,\

00,38,00,44,00,42,00,39,00,2d,00,31,00,43,00,30,00,34,00,37,00,42,00,43,00,\
  44,00,36,00,30,00,44,00,45,00,7d,00,00,00,00,00,00

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters\DNSRegisteredAdapters]

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters\Interfaces]

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters\Interfaces\{45AB0754-CDEE-4395-91ED-E31A1CAB18B7}]
"UseZeroBroadcast"=dword:00000000
"EnableDHCP"=dword:00000000
"IPAddress"=hex(7):30,00,2e,00,30,00,2e,00,30,00,2e,00,30,00,00,00,00,00
"SubnetMask"=hex(7):30,00,2e,00,30,00,2e,00,30,00,2e,00,30,00,00,00,00,00
"DefaultGateway"=hex(7):00,00
"EnableDeadGWDetect"=dword:00000001
"DontAddDefaultGateway"=dword:00000000

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters\Interfaces\{67B69D82-C452-4FEF-8E36-AFE423842DE0}]
"UseZeroBroadcast"=dword:00000000
"EnableDHCP"=dword:00000000
"IPAddress"=hex(7):30,00,2e,00,30,00,2e,00,30,00,2e,00,30,00,00,00,00,00
"SubnetMask"=hex(7):30,00,2e,00,30,00,2e,00,30,00,2e,00,30,00,00,00,00,00
"DefaultGateway"=hex(7):00,00
"EnableDeadGWDetect"=dword:00000001
"DontAddDefaultGateway"=dword:00000000

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters\Interfaces\{D2B6240B-2F3E-429B-B914-682B88BB1250}]
"UseZeroBroadcast"=dword:00000000
"EnableDeadGWDetect"=dword:00000001
"EnableDHCP"=dword:00000000
"IPAddress"=hex(7):31,00,39,00,32,00,2e,00,31,00,36,00,38,00,2e,00,31,00,31,00,\
  2e,00,31,00,30,00,31,00,00,00,00,00
"SubnetMask"=hex(7):32,00,35,00,35,00,2e,00,32,00,35,00,35,00,2e,00,32,00,35,\
  00,35,00,2e,00,30,00,00,00,00,00
"DefaultGateway"=hex(7):00,00
"DefaultGatewayMetric"=hex(7):00,00
"NameServer"=""
"Domain"=""
"RegistrationEnabled"=dword:00000001
"RegisterAdapterName"=dword:00000000
"TCPAllowedPorts"=hex(7):30,00,00,00,00,00
"UDPAllowedPorts"=hex(7):30,00,00,00,00,00
```

"RawIPAllowedProtocols"=hex(7):30,00,00,00,00,00
"NTEContextList"=hex(7):30,00,78,00,30,00,30,00,30,00,30,00,30,00,30,00,30,00,30,00,\
  32,00,00,00,00,00
"DhcpClassIdBin"=hex:
"DhcpServer"="255.255.255.255"
"Lease"=dword:00000e10
"LeaseObtainedTime"=dword:4626939c
"T1"=dword:46269aa4
"T2"=dword:46269fea
"LeaseTerminatesTime"=dword:4626a1ac
"IPAutoconfigurationAddress"="0.0.0.0"
"IPAutoconfigurationMask"="255.255.0.0"
"IPAutoconfigurationSeed"=dword:00000000
"AddressType"=dword:00000000

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters\Interfaces\{FAA76442-2F4A-4DAE-8DB9-1C047BCD60DE}]
"UseZeroBroadcast"=dword:00000000
"EnableDeadGWDetect"=dword:00000001
"EnableDHCP"=dword:00000000
"IPAddress"=hex(7):31,00,30,00,2e,00,31,00,2e,00,31,00,2e,00,32,00,00,00,00,00
"SubnetMask"=hex(7):32,00,35,00,35,00,2e,00,32,00,35,00,35,00,2e,00,32,00,35,\
  00,35,00,2e,00,30,00,00,00,00,00
"DefaultGateway"=hex(7):00,00
"DefaultGatewayMetric"=hex(7):00,00
"NameServer"=""
"Domain"=""
"RegistrationEnabled"=dword:00000001
"RegisterAdapterName"=dword:00000000
"TCPAllowedPorts"=hex(7):30,00,00,00,00,00
"UDPAllowedPorts"=hex(7):30,00,00,00,00,00
"RawIPAllowedProtocols"=hex(7):30,00,00,00,00,00
"NTEContextList"=hex(7):30,00,78,00,30,00,30,00,30,00,30,00,30,00,30,00,30,00,30,00,\
  33,00,00,00,00,00
"DhcpClassIdBin"=hex:
"DhcpServer"="255.255.255.255"
"Lease"=dword:00000e10
"LeaseObtainedTime"=dword:4625622d
"T1"=dword:46256935
"T2"=dword:46256e7b
"LeaseTerminatesTime"=dword:4625703d
"IPAutoconfigurationAddress"="0.0.0.0"
"IPAutoconfigurationMask"="255.255.0.0"
"IPAutoconfigurationSeed"=dword:00000000
"AddressType"=dword:00000000

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters\PersistentRoutes]

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters\Winsock]
"UseDelayedAcceptance"=dword:00000000
"HelperDllName"=hex(2):25,00,53,00,79,00,73,00,74,00,65,00,6d,00,52,00,6f,00,\

6f,00,74,00,25,00,5c,00,53,00,79,00,73,00,74,00,65,00,6d,00,33,00,32,00,5c,\

00,77,00,73,00,68,00,74,00,63,00,70,00,69,00,70,00,2e,00,64,00,6c,00,6c,00,\
  00,00
"MaxSockAddrLength"=dword:00000010
"MinSockAddrLength"=dword:00000010
"Mapping"=hex:0b,00,00,00,03,00,00,00,02,00,00,00,01,00,00,00,06,00,00,00,02,\

00,00,00,01,00,00,00,00,00,00,00,02,00,00,00,00,00,00,00,06,00,00,00,00,00,\

00,00,00,00,00,00,06,00,00,00,00,00,00,00,00,01,00,00,00,06,00,00,00,02,00,00,\

00,02,00,00,00,11,00,00,00,02,00,00,00,02,00,00,00,00,00,00,00,02,00,00,00,\

00,00,00,00,11,00,00,00,00,00,00,00,00,00,00,00,11,00,00,00,00,00,00,00,02,\
  00,00,00,11,00,00,00,02,00,00,00,03,00,00,00,00,00,00,00

software_registry.reg

Windows Registry Editor Version 5.00

[HKEY_LOCAL_MACHINE\SOFTWARE\TPCC]
"dlvyLogPath"="c:\\InetPub\\wwwroot\\tpcc\\"
"dlvyQueueLen"=dword:00004e20
"dlvyThreads"=dword:00000002
"nullDB"=dword:00000000
"htmlTrace"=dword:00000000
"dbName"="tpcc"
"errorLogFile"="c:\\inetpub\\wwwroot\\tpcc\\isapi_err.log"
"htmlTraceLogFile"="c:\\inetpub\\wwwroot\\tpcc\\isapi.log"
"numUsers"=dword:00007530
"dbType"="ORACLE"
"dbUserName"="tpcc"
"dbPassword"="tpcc"
"dbInterfacePath"="C:\\inetpub\\wwwroot\\tpcc\\tpccOracleglue.dll"
"isapi_trace"=dword:00000000
"numPools"=dword:00000001
"numServers"=dword:00000001
"numWarehouse"=dword:000009c4
"OraComServLog"="c:\\inetpub\\wwwroot\\tpcc\\oci_err.log"
"OracleHome"="c:\\ora10g"

B.3 AIX Parameters

Bull Escala PL1660R

OS PARAMETERS

```
keylock         normal            State
of system keylock at boot time
False
max_capacity    4.00
Maximum potential processor capacity
False
max_logname     9
Maximum login name length at boot time
True
maxbuf          20
Maximum number of pages in block I/O
BUFFER CACHE True
```

```
maxmbuf          0
Maximum Kbytes of real memory allowed
for MBUFS   True
maxpout          0                   HIGH
water mark for pending write I/Os per
file   True
maxuproc     128000          Maximum number of PROCESSES
allowed per user     True
SW_dist_intr    false          Enable SW distribution of interrupts
True
autorestart     true            Automatically REBOOT OS after a crash
True
boottype        disk            N/A                                False
capacity_inc    1.00            Processor capacity increment
False
capped          true            Partition is capped
False
conslogin       enable          System Console Login
False
cpuguard        enable          CPU Guard
True
dedicated       true            Partition is dedicated
False
ent_capacity    4.00            Entitled processor capacity
False
frequency       1596000000      System Bus Frequency
False
fullcore        false           Enable full CORE dump
True
fwversion       IBM,FM310_039   Firmware version and revision
levels          False
id_to_partition 0X800003C1AAD00002 Partition ID
False
id_to_system    0X800003C1AAD00000 System ID
False
iostat          false           Continuously maintain DISK I/O history
True

min_capacity     1.00                             Minimum
potential processor capacity          False
minpout         0               LOW water mark for pending write I/Os
per file    True
modelname       IBM,9117-MMA    Machine name
False
ncargs          6               ARG/ENV list size in 4K byte blocks
True
nfs4_acl_compat secure          NFS4 ACL Compatibility Mode
True
pre430core      false           Use pre-430 style CORE dump
True
pre520tune      disable         Pre-520 tuning compatibility mode
True
realmem         200015872       Amount of usable physical memory
in Kbytes       False
rtasversion     1               Open Firmware RTAS version
False
sed_config      select          Stack Execution Disable (SED) Mode
True
systemid        IBM,02102CFCD   Hardware system identifier
False
variable_weight 0               Variable processor capacity weight
False


vmo -L
NAME                      CUR    DEF    BOOT   MIN    MAX    UNIT
TYPE
    DEPENDENCIES
--------------------------------------------------------------------------------
cpu_scale_memp            8      8      8      1      64                B
--------------------------------------------------------------------------------
data_stagger_interval     161    161    161    0      4K-1   4KB pages
D
    lgpg_regions
--------------------------------------------------------------------------------
defps                     1      1      1      0      1      boolean     D
--------------------------------------------------------------------------------
force_relalias_lite       0      0      0      0      1      boolean     D
--------------------------------------------------------------------------------
framesets                 2      2      2      1      10                 B
--------------------------------------------------------------------------------
htabscale                 n/a    -1     -1     -4     0                  B
--------------------------------------------------------------------------------
kernel_heap_psize         16M    4K     16M    4K     16M    bytes
B
--------------------------------------------------------------------------------
kernel_psize              16M    0      0      0      16M    bytes       B
--------------------------------------------------------------------------------
large_page_heap_size      0      0      0      0      8E-1   bytes       B
    lgpg_regions
--------------------------------------------------------------------------------
lgpg_regions              1588   0      1610   0                         D
    lgpg_size
--------------------------------------------------------------------------------
lgpg_size                 16M    0      16M    0      16M    bytes       D
    lgpg_regions
--------------------------------------------------------------------------------
low_ps_handling           1      1      1      1      2                  D
--------------------------------------------------------------------------------
lru_file_repage           1      1      1      0      1      boolean     D
--------------------------------------------------------------------------------
lru_poll_interval         10     10     10     0      60000  milliseconds
D
--------------------------------------------------------------------------------
lrubucket                 128K   128K   128K   64K    4M     4KB pages
D
--------------------------------------------------------------------------------
maxclient%                80     80     80     1      100    % memory    D
    maxperm%
    minperm%
--------------------------------------------------------------------------------
maxfree                   1088   1088   1088   8      200K   4KB pages
D
    minfree
    memory_frames
--------------------------------------------------------------------------------
maxperm                   968302        968302                           S
--------------------------------------------------------------------------------
maxperm%                  80     80     80     1      100    % memory
D
    minperm%
    maxclient%
--------------------------------------------------------------------------------
maxpin                    48819K        48819K                           S
--------------------------------------------------------------------------------
maxpin%                   99     80     99     1      99     % memory    D
    pinnable_frames
    memory_frames
--------------------------------------------------------------------------------
mbuf_heap_psize           64K    0      0      0      16M    bytes       B
--------------------------------------------------------------------------------
memory_affinity           1      1      1      0      1      boolean     B
--------------------------------------------------------------------------------
memory_frames             48832K        48832K               4KB pages
S
--------------------------------------------------------------------------------
memplace_data             2      2      2      1      2                  D
    memory_affinity
--------------------------------------------------------------------------------
memplace_mapped_file      2      2      2      1      2                  D
    memory_affinity
--------------------------------------------------------------------------------
```

```
memplace_shm_anonymous    2     2     2     1     2
D
    memory_affinity
--------------------------------------------------------------------------------
memplace_shm_named        2     2     2     1     2                   D
    memory_affinity
--------------------------------------------------------------------------------
memplace_stack            2     2     2     1     2                   D
    memory_affinity
--------------------------------------------------------------------------------
memplace_text             2     2     2     1     2                   D
    memory_affinity
--------------------------------------------------------------------------------
memplace_unmapped_file    2     2     2     1     2                   D
    memory_affinity
--------------------------------------------------------------------------------
mempools                  2           2                               d
    cpu_scale_memp
--------------------------------------------------------------------------------
minfree                   960    960    960    8     200K   4KB pages
D
    maxfree
    memory_frames
--------------------------------------------------------------------------------
minperm                   242075        242075                        S
--------------------------------------------------------------------------------
minperm%                  20     20     20     1     100    % memory
D
    maxperm%
    maxclient%
--------------------------------------------------------------------------------
nokilluid                 0     0     0     0     4G-1   uid          D
--------------------------------------------------------------------------------
npskill                   36K    36K    36K    1     4M-1   4KB pages        D
--------------------------------------------------------------------------------
npsrpgmax                 288K   288K   288K   0     4M-1   4KB pages
D
    npsrpgmin
--------------------------------------------------------------------------------
npsrpgmin                 216K   216K   216K   0     4M-1   4KB pages
D
    npsrpgmax
--------------------------------------------------------------------------------
npsscrubmax               288K   288K   288K   0     4M-1   4KB pages
D
    npsscrubmin
--------------------------------------------------------------------------------
npsscrubmin               216K   216K   216K   0     4M-1   4KB pages
D
    npsscrubmax
--------------------------------------------------------------------------------
npswarn                   144K   144K   144K   0     4M-1   4KB pages
D
--------------------------------------------------------------------------------
num_spec_dataseg          0     0     0     0                         B
--------------------------------------------------------------------------------
numpsblks                 4608K         4608K         4KB blocks       S
--------------------------------------------------------------------------------
page_steal_method         0     0     0     0     1     boolean        B
--------------------------------------------------------------------------------
pagecoloring              n/a   0     0     0     1     boolean        B
--------------------------------------------------------------------------------
pinnable_frames           1115K         1115K         4KB pages
S
--------------------------------------------------------------------------------
pta_balance_threshold     n/a   1     1     0     99    % pta segment
D
--------------------------------------------------------------------------------
relalias_percentage       0     0     0     0     32K-1                D
--------------------------------------------------------------------------------
rpgclean                  0     0     0     0     1     boolean        D
--------------------------------------------------------------------------------
rpgcontrol                2     2     2     0     3                    D
--------------------------------------------------------------------------------
scrub                     0     0     0     0     1     boolean        D
--------------------------------------------------------------------------------
scrubclean                0     0     0     0     1     boolean        D
--------------------------------------------------------------------------------
soft_min_lgpgs_vmpool     0     0     0     0     90    %              D
    lgpg_regions
--------------------------------------------------------------------------------
spec_dataseg_int          512    512    512    0                      B
--------------------------------------------------------------------------------
strict_maxclient          1     1     1     0     1     boolean        D
    strict_maxperm
--------------------------------------------------------------------------------
strict_maxperm            0     0     0     0     1     boolean        D
    strict_maxclient
--------------------------------------------------------------------------------
v_pinshm                  1     0     1     0     1     boolean        D
--------------------------------------------------------------------------------
vm_modlist_threshold      -1    -1    -1    -2    2G-1                 D
--------------------------------------------------------------------------------
vmm_fork_policy           1     1     1     0     1     boolean        D
--------------------------------------------------------------------------------
vmm_mpsize_support        1     1     1     0     1     boolean
B
--------------------------------------------------------------------------------

n/a means parameter not supported by the current platform or kernel

Parameter types:
   S = Static: cannot be changed
   D = Dynamic: can be freely changed
   B = Bosboot: can only be changed using bosboot and reboot
   R = Reboot: can only be changed during reboot
   C = Connect: changes are only effective for future socket
connections
   M = Mount: changes are only effective for future mountings
   I = Incremental: can only be incremented
   d = deprecated: deprecated and cannot be changed

Value conventions:
   K = Kilo: 2^10       G = Giga: 2^30       P = Peta: 2^50
   M = Mega: 2^20       T = Tera: 2^40       E = Exa: 2^60
```

Appendix - C: Database Setup Code

C.1 Database Creation Scripts

createuser.sh

```
#!/bin/sh

echo Creating user tpcc...
$tpcc_sqlplus $tpcc_dba_user_pass @$tpcc_sql_dir/createuser >
junk 2>&1
if test $? -ne 0
then
  exit 1;
else
  exit 0;
fi
```

createts.sh

```
#created automatically by
/scratch/roagrawa/ibm/tpcc_P64way/scripts/buildcreatets.sh Tue
Feb 20 10:47:31 PST 2007

# Tablespace ware, ts size 160M (163840K)
# each file 160M (163840K)
# extents 155104K (155104K)
# 1 files

$tpcc_createts ware 1 1     160M 155104K unix 0     0 4 auto t
    if expr $? != 0 > /dev/null; then
      echo Creating tablespace for ware failed.  Exiting.
      exit 0
    fi

# Tablespace cust, ts size 1101930M (1128376320K)
# each file 15970M (16353280K)
# extents 226988K (226988K)
# 69 files

$tpcc_createts cust 69 1     15970M 226988K unix 0     1 4 auto t
    if expr $? != 0 > /dev/null; then
      echo Creating tablespace for cust failed.  Exiting.
      exit 0
    fi

# Tablespace dist, ts size 1510M (1546240K)
# each file 1510M (1546240K)
# extents 1541824K (1541824K)
# 1 files

$tpcc_createts dist 1 1     1510M 1541824K unix 0     54 4 auto t
    if expr $? != 0 > /dev/null; then
      echo Creating tablespace for dist failed.  Exiting.
      exit 0
    fi

# Tablespace hist, ts size 93660M (95907840K)
# each file 15610M (15984640K)
# extents 103084K (103084K)
# 6 files

$tpcc_createts hist 6 1     15610M 103084K unix 0     55 4 auto t
    if expr $? != 0 > /dev/null; then
      echo Creating tablespace for hist failed.  Exiting.
      exit 0
    fi

# Tablespace stok, ts size 1080040M (1105960960K)
# each file 8060M (8253440K)
# extents 223002K (223002K)
# 134 files

$tpcc_createts stok 134 1     8060M 223002K unix 0     61 4 2K t
    if expr $? != 0 > /dev/null; then
      echo Creating tablespace for stok failed.  Exiting.
      exit 0
    fi

# Tablespace item, ts size 20M (20480K)
# each file 20M (20480K)
# extents 16892K (16892K)
# 1 files

$tpcc_createts item 1 1     20M 16892K unix 0     128 4 auto t
    if expr $? != 0 > /dev/null; then
      echo Creating tablespace for item failed.  Exiting.
      exit 0
    fi

# Tablespace ordr, ts size 1279200M (1309900800K)
# each file 63960M (65495040K)
# extents 103296K (103296K)
# 20 files

$tpcc_createts ordr 20 1     63960M 103296K unix 0     129 4 16K
t
    if expr $? != 0 > /dev/null; then
      echo Creating tablespace for ordr failed.  Exiting.
      exit 0
    fi

# Tablespace nord, ts size 11990M (12277760K)
# each file 11990M (12277760K)
# extents 1227376K (1227376K)
# 1 files

$tpcc_createts nord 1 1     11990M 1227376K unix 0     149 4
auto t
    if expr $? != 0 > /dev/null; then
      echo Creating tablespace for nord failed.  Exiting.
      exit 0
    fi

# Tablespace iware, ts size 50M (51200K)
# each file 50M (51200K)
# extents 46024K (46024K)
# 1 files

$tpcc_createts iware 1 1     50M 46024K unix 0     150 4 auto t
    if expr $? != 0 > /dev/null; then
      echo Creating tablespace for iware failed.  Exiting.
      exit 0
    fi

# Tablespace icust1, ts size 25350M (25958400K)
# each file 25350M (25958400K)
# extents 811024K (811024K)
# 1 files

$tpcc_createts icust1 1 1     25350M 811024K unix 0     151 4 16K
t
    if expr $? != 0 > /dev/null; then
      echo Creating tablespace for icust1 failed.  Exiting.
      exit 0
    fi
```

```
# Tablespace icust2, ts size 57120M (58490880K)
# each file 14280M (14622720K)
# extents 456652K (456652K)
# 4 files

$tpcc_createts icust2 4 1       14280M 456652K unix 0       152 4
auto t
    if expr $? != 0 > /dev/null; then
      echo Creating tablespace for icust2 failed.  Exiting.
      exit 0
    fi

# Tablespace idist, ts size 180M (184320K)
# each file 180M (184320K)
# extents 181024K (181024K)
# 1 files

$tpcc_createts idist 1 1       180M 181024K unix 0       156 4 auto t
    if expr $? != 0 > /dev/null; then
      echo Creating tablespace for idist failed.  Exiting.
      exit 0
    fi

# Tablespace istok, ts size 75080M (76881920K)
# each file 37540M (38440960K)
# extents 1201024K (1201024K)
# 2 files

$tpcc_createts istok 2 1       37540M 1201024K unix 0       157 4 16K
t
    if expr $? != 0 > /dev/null; then
      echo Creating tablespace for istok failed.  Exiting.
      exit 0
    fi

# Tablespace iitem, ts size 20M (20480K)
# each file 20M (20480K)
# extents 11264K (11264K)
# 1 files

$tpcc_createts iitem 1 1       20M 11264K unix 0       159 4 auto t
    if expr $? != 0 > /dev/null; then
      echo Creating tablespace for iitem failed.  Exiting.
      exit 0
    fi

# Tablespace iordr2, ts size 55960M (57303040K)
# each file 13990M (14325760K)
# extents 102988K (102988K)
# 4 files

$tpcc_createts iordr2 4 1       13990M 102988K unix 0       160 4
auto t
    if expr $? != 0 > /dev/null; then
      echo Creating tablespace for iordr2 failed.  Exiting.
      exit 0
    fi

# Tablespace temp, ts size 188520M (193044480K)
# each file 15710M (16087040K)
# extents 203556K (203556K)
# 12 files

$tpcc_createts temp 12 1       15710M 203556K unix 1       164 4
auto t
    if expr $? != 0 > /dev/null; then
      echo Creating tablespace for temp failed.  Exiting.
      exit 0
    fi
```

addfile.sh

```
#!/bin/sh
# $1 = tablespace name
# $2 = filename
# $3 = size
# $4 = temporary ts (1) or not (0)
# global variable $tpcc_listfiles, does not execute sql

if expr x$tpcc_listfiles = xt > /dev/null; then
  echo $2 $3 >> $tpcc_bench/files.dat
  exit 0
fi

if expr $4 = 1 > /dev/null; then
  altersql="alter tablespace $1 add tempfile '$2' size $3 reuse;"
else
  altersql="alter tablespace $1 add datafile '$2' size $3 reuse
autoextend on;"
fi

$tpcc_sqlplus $tpcc_user_pass <<!
   spool addfile_$1.log
   set echo on
  $altersql
   set echo off
   spool off
   exit ;
!
```

addts.sh

```
#!/bin/sh
# $1 = tablespace name
# $2 = filename
# $3 = size
# $4 = uniform size
# $5 = block size
# $6 = temporary ts (1) or not (0)
# $7 = bitmapped manage (t) or not (f) or (d) for dictionary
# global variable $tpcc_listfiles, does not execute sql

if expr x$tpcc_listfiles = xt > /dev/null; then
  echo $2 $3 >> $tpcc_bench/files.dat
  exit 0
fi

if expr $5 = auto > /dev/null; then
  bssql=
else
  bssql="blocksize $5"
fi

if expr $6 = 1 > /dev/null; then
  createsql="create temporary tablespace $1 tempfile '$2' size $3
reuse extent management local uniform size $4;"
else
  if expr x$7 = xt > /dev/null; then
    createsql="create tablespace $1 datafile '$2' size $3 reuse extent
management local uniform size $4 segment space management
auto $bssql nologging ;"
  else
    if expr x$7 = xd > /dev/null; then
      createsql="create tablespace $1 datafile '$2' size $3 reuse
extent management dictionary nologging $bssql;"
    else
      createsql="create tablespace $1 datafile '$2' size $3 reuse
extent management local uniform size $4 segment space
management manual $bssql nologging ;"
    fi
  fi
fi
```

```
$tpcc_sqlplus $tpcc_user_pass <<!
   spool createts_$1.log
   set echo on
   drop tablespace $1 including contents;
 $createsql
   set echo off
   spool off
   exit ;
!
```

assigntemp.sh

```
#!/bin/sh

echo Assigning temporary tablespace to user tpcc...
$tpcc_sqlplus $tpcc_dba_user_pass @$tpcc_sql_dir/assigntemp >
junk 2>&1
if test $? -ne 0
then
  exit 1;
else
  exit 0;
fi
```

stepenv.sh

```
# forces any env variables we set to be exported
set -a
tpcc_kit=t
tpcc_bench=$PWD
tpcc_scripts=$tpcc_bench/scripts
tpcc_require=$tpcc_scripts/require_vars.sh
tpcc_lcm=$tpcc_scripts/lcm.sh
tpcc_tokilobytes=$tpcc_scripts/tokilobytes.sh
tpcc_fromkilobytes=$tpcc_scripts/fromkilobytes.sh
tpcc_estsize=$tpcc_scripts/estsize.sh
tpcc_notneg=$tpcc_scripts/notneg.sh
tpcc_isneg=$tpcc_scripts/isneg.sh


# need a better way to check for bc, may
# resort to checking each directory in path
# if this doesn't work
#11/7/02 - alex.ni this is causing too many problems
#because systems have bc in some odd place.  typically
#mangled cygwin installs w/ mksnt/cygwin mixes
#if test -x /usr/bin/bc -o -x /bin/bc; then
tpcc_bcexpr=$tpcc_scripts/bcexpr.sh
#else
#tpcc_bcexpr=expr
#fi


# the ksh version is a bit faster, so we want
# to use it if we have ksh.  Otherwise we have
# a compatible version.
#if test -x /bin/ksh; then
#tpcc_createts=$tpcc_scripts/createts.ksh
#else
tpcc_createts=$tpcc_scripts/createts.sh
#fi

tpcc_tabledata=$tpcc_scripts/tabledata.sh
tpcc_load=$tpcc_bench/benchrun/bin/tpccload.exe
tpcc_createtablespaces=$tpcc_scripts/createtablespaces.sh

##
tpcc_sqlplus=cat
tpcc_sqlplus_args='/nolog'
tpcc_internal_connect='connect / as sysdba'
tpcc_user_pass='tpcc/tpcc'
tpcc_dba_user_pass='system/manager'
oracle_dba=system
oracle_dba_password=manager
tpcc_sqlplus=sqlplus

# import options generated by gui
. ${tpcc_bench}/options.sh

#8gb oracle filesize limit (in k)
tpcc_fsize_limit_k=8243200
#2gb - 1k oracle extent limit (in k)
tpcc_extent_limit_k=2048000
#file number limit: 1024
tpcc_file_number_limit=1024

# Runlen calculations should be in hours, but
# this was the old calculation, which assumed
# minutes, and also 8 times:
# tpcc_runlen=`$tpcc_bcexpr 8 \* 60 \* $tpcc_runlen`
# we just want to keep the value as it is.

tpcc_system_size=400M
tpcc_kilo_bytes=1024
#tpcc_logfile_size=`$tpcc_bcexpr 20 + \( $tpcc_scale \)`

if test $tpcc_np -gt 1 ; then
  # 4.69k per commit * 2.1 commit per TPMC ~ 9.85K
  # 9.85k * 30 minutes * 12.5 TPMC per Warehouse = 3693
  tpcc_logfile_size=`$tpcc_bcexpr \( $tpcc_scale \* 3693 \) /
$tpcc_kilo_bytes`
else
  # 2.4k per commit * 2.1 commit per TPMC ~ 5k
  # 5k * 30 minutes * 12.5 TPMC per Warehouse = 1875
  tpcc_logfile_size=`$tpcc_bcexpr \( $tpcc_scale \* 1875 \) /
$tpcc_kilo_bytes`
fi

if test $tpcc_logfile_size -lt 1024; then
  tpcc_logfile_size=1024
fi
tpcc_logfile_size="${tpcc_logfile_size}M"

tpcc_undo_size=`$tpcc_bcexpr 2 \* $tpcc_scale`
if test $tpcc_undo_size -gt 8096; then
  tpcc_undo_size=8096
fi
if test $tpcc_undo_size -lt 512; then
  tpcc_undo_size=512
fi
tpcc_undo_size="${tpcc_undo_size}M"

tpcc_undo_bs=8K

tpcc_statspack_size=`$tpcc_bcexpr 1 \* $tpcc_scale`
if test $tpcc_statspack_size -gt 2048; then
  tpcc_statspack_size=2048
fi
if test $tpcc_statspack_size -lt 300; then
  tpcc_statspack_size=300
fi
tpcc_statspack_size="${tpcc_statspack_size}M"

tpcc_sysaux_size=120M

# fixed table params

#table list (note temp is always at the end since it may use numbers
from other tables, and it's not included in these lists)
tpcc_table_list='ware cust dist hist stok item ordr ordl nord'
tpcc_index_list='iware icust1 icust2 idist istok iitem iordr1 iordr2 iordl
inord'
#for these I use average row length, calculated from multi-blocksize
stats.
```

```
#we figure out how many new rows we will gain in a run (in
createtablesspaces.sh)
#and add that much to the base tablespace size.
tpcc_hist_growth=51
tpcc_ordr_growth=35
tpcc_nord_growth=regular
#tpcc_ordl_growth=660
tpcc_ordl_growth=900

#i started indices at 1/10th... need an exact figure
tpcc_iordr1_growth=20
tpcc_iordr2_growth=20
tpcc_iordl_growth=66
tpcc_inord_growth=2

tpcc_item_growth=0
tpcc_iitem_growth=0
tpcc_temp_growth=0

tpcc_cust_growth=regular
tpcc_icust1_growth=regular
tpcc_icust2_growth=regular

tpcc_stok_growth=regular
tpcc_istok_growth=regular

tpcc_ware_growth=regular
tpcc_iware_growth=regular

tpcc_dist_growth=regular
tpcc_idist_growth=regular

# minimum size of temp tablespace
tpcc_tempts_min=10240

# for Linux, set appropriate tablespace heuristics
# to set high io tables to have 64 files, and minimize
# others.
if expr $tpcc_os = linux > /dev/null; then
#  for table in $tpcc_table_list $tpcc_index_list temp; do
#    eval "tpcc_${table}_tsfileinc=1"
#  done
  if test $tpcc_numfiles = 0 ; then
    tpcc_numfiles=256
  fi
  tpcc_os=unix

#  tpcc_stok_tsfileinc=64
#  tpcc_cust_tsfileinc=64
#  tpcc_iordl2_tsfileinc=16
#  tpcc_icust2_tsfileinc=16
#  tpcc_iordl_tsfileinc=16
else
#in case someone changes out of linux, and the shell is stuck
  for table in $tpcc_table_list $tpcc_index_list temp; do
    eval "tpcc_${table}_tsfileinc="
  done
fi
  tpcc_stok_tsfileinc=
  tpcc_cust_tsfileinc=
  tpcc_iordl2_tsfileinc=
  tpcc_icust2_tsfileinc=
  tpcc_iordl_tsfileinc=
#fi


# import local options
. ${tpcc_bench}/localoptions.sh

if expr `echo x$tpcc_no_options` = xt > /dev/null; then
  echo Please modify ${tpcc_bench}/localoptions.sh to configure the
generator.
  exit 1
fi

tpcc_fixordrordl=${tpcc_genscripts_dir}/loadfixordrordl.sh
tpcc_updateordrordl=${tpcc_scripts}/updateordrordl.sh

#tp- get table param.  (that is, $tpcc_tablename_tableparam)
tp(){
  eval echo \""\$tpcc_$1_$2"\"
}

# automatically generated variables
if expr `echo $tpcc_version | cut -b1` = t > /dev/null; then
  tpcc_auto_undo=t
else
  tpcc_auto_undo=f
fi
if expr `echo $tpcc_version | cut -b2` = t > /dev/null; then
  tpcc_autospace_avail=t
else
  tpcc_autospace_avail=f
fi
if expr `echo $tpcc_version | cut -b3` = t > /dev/null; then
  tpcc_queue_avail=t
  tpcc_use_sysaux=t
else
  tpcc_queue_avail=f
  tpcc_use_sysaux=f
fi

# for NT, ORACLE does not like $variables in sql scripts, so we
must
# hardcode these things for it.
if test x$tpcc_os = xnt; then
  tpcc_hardcode=t
else
  tpcc_hardcode=f
fi

# if this is unset we need to make sure it's something anyway
if test x$tpcc_defbs = x; then
  tpcc_defbs=2
fi

# used for loading program
if test x$tpcc_hash_overflow = xt; then
  tpcc_hash_overflow=t
else
  unset tpcc_hash_overflow
fi
if test x$tpcc_overflow = xt; then
  tpcc_hash_overflow=t
else
  unset tpcc_hash_overflow
fi

tpcc_create_steps="buildtpccflags buildcreatets buildcreatedb \
buildcreatetable-ware buildcreatetable-cust buildcreatetable-dist
buildcreatetable-hist buildcreatetable-stok buildcreatetable-item
buildcreatetable-ordr buildcreatetable-ordl buildcreatetable-nord \
buildloadware buildloaddist buildloaditem buildloadhist buildloadnord
buildloadordrordl buildloadcust buildloadstok \
buildcreateindex-iware buildcreateindex-icust1 buildcreateindex-
icust2 buildcreateindex-idist buildcreateindex-istok buildcreateindex-
iitem buildcreateindex-iordr1 buildcreateindex-iordr2
buildcreateindex-iordl buildcreateindex-inord \
buildstoreprocsql buildspacestats listfiles
"

# remove runscript-loadfixordrordl - shuang, 030626
```

```
tpcc_steps="runsqllocal-createdb shutdowndb startupdb-p_build
createuser ddview runscript-createts assigntemp \
  runsql-createtable_ware runsql-createtable_cust runsql-
createtable_dist runsql-createtable_hist runsql-createtable_stok
runsql-createtable_item runsql-createtable_ordr runsql-
createtable_ordl runsql-createtable_nord \
runscript-loadware runscript-loaddist runscript-loaditem runscript-
loadhist runscript-loadnord runscript-loadordrordl runscript-loadcust
runscript-loadstok \
analyze runsql-createindex_iware runsql-createindex_icust1 runsql-
createindex_icust2 runsql-createindex_idist runsql-createindex_istok
runsql-createindex_iitem runsql-createindex_iordr1 runsql-
createindex_iordr2 runsql-createindex_iordl runsql-
createindex_inord \
createstats createstoredprocs createspacestats createmisc"


tpcc_total_files=524

# no longer automatically exports env variables
set +a

# check for problems with configuration
badconf=
for table in $tpcc_table_list; do
  if expr `tp $table imp` = queue > /dev/null; then
    if expr $tpcc_queue_avail = f > /dev/null; then
   echo Table $table may not be a queue, since queues are
   echo are unavailable in the selected Oracle version.
   badconf=t
    fi
  fi
  if expr $tpcc_autospace_avail = f \& `tp $table autospace` = t >
/dev/null; then
    echo Table $table may not use bitmapped space management
    echo since it is not available in the selected Oracle version.
    badconf=t
  fi
done

if test -n "$badconf"; then
  exit 1
fi

# make sure we have everything
if $tpcc_require ORACLE_SID \
 tpcc_tokilobytes tpcc_createts tpcc_lcm\
 tpcc_sqlplus tpcc_internal_connect\
 tpcc_np tpcc_cpu tpcc_os tpcc_runlen tpcc_ldrive tpcc_scale
tpcc_disks_location tpcc_auto_undo tpcc_tempts_min\
 tpcc_system_size tpcc_logfile_size\
 tpcc_undo_size tpcc_undo_bs\
 oracle_dba oracle_dba_password tpcc_dba_user_pass
then exit 1; fi

if test x$tpcc_hardcode != xt; then
  tpcc_disks_location=${tpcc_disks_location}/
#  tpcc_sql_dir='$tpcc_sql_dir'
#  tpcc_statspack_size='$tpcc_statspack_size'
#  tpcc_genscripts_dir='$tpcc_genscripts_dir'
fi
```

driver.sh

```
#!/bin/sh

. ./stepenv.sh

if expr $# \< 1 > /dev/null; then
  echo "$0 <starting stepname> <optional: only>"
  echo OR use:
  echo "$0 buildcreate  - to build the database creation scripts"
  echo "$0 create       - to create the database (after buildcreate)"
  echo "$0 steps        - to list individual steps"
  exit 1
fi

if expr x$1 = xsteps > /dev/null; then
  echo stepnames are from creation scripts: $tpcc_create_steps
  echo
  echo or running steps: $tpcc_steps
  echo "use the 'only' option to only do that step (otherwise all steps
after will also be executed.)"
  echo "   (e.g.  $0 listfiles only)"
  echo "use the 'through' option to do a sequence of steps
(inclusively.)"
  echo "   (e.g.  $0 shutdowndb through startupdb-p_build)"
  exit 1
fi

startstep=$1
controlcmd=$2
endstep=$3

# Aliases for special steps
if test $startstep = buildcreate; then
  startstep=`echo $tpcc_create_steps | cut -d' ' -f1`
fi

if test $startstep = create; then
  startstep=`echo $tpcc_steps | cut -d' ' -f1`
fi

if test "x$controlcmd" = x; then
  endstep=
  # Since endstep is null it won't match any other steps, so we keep
going.
elif test "x$controlcmd" = xonly; then
  controlcmd=only
  # this is allowed
elif test "x$controlcmd" = xthrough; then
  actualstep=f
  for step in $tpcc_create_steps $tpcc_steps ; do
    if test "x$step" = "x$endstep"; then
      actualstep=t
    fi
  done
  if test $actualstep = f; then
    echo "Invalid step $endstep.  Use $0 steps  to show steps."
    exit 1
  fi
else
  echo "Invalid syntax.  Use $0 by itself for help."
  exit 1
fi

echo Starting from step: $startstep

dostep=f
for step in $tpcc_create_steps $tpcc_steps ; do
  if expr $step = $startstep > /dev/null; then
    dostep=t
  fi

  if expr $dostep = t > /dev/null; then
    echo STEP: $step
    cd $tpcc_bench
    $tpcc_scripts/`echo $step | cut -d- -f1`.sh `echo $step | sed -e's/-
*$/-/' | cut -d- -f2- | sed -e's/-/ /g'`
    lasterror=$?
    cd $tpcc_bench
    if test -n "`find $tpcc_bench/scripts -name '*.log'`"; then
```

```
  mv -f *.log `find $tpcc_bench/scripts -name '*.log'`
$tpcc_bench/log/
    else
      if test -n "`find $tpcc_bench/ -name '*.log'`"; then
        mv -f *.log $tpcc_bench/log/
      fi
    fi

    if expr $lasterror != 0 > /dev/null; then
      if expr $lasterror != 99 > /dev/null; then
        echo Step $step failed.  Stopping driver.
        exit 1
      else
        echo Step $step has completed and requested stop.  Stopping
driver.
        exit 0
      fi
    fi
    if test "x$controlcmd" = xonly; then
      exit 0
    fi
    if test "x$endstep" = "x$step"; then
      echo The driver reached the last desired step.  Stopping driver.
      exit 0
    fi
  fi
done

if expr $dostep = f > /dev/null; then
  echo No such step: $1
fi
```

loadware.sh

```
cd $tpcc_bench
$tpcc_load -M $tpcc_scale -w > loadware.log 2>&1
```

loaddist.sh

```
cd $tpcc_bench
$tpcc_load -M $tpcc_scale -d > loaddist.log 2>&1
```

loaditem.sh

```
cd $tpcc_bench
$tpcc_load -M $tpcc_scale -i > loaditem.log 2>&1
```

loadhist.sh

```
#created automatically by
/scratch/roagrawa/ibm/tpcc_P64way/scripts/evenload.sh Tue Feb 20
10:47:57 PST 2007
rm -f loadhist*.log
cd $tpcc_bench
allprocs=
$tpcc_load -M 36000 -h  -b 1 -e 4500 >> loadhist0.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -h  -b 4501 -e 9000 >> loadhist1.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -h  -b 9001 -e 13500 >> loadhist2.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -h  -b 13501 -e 18000 >> loadhist3.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -h  -b 18001 -e 22500 >> loadhist4.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -h  -b 22501 -e 27000 >> loadhist5.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -h  -b 27001 -e 31500 >> loadhist6.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -h  -b 31501 -e 36000 >> loadhist7.log 2>&1 &
allprocs="$allprocs ${!}"
error=0
for curproc in $allprocs; do
  wait $curproc
  error=`expr $? + $error`
done
exit `expr $error != 0`
```

loadnord.sh

```
#created automatically by
/scratch/roagrawa/ibm/tpcc_P64way/scripts/evenload.sh Tue Feb 20
10:47:58 PST 2007
rm -f loadnord*.log
cd $tpcc_bench
allprocs=
$tpcc_load -M 36000 -n  -b 1 -e 36000 >> loadnord0.log 2>&1 &
allprocs="$allprocs ${!}"
error=0
for curproc in $allprocs; do
  wait $curproc
  error=`expr $? + $error`
done
exit `expr $error != 0`
```

loadordrordl.sh

```
#created automatically by
/scratch/roagrawa/ibm/tpcc_P64way/scripts/evenload.sh Tue Feb 20
10:47:58 PST 2007
rm -f loadordrordl*.log
cd $tpcc_bench
allprocs=
$tpcc_load -M 36000 -o ${tpcc_disks_location}dummy0.dat -b 1 -e
4500 >> loadordrordl0.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -o ${tpcc_disks_location}dummy1.dat -b 4501
-e 9000 >> loadordrordl1.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -o ${tpcc_disks_location}dummy2.dat -b 9001
-e 13500 >> loadordrordl2.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -o ${tpcc_disks_location}dummy3.dat -b
13501 -e 18000 >> loadordrordl3.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -o ${tpcc_disks_location}dummy4.dat -b
18001 -e 22500 >> loadordrordl4.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -o ${tpcc_disks_location}dummy5.dat -b
22501 -e 27000 >> loadordrordl5.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -o ${tpcc_disks_location}dummy6.dat -b
27001 -e 31500 >> loadordrordl6.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -o ${tpcc_disks_location}dummy7.dat -b
31501 -e 36000 >> loadordrordl7.log 2>&1 &
allprocs="$allprocs ${!}"
error=0
for curproc in $allprocs; do
  wait $curproc
  error=`expr $? + $error`
done
exit `expr $error != 0`
```

loadcust.sh

```
#created automatically by
/scratch/roagrawa/ibm/tpcc_P64way/scripts/evenload.sh Tue Feb 20
10:47:58 PST 2007
rm -f loadcust*.log
cd $tpcc_bench
```

```
allprocs=
$tpcc_load -M 36000 -C  -l 1 -m 375 >> loadcust0.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -C  -l 376 -m 750 >> loadcust1.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -C  -l 751 -m 1125 >> loadcust2.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -C  -l 1126 -m 1500 >> loadcust3.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -C  -l 1501 -m 1875 >> loadcust4.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -C  -l 1876 -m 2250 >> loadcust5.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -C  -l 2251 -m 2625 >> loadcust6.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -C  -l 2626 -m 3000 >> loadcust7.log 2>&1 &
allprocs="$allprocs ${!}"
error=0
for curproc in $allprocs; do
  wait $curproc
  error=`expr $? + $error`
done
exit `expr $error != 0`
```

loadstok.sh

```
#created automatically by
/scratch/roagrawa/ibm/tpcc_P64way/scripts/evenload.sh Tue Feb 20
10:47:58 PST 2007
rm -f loadstok*.log
cd $tpcc_bench
allprocs=
$tpcc_load -M 36000 -S  -j 1 -k 12500 >> loadstok0.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -S  -j 12501 -k 25000 >> loadstok1.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -S  -j 25001 -k 37500 >> loadstok2.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -S  -j 37501 -k 50000 >> loadstok3.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -S  -j 50001 -k 62500 >> loadstok4.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -S  -j 62501 -k 75000 >> loadstok5.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -S  -j 75001 -k 87500 >> loadstok6.log 2>&1 &
allprocs="$allprocs ${!}"
$tpcc_load -M 36000 -S  -j 87501 -k 100000 >> loadstok7.log 2>&1
&
allprocs="$allprocs ${!}"
error=0
for curproc in $allprocs; do
  wait $curproc
  error=`expr $? + $error`
done
exit `expr $error != 0`
```

C.2 SQL Creation Scripts

createdb.sql

```
/* created automatically by
/scratch/roagrawa/ibm/tpcc_P64way/dbf/scripts/buildcreatedb.sh
Tue Feb 20 10:47:43 PST 2007 */
spool createdb.log

set echo on

shutdown abort

startup pfile=p_create.ora nomount
create database tpcc
  controlfile reuse
  maxinstances 1
  datafile
   '/home/oracle/bench/tpcc_P64way/dbf/system_1' size 400M reuse
  logfile '/home/oracle/bench/tpcc_P64way/dbf/log_1_1' size 20000M
reuse,
         '/home/oracle/bench/tpcc_P64way/dbf/log_1_2' size 20000M
reuse
  sysaux datafile '/home/oracle/bench/tpcc_P64way/dbf/tpccaux' size
120M reuse ;



create undo tablespace undo_1 datafile
  '/home/oracle/bench/tpcc_P64way/dbf/roll1' size 8096M reuse
blocksize 8K;

set echo off
exit sql.sqlcode
```

createuser.sql

```
spool createusertpcc.log;

set echo on;

create user tpcc identified by tpcc;

grant dba to tpcc;

set echo off;
spool off;

exit ;
```

assigntemp.sql

```
spool assigntemp.log;

set echo on;

alter user tpcc temporary tablespace temp_0;

set echo off;
spool off;

exit ;
```

createtable_ware.sql

```
/* created automatically by
/scratch/roagrawa/ibm/tpcc_P64way/scripts/buildcreatetable.sh Tue
Feb 20 10:47:44 PST 2007 */
set timing on
    set sqlblanklines on
    spool createtable_ware.log
    set echo on
      drop cluster warecluster including tables ;

create cluster warecluster (
  w_id number
  )
  single table
  hashkeys 36000
  hash is ( (w_id - 1) )
  size 3496
    initrans 2
  storage ( buffer_pool default )
```

```
  tablespace ware_0;

create table ware (
  w_id number
, w_ytd number
, w_tax number
, w_name varchar2(10)
, w_street_1 varchar2(20)
, w_street_2 varchar2(20)
, w_city varchar2(20)
, w_state char(2)
, w_zip char(9)
)
cluster warecluster (
  w_id
);
    set echo off
    spool off
    exit sql.sqlcode;
```

createtable_cust.sql

```
/* created automatically by
/scratch/roagrawa/ibm/tpcc_P64way/scripts/buildcreatetable.sh Thu
Feb 22 10:34:49 PST 2007 */
set timing on
    set sqlblanklines on
    spool createtable_cust.log
    set echo on
      drop cluster custcluster including tables ;

create cluster custcluster (
  c_id number
, c_d_id number
, c_w_id number
  )
  single table
  hashkeys 1080000000
  hash is ( (c_id * ( 36000 * 10 ) + c_w_id * 10 + c_d_id) )
  size 360
  pctfree 0  initrans 3
  storage ( buffer_pool recycle ) parallel ( degree 4 )
  tablespace cust_0;

create table cust (
  c_id number
, c_d_id number
, c_w_id number
, c_discount number
, c_credit char(2)
, c_last varchar2(16)
, c_first varchar2(16)
, c_credit_lim number
, c_balance number
, c_ytd_payment number
, c_payment_cnt number
, c_delivery_cnt number
, c_street_1 varchar2(20)
, c_street_2 varchar2(20)
, c_city varchar2(20)
, c_state char(2)
, c_zip char(9)
, c_phone char(16)
, c_since date
, c_middle char(2)
, c_data char(500)
)
cluster custcluster (
  c_id
, c_d_id
, c_w_id
);
    set echo off
    spool off
    exit sql.sqlcode;
```

createtable_dist.sql

```
/* created automatically by
/scratch/roagrawa/ibm/tpcc_P64way/scripts/buildcreatetable.sh Tue
Feb 20 10:47:48 PST 2007 */
set timing on
    set sqlblanklines on
    spool createtable_dist.log
    set echo on
      drop cluster distcluster including tables ;

create cluster distcluster (
  d_id number
, d_w_id number
  )
  single table
  hashkeys 360000
  hash is ( ((d_w_id * 10) + d_id) )
  size 3496
    initrans 4
  storage ( buffer_pool default )
  tablespace dist_0;

create table dist (
  d_id number
, d_w_id number
, d_ytd number
, d_next_o_id number
, d_tax number
, d_name varchar2(10)
, d_street_1 varchar2(20)
, d_street_2 varchar2(20)
, d_city varchar2(20)
, d_state char(2)
, d_zip char(9)
)
cluster distcluster (
  d_id
, d_w_id
);
    set echo off
    spool off
    exit sql.sqlcode;
```

createtable_hist.sql

```
/* created automatically by
/scratch/roagrawa/ibm/tpcc_P64way/scripts/buildcreatetable.sh Tue
Feb 20 10:47:50 PST 2007 */
set timing on
    set sqlblanklines on
    spool createtable_hist.log
    set echo on
      drop table hist ;

create table hist (
  h_c_id number
, h_c_d_id number
, h_c_w_id number
, h_d_id number
, h_w_id number
, h_date date
, h_amount number
, h_data varchar2(24)
)
  pctfree 5  initrans 4
  storage ( buffer_pool recycle )
  tablespace hist_0 ;
```

```
set echo off
spool off
exit sql.sqlcode;
```

createtable_stok.sql

```
/* created automatically by
/scratch/roagrawa/ibm/tpcc_P64way/scripts/buildcreatetable.sh Tue
Feb 20 10:47:51 PST 2007 */
set timing on
  set sqlblanklines on
  spool createtable_stok.log
  set echo on
    drop cluster stokcluster including tables ;

create cluster stokcluster (
 s_i_id number
, s_w_id number
 )
 single table
 hashkeys 3600000000
 hash is ( (s_i_id * 36000 + s_w_id) )
 size 270
 pctfree 0  initrans 2 maxtrans 2
 storage ( buffer_pool keep ) parallel ( degree 4 )
 tablespace stok_0;

create table stok (
 s_i_id number
, s_w_id number
, s_quantity number
, s_ytd number
, s_order_cnt number
, s_remote_cnt number
, s_data varchar2(50)
, s_dist_01 char(24)
, s_dist_02 char(24)
, s_dist_03 char(24)
, s_dist_04 char(24)
, s_dist_05 char(24)
, s_dist_06 char(24)
, s_dist_07 char(24)
, s_dist_08 char(24)
, s_dist_09 char(24)
, s_dist_10 char(24)
)
cluster stokcluster (
 s_i_id
, s_w_id
);
  set echo off
  spool off
  exit sql.sqlcode;
```

createtable_item.sql

```
/* created automatically by
/scratch/roagrawa/ibm/tpcc_P64way/scripts/buildcreatetable.sh Tue
Feb 20 10:47:53 PST 2007 */
set timing on
  set sqlblanklines on
  spool createtable_item.log
  set echo on
    drop cluster itemcluster including tables ;

create cluster itemcluster (
 i_id number(6,0)
 )
 single table
 hashkeys 100000
 hash is ( (i_id) )
 size 120
 pctfree 0  initrans 3
 storage ( buffer_pool keep )
 tablespace item_0;

create table item (
 i_id number(6,0)
, i_name varchar2(24)
, i_price number
, i_data varchar2(50)
, i_im_id number
)
cluster itemcluster (
 i_id
);
  set echo off
  spool off
  exit sql.sqlcode;
```

createtable_ordl.sql

```
/* created automatically by
/scratch/roagrawa/ibm/tpcc_P64way/scripts/buildcreatetable.sh Tue
Feb 20 10:47:56 PST 2007 */
set timing on
  set sqlblanklines on
  spool createtable_ordl.log
  set echo on
    create table ordl (
  ol_w_id number
, ol_d_id number
, ol_o_id number sort
, ol_number number sort
, ol_i_id number
, ol_delivery_d date
, ol_amount number
, ol_supply_w_id number
, ol_quantity number
, ol_dist_info char(24)
  , constraint ordl_uk primary key (ol_w_id, ol_d_id, ol_o_id,
ol_number  )) CLUSTER ordrcluster_queue(ol_w_id, ol_d_id,
ol_o_id, ol_number) ;
  set echo off
  spool off
  exit sql.sqlcode;
```

createtable_nord.sql

```
/* created automatically by
/scratch/roagrawa/ibm/tpcc_P64way/scripts/buildcreatetable.sh Tue
Feb 20 10:47:57 PST 2007 */
set timing on
  set sqlblanklines on
  spool createtable_nord.log
  set echo on
    drop cluster nordcluster_queue including tables ;

 create cluster nordcluster_queue (
  no_w_id number
, no_d_id number
, no_o_id number SORT
  )

  hashkeys 360000
  hash is ( (no_w_id - 1) * 10 + no_d_id - 1 )
  size 190
  tablespace nord_0;

 create table nord (
  no_w_id number
, no_d_id number
, no_o_id number sort
  , constraint nord_uk primary key ( no_w_id
```

```
, no_d_id
, no_o_id )
  )
  cluster nordcluster_queue (
    no_w_id
, no_d_id
, no_o_id
  );
    set echo off
    spool off
    exit sql.sqlcode;
```

createindex_iware.sql

```
/* created automatically by
/scratch/roagrawa/ibm/tpcc_P64way/scripts/buildcreateindex.sh Tue
Feb 20 10:47:59 PST 2007 */
set timing on
    set sqlblanklines on
    spool createindex_iware.log ;
    set echo on ;
    drop index iware ;
      create unique index iware on ware ( w_id )
  pctfree 1  initrans 3
  storage ( buffer_pool default )
  parallel 1
  compute statistics
  tablespace iware_0 ;
    set echo off
    spool off
    exit sql.sqlcode;
```

createindex_icust1.sql

```
/* created automatically by
/scratch/roagrawa/ibm/tpcc_P64way/scripts/buildcreateindex.sh Tue
Feb 20 10:48:00 PST 2007 */
set timing on
    set sqlblanklines on
    spool createindex_icust1.log ;
    set echo on ;
    drop index icust1 ;
      create unique index icust1 on cust ( c_w_id
, c_d_id
, c_id )
  pctfree 1  initrans 3
  storage ( buffer_pool default )
  parallel 16
  compute statistics
  tablespace icust1_0 ;
    set echo off
    spool off
    exit sql.sqlcode;
```

createindex_icust2.sql

```
/* created automatically by
/scratch/roagrawa/ibm/tpcc_P64way/scripts/buildcreateindex.sh Tue
Feb 20 10:48:00 PST 2007 */
set timing on
    set sqlblanklines on
    spool createindex_icust2.log ;
    set echo on ;
    drop index icust2 ;
      create unique index icust2 on cust ( c_last
, c_w_id
, c_d_id
, c_first
, c_id )
  pctfree 1  initrans 3
  storage ( buffer_pool default )
  parallel 16
  compute statistics
  tablespace icust2_0 ;
    set echo off
    spool off
    exit sql.sqlcode;
```

createindex_idist.sql

```
/* created automatically by
/scratch/roagrawa/ibm/tpcc_P64way/scripts/buildcreateindex.sh Tue
Feb 20 10:48:01 PST 2007 */
set timing on
    set sqlblanklines on
    spool createindex_idist.log ;
    set echo on ;
    drop index idist ;
      create unique index idist on dist ( d_w_id
, d_id )
  pctfree 5  initrans 3
  storage ( buffer_pool default )
  parallel 1
  compute statistics
  tablespace idist_0 ;
    set echo off
    spool off
    exit sql.sqlcode;
```

createindex_istok.sql

```
/* created automatically by
/scratch/roagrawa/ibm/tpcc_P64way/scripts/buildcreateindex.sh Tue
Feb 20 10:48:02 PST 2007 */
set timing on
    set sqlblanklines on
    spool createindex_istok.log ;
    set echo on ;
    drop index istok ;
      create unique index istok on stok ( s_i_id
, s_w_id )
  pctfree 1  initrans 3
  storage ( buffer_pool default )
  parallel 4
  compute statistics
  tablespace istok_0 ;
    set echo off
    spool off
    exit sql.sqlcode;
```

createindex_iitem.sql

```
/* created automatically by
/scratch/roagrawa/ibm/tpcc_P64way/scripts/buildcreateindex.sh Tue
Feb 20 10:48:03 PST 2007 */
set timing on
    set sqlblanklines on
    spool createindex_iitem.log ;
    set echo on ;
    drop index iitem ;
      create unique index iitem on item ( i_id )
  pctfree 5  initrans 4
  storage ( buffer_pool default )

  compute statistics
  tablespace iitem_0 ;
    set echo off
    spool off
    exit sql.sqlcode;
```

createindex_iordr2.sql

```
/* created automatically by
/scratch/roagrawa/ibm/tpcc_P64way/scripts/buildcreateindex.sh Tue
Feb 20 10:48:04 PST 2007 */
set timing on
   set sqlblanklines on
   spool createindex_iordr2.log ;
   set echo on ;
   drop index iordr2 ;
     create unique index iordr2 on ordr ( o_c_id
, o_d_id
, o_w_id
, o_id )
  pctfree 25  initrans 4
  storage ( buffer_pool default )
  parallel 16
  compute statistics
  tablespace iordr2_0 ;
   set echo off
   spool off
   exit sql.sqlcode;
```

createtable_ordr.sql

```
/* created automatically by
/scratch/roagrawa/ibm/tpcc_P64way/scripts/buildcreatetable.sh Tue
Feb 20 10:47:54 PST 2007 */
set timing on
   set sqlblanklines on
   spool createtable_ordr.log
   set echo on
       drop cluster ordrcluster_queue including tables ;

  create cluster ordrcluster_queue (
   o_w_id number
, o_d_id number
, o_id number SORT
, o_number number SORT
   )

   hashkeys 360000
   hash is ( (o_w_id - 1) * 10 + o_d_id - 1 )
   size 1490
   tablespace ordr_0;

  create table ordr (
   o_id number sort
, o_w_id number
, o_d_id number
, o_c_id number
, o_carrier_id number
, o_ol_cnt number
, o_all_local number
, o_entry_d date
   , constraint ordr_uk primary key ( o_w_id
, o_d_id
, o_id )
  )
  cluster ordrcluster_queue (
   o_w_id
, o_d_id
, o_id
  );
   set echo off
   spool off
   exit sql.sqlcode;
```

analyze.sql

```
spool analyze.log;
set echo on;

connect tpcc/tpcc

execute dbms_stats.GATHER_TABLE_STATS
(OWNNAME=>'TPCC', -
                    TABNAME=>'STOK', -
                    PARTNAME=>NULL, -
                    ESTIMATE_PERCENT=>1, -
                    BLOCK_SAMPLE=>TRUE, -
                    METHOD_OPT=>'FOR ALL COLUMNS
SIZE 1', -
                    DEGREE=>10, -
                    GRANULARITY=>'DEFAULT', -
                    CASCADE=>TRUE);

execute dbms_stats.GATHER_TABLE_STATS
(OWNNAME=>'TPCC', -
                    TABNAME=>'CUST', -
                    PARTNAME=>NULL, -
                    ESTIMATE_PERCENT=>1, -
                    BLOCK_SAMPLE=>TRUE, -
                    METHOD_OPT=>'FOR ALL COLUMNS
SIZE 1', -
                    DEGREE=>10, -
                    GRANULARITY=>'DEFAULT', -
                    CASCADE=>TRUE);

execute dbms_stats.GATHER_TABLE_STATS
(OWNNAME=>'TPCC', -
                    TABNAME=>'ORDR', -
                    PARTNAME=>NULL, -
                    ESTIMATE_PERCENT=>1, -
                    BLOCK_SAMPLE=>TRUE, -
                    METHOD_OPT=>'FOR ALL COLUMNS
SIZE 1', -
                    DEGREE=>10, -
                    GRANULARITY=>'DEFAULT', -
                    CASCADE=>TRUE);

execute dbms_stats.GATHER_TABLE_STATS
(OWNNAME=>'TPCC', -
                    TABNAME=>'ORDL', -
                    PARTNAME=>NULL, -
                    ESTIMATE_PERCENT=>1, -
                    BLOCK_SAMPLE=>TRUE, -
                    METHOD_OPT=>'FOR ALL COLUMNS
SIZE 1', -
                    DEGREE=>10, -
                    GRANULARITY=>'DEFAULT', -
                    CASCADE=>TRUE);

execute dbms_stats.GATHER_TABLE_STATS
(OWNNAME=>'TPCC', -
                    TABNAME=>'NORD', -
                    PARTNAME=>NULL, -
                    ESTIMATE_PERCENT=>1, -
                    BLOCK_SAMPLE=>TRUE, -
                    METHOD_OPT=>'FOR ALL COLUMNS
SIZE 1', -
                    DEGREE=>10, -
                    GRANULARITY=>'DEFAULT', -
                    CASCADE=>TRUE);

execute
dbms_stats.GATHER_TABLE_STATS(OWNNAME=>'TPCC', -
                    TABNAME=>'HIST', -
                    PARTNAME=>NULL, -
                    ESTIMATE_PERCENT=>1, -
                    BLOCK_SAMPLE=>TRUE, -
                    METHOD_OPT=>'FOR ALL COLUMNS
SIZE 1', -
                    DEGREE=>10, -
                    GRANULARITY=>'DEFAULT', -
```

```
                          CASCADE=>TRUE);

execute
dbms_stats.GATHER_TABLE_STATS(OWNNAME=>'TPCC', -
                          TABNAME=>'DIST', -
                          PARTNAME=>NULL, -
                          ESTIMATE_PERCENT=>1, -
                          BLOCK_SAMPLE=>TRUE, -
                          METHOD_OPT=>'FOR ALL COLUMNS
SIZE 1', -
                          DEGREE=>10, -
                          GRANULARITY=>'DEFAULT', -
                          CASCADE=>TRUE);

execute
dbms_stats.GATHER_TABLE_STATS(OWNNAME=>'TPCC', -
                          TABNAME=>'ITEM', -
                          PARTNAME=>NULL, -
                          ESTIMATE_PERCENT=>10, -
                          BLOCK_SAMPLE=>TRUE, -
                          METHOD_OPT=>'FOR ALL COLUMNS
SIZE 1', -
                          DEGREE=>1, -
                          GRANULARITY=>'DEFAULT', -
                          CASCADE=>TRUE);

execute
dbms_stats.GATHER_TABLE_STATS(OWNNAME=>'TPCC', -
                          TABNAME=>'WARE', -
                          PARTNAME=>NULL, -
                          ESTIMATE_PERCENT=>10, -
                          BLOCK_SAMPLE=>TRUE, -
                          METHOD_OPT=>'FOR ALL COLUMNS
SIZE 1', -
                          DEGREE=>10, -
                          GRANULARITY=>'DEFAULT', -
                          CASCADE=>TRUE);



set echo off;
spool off;

exit sql.sqlcode;
```

createspacestats.sql

```
@space_init
@space_get 12 10
@space_rpt
spool off
exit sql.sqlcode;
```

createstoredprocs.sql

```
spool createstoreprocs.log
@tkvcinin.sql
spool off
exit sql.sqlcode;
```

C.3 Data Generation Code

tpccload.c

```
#ifdef RCSID
static char *RCSid =
   "$Header: tpccload.c 7030100.1 96/05/13 16:20:36 plai
Generic<base> $ Copyr (c) 1993 Oracle";
#endif /* RCSID */

/*==================================================
================+
 |       Copyright (c) 1994  Oracle Corp, Redwood Shores, CA       |
 |                OPEN SYSTEMS PERFORMANCE GROUP
|
 |                      All Rights Reserved                        |

+==================================================
===============+
 | FILENAME
 |    tpccload.c
 | DESCRIPTION
 |    Load or generate TPC-C database tables.
 |    Usage: tpccload -M <# of wares> [options]
 |           options: -A  load all tables
 |                    -w  load ware table
 |                    -d  load dist table
 |                    -c  load cust table (cluster around c_w_id)
 |                    -C  load cust table (cluster around c_id)
 |                    -i  load item table
 |                    -s  load stok table (cluster around s_w_id)
 |                    -S  load stok table (cluster around s_i_id)
 |                    -h  load hist table
 |                    -n  load new-order table
 |                    -o <oline file> load order and order-line table
 |                    -b <ware#>  beginning ware number
 |                    -e <ware#>  ending ware number
 |                    -j <item#>  beginning item number (with -S)
 |                    -k <item#>  ending item number (with -S)
 |                    -l <cid#>  beginning cid number (with -C)
 |                    -m <cid#>  ending cid number (with -C)
 |                    -g  generate rows to standard output

+==================================================
===============*/

#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <time.h>
#include <sys/types.h>
#include "tpcc.h"

#ifdef ORA_NT
#undef boolean
#include <process.h>
#include "dpbcore.h"
# define gettime dpbtimef
# define getcpu  dpbcpu
#define lrand48() ((long)rand() <<15 | rand())
#ifdef __STDC__
#  define PROTO(args)    args
#else
#  define PROTO(args)    ()
#endif
#endif

#define DISTARR 10      /* dist insert array size*/
#define CUSTARR 100     /* cust insert array size   */
#define STOCARR 100     /* stok insert array size   */
#define ITEMARR 100     /* item insert array size   */
#define HISTARR 100            /* hist insert array size    */
#define ORDEARR 100             /* order insert array size       */
#define NEWOARR 100             /* new order insert array size  */

#define DISTFAC 10      /* max. dist id */
#define CUSTFAC 3000   /* max. cust id*/
#define STOCFAC 100000      /* max. stok id*/
```

```
#define ITEMFAC 100000    /* max. item id       */
#define HISTFAC 30000           /* history / warehouse  */
#define ORDEFAC 3000            /* order / district     */
#define NEWOFAC 900             /* new order / district */

#define C       0               /* constant in non-uniform dist. eqt. */
#define CNUM1   1               /* first constant in non-uniform dist. eqt.
*/
#define CNUM2   2               /* second constant in non-uniform dist.
eqt. */
#define CNUM3   3               /* third constant in non-uniform dist. eqt.
*/

#define SEED    2               /* seed for random functions */

#define NOT_SERIALIZABLE  8177  /* ORA-08177: transaction not
serializable */
#define SNAPSHOT_TOO_OLD  1555  /* ORA-01555: snapshot too
old */
#define RECOVERR -10
#define IRRECERR -20

#define SQLTXTW "INSERT INTO ware (w_id, w_ytd, w_tax,
w_name, w_street_1, w_street_2, w_city, w_state, w_zip) VALUES
(:w_id, 30000000, :w_tax, :w_name, :w_street_1, \
  :w_street_2, :w_city, :w_state, :w_zip)"

#define SQLTXTD "INSERT INTO dist (d_id, d_w_id, d_ytd, d_tax,
d_next_o_id, d_name, d_street_1, d_street_2, d_city, d_state, d_zip)
VALUES (:d_id, :d_w_id,3000000, :d_tax, \

3001, :d_name, :d_street_1, :d_street_2, :d_city, :d_state, :d_zip)"

#define SQLTXTCQUERY "select /*+ HASH ( cust ) */ count(*) from
cust where c_w_id = :s_c_w_id and c_d_id = :s_c_d_id and c_id
= :s_c_id"

#define SQLTXTC "INSERT INTO cust (C_ID, C_D_ID, C_W_ID,
C_FIRST, C_MIDDLE, C_LAST, 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, C_YTD_PAYMENT,
C_PAYMENT_CNT, C_DELIVERY_CNT, C_DATA) VALUES
(:c_id, :c_d_id, :c_w_id, \
  :c_first, 'OE', :c_last, :c_street_1, :c_street_2, :c_city, :c_state, \
  :c_zip, :c_phone, SYSDATE, :c_credit, 5000000, :c_discount, -
1000, 1000, 1, \
  0, :c_data)"

#define SQLTXTH "INSERT INTO hist (h_c_id, h_c_d_id, h_c_w_id,
h_d_id, h_w_id, h_date, h_amount, h_data) VALUES
(:h_c_id, :h_c_d_id, :h_c_w_id, \
  :h_d_id, :h_w_id, SYSDATE, 1000, :h_data)"

#define SQLTXTSQUERY "select /*+ HASH ( stok ) */ count(*) from
stok where s_w_id = :s_s_w_id and s_i_id = :s_s_i_id "

#define SQLTXTS "INSERT INTO stok (s_i_id, s_w_id,
s_quantity,s_dist_01, s_dist_02, s_dist_03, s_dist_04, s_dist_05 ,
s_dist_06, s_dist_07, s_dist_08, s_dist_09, s_dist_10, s_ytd,
s_order_cnt, s_remote_cnt, s_data) \
VALUES (:s_i_id, :s_w_id, :s_quantity, \
  :s_dist_01, :s_dist_02, :s_dist_03, :s_dist_04, :s_dist_05, :s_dist_
06, \
  :s_dist_07, :s_dist_08, :s_dist_09, :s_dist_10, 0, 0, 0, :s_data)" \

#define SQLTXTI "INSERT INTO item
(I_ID,I_IM_ID,I_NAME,I_PRICE,I_DATA) VALUES
(:i_id, :i_im_id, :i_name, :i_price, \
  :i_data)"

#define SQLTXTO1 "INSERT INTO ordr (O_ID,
O_D_ID,O_W_ID,O_C_ID,O_ENTRY_D,O_CARRIER_ID,O_OL_C
NT,O_ALL_LOCAL) \
  VALUES (:o_id, :o_d_id, :o_w_id, :o_c_id, \
  SYSDATE, :o_carrier_id, :o_ol_cnt, 1)"

#define SQLTXTO2 "INSERT INTO ordr (O_ID,
O_D_ID,O_W_ID,O_C_ID,O_ENTRY_D,O_CARRIER_ID,O_OL_C
NT,O_ALL_LOCAL) \
  VALUES (:o_id, :o_d_id, :o_w_id, :o_c_id, \
  SYSDATE, 11, :o_ol_cnt, 1)"

#define SQLTXTOL1 "INSERT INTO ordl (OL_O_ID, OL_D_ID,
OL_W_ID, OL_NUMBER, OL_DELIVERY_D, OL_I_ID,
OL_SUPPLY_W_ID, OL_QUANTITY, OL_AMOUNT,
OL_DIST_INFO) \
  VALUES (:ol_o_id, :ol_d_id, \
  :ol_w_id, :ol_number, SYSDATE, :ol_i_id, :ol_supply_w_id, 5, 0, \
  :ol_dist_info)"

#define SQLTXTOL2 "INSERT INTO ordl (OL_O_ID, OL_D_ID,
OL_W_ID, OL_NUMBER, OL_DELIVERY_D, OL_I_ID,
OL_SUPPLY_W_ID, OL_QUANTITY, OL_AMOUNT,
OL_DIST_INFO) \
  VALUES (:ol_o_id, :ol_d_id, \
  :ol_w_id, :ol_number, to_date('01-Jan-
1811'), :ol_i_id, :ol_supply_w_id, 5, :ol_amount, \
  :ol_dist_info)"

#define SQLTXTNO "INSERT INTO nord (no_o_id, no_d_id,
no_w_id) VALUES (:no_o_id, :no_d_id, :no_w_id)"

#define SQLTXTENHA "alter session set
\"_enable_hash_overflow\"=true"
#define SQLTXTDIHA "alter session set
\"_enable_hash_overflow\"=false"

static char *lastname[] = {
  "BAR",
  "OUGHT",
  "ABLE",
  "PRI",
  "PRES",
  "ESE",
  "ANTI",
  "CALLY",
  "ATION",
  "EING"
};

char num9[10];
char num16[17];
char str2[3];
char str24[15][25];
int randperm3000[3000];

void initperm();
void randstr();
void randdatastr();
void randnum();
void randlastname (char*, int);
int NURand();
void sysdate();

OCIEnv *tpcenv;
OCIServer *tpcsrv;
OCIError *errhp;
OCISvcCtx *tpcsvc;
OCISession *tpcusr;

OCIStmt *curw;
OCIStmt *curd;
```

```
OCIStmt *curc;
OCIStmt *curcs;
OCIStmt *curh;
OCIStmt *curs;
OCIStmt *curss;
OCIStmt *curi;
OCIStmt *curo1;
OCIStmt *curo2;
OCIStmt *curol1;
OCIStmt *curol2;
OCIStmt *curno;

OCIBind *w_id_bp = (OCIBind *) 0;
OCIBind *w_name_bp = (OCIBind *) 0;
OCIBind *w_street1_bp = (OCIBind *) 0;
OCIBind *w_street2_bp = (OCIBind *) 0;
OCIBind *w_city_bp = (OCIBind *) 0;
OCIBind *w_state_bp = (OCIBind *) 0;
OCIBind *w_zip_bp = (OCIBind *) 0;
OCIBind *w_tax_bp = (OCIBind *) 0;

OCIBind *d_id_bp = (OCIBind *) 0;
OCIBind *d_w_id_bp = (OCIBind *) 0;
OCIBind *d_name_bp = (OCIBind *) 0;
OCIBind *d_street1_bp = (OCIBind *) 0;
OCIBind *d_street2_bp = (OCIBind *) 0;
OCIBind *d_city_bp = (OCIBind *) 0;
OCIBind *d_state_bp = (OCIBind *) 0;
OCIBind *d_zip_bp = (OCIBind *) 0;
OCIBind *d_tax_bp = (OCIBind *) 0;

OCIDefine *s_c_ret_bp = (OCIDefine *) 0;
OCIBind *s_c_id_bp = (OCIBind *) 0;
OCIBind *s_c_d_id_bp = (OCIBind *) 0;
OCIBind *s_c_w_id_bp = (OCIBind *) 0;

OCIBind *c_id_bp = (OCIBind *) 0;
OCIBind *c_d_id_bp = (OCIBind *) 0;
OCIBind *c_w_id_bp = (OCIBind *) 0;
OCIBind *c_first_bp = (OCIBind *) 0;
OCIBind *c_last_bp = (OCIBind *) 0;
OCIBind *c_street1_bp = (OCIBind *) 0;
OCIBind *c_street2_bp = (OCIBind *) 0;
OCIBind *c_city_bp = (OCIBind *) 0;
OCIBind *c_state_bp = (OCIBind *) 0;
OCIBind *c_zip_bp = (OCIBind *) 0;
OCIBind *c_phone_bp = (OCIBind *) 0;
OCIBind *c_discount_bp = (OCIBind *) 0;
OCIBind *c_credit_bp = (OCIBind *) 0;
OCIBind *c_data_bp = (OCIBind *) 0;

OCIBind *i_id_bp = (OCIBind *) 0;
OCIBind *i_im_id_bp = (OCIBind *) 0;
OCIBind *i_name_bp = (OCIBind *) 0;
OCIBind *i_price_bp = (OCIBind *) 0;
OCIBind *i_data_bp = (OCIBind *) 0;

OCIDefine *s_s_ret_bp = (OCIDefine *) 0;
OCIBind *s_s_i_id_bp = (OCIBind *) 0;
OCIBind *s_s_w_id_bp = (OCIBind *) 0;

OCIBind *s_i_id_bp = (OCIBind *) 0;
OCIBind *s_w_id_bp = (OCIBind *) 0;
OCIBind *s_quantity_bp = (OCIBind *) 0;
OCIBind *s_dist_01_bp = (OCIBind *) 0;
OCIBind *s_dist_02_bp = (OCIBind *) 0;
OCIBind *s_dist_03_bp = (OCIBind *) 0;
OCIBind *s_dist_04_bp = (OCIBind *) 0;
OCIBind *s_dist_05_bp = (OCIBind *) 0;
OCIBind *s_dist_06_bp = (OCIBind *) 0;
OCIBind *s_dist_07_bp = (OCIBind *) 0;
OCIBind *s_dist_08_bp = (OCIBind *) 0;
OCIBind *s_dist_09_bp = (OCIBind *) 0;
OCIBind *s_dist_10_bp = (OCIBind *) 0;
OCIBind *s_data_bp = (OCIBind *) 0;

OCIBind *h_c_id_bp = (OCIBind *) 0;
OCIBind *h_c_d_id_bp = (OCIBind *) 0;
OCIBind *h_c_w_id_bp = (OCIBind *) 0;
OCIBind *h_d_id_bp = (OCIBind *) 0;
OCIBind *h_w_id_bp = (OCIBind *) 0;
OCIBind *h_data_bp = (OCIBind *) 0;

OCIBind *ol_o_id_bp = (OCIBind *) 0;
OCIBind *ol_d_id_bp = (OCIBind *) 0;
OCIBind *ol_w_id_bp = (OCIBind *) 0;
OCIBind *ol_i_id_bp = (OCIBind *) 0;
OCIBind *ol_number_bp = (OCIBind *) 0;
OCIBind *ol_supply_w_id_bp = (OCIBind *) 0;
OCIBind *ol_dist_info_bp = (OCIBind *) 0;
OCIBind *ol_amount_bp = (OCIBind *) 0;

OCIBind *o_id_bp = (OCIBind *) 0;
OCIBind *o_d_id_bp = (OCIBind *) 0;
OCIBind *o_w_id_bp = (OCIBind *) 0;
OCIBind *o_c_id_bp = (OCIBind *) 0;
OCIBind *o_carrier_id_bp = (OCIBind *) 0;
OCIBind *o_ol_cnt_bp  = (OCIBind *) 0;
OCIBind *o_ocnt_bp = (OCIBind *) 0;
OCIBind *o_olcnt_bp  = (OCIBind *) 0;


OCIBind *no_o_id_bp  = (OCIBind *) 0;
OCIBind *no_d_id_bp  = (OCIBind *) 0;
OCIBind *no_w_id_bp  = (OCIBind *) 0;

void myusage()
{
  fprintf (stderr, "\n");
  fprintf (stderr, "Usage:\ttpccload -M <multiplier> [options]\n");
  fprintf (stderr, "options:\n");
  fprintf (stderr, "\t-A :\tload all tables\n");
  fprintf (stderr, "\t-w :\tload ware table\n");
  fprintf (stderr, "\t-d :\tload dist table\n");
  fprintf (stderr, "\t-c :\tload cust table (cluster around c_w_id\n");
  fprintf (stderr, "\t-C :\tload cust table (cluster around c_id\n");
  fprintf (stderr, "\t-i :\tload item table\n");
  fprintf (stderr, "\t-s :\tload stok table (cluster around s_w_id)\n");
  fprintf (stderr, "\t-S :\tload stok table (cluster around s_i_id)\n");
  fprintf (stderr, "\t-h :\tload hist table\n");
  fprintf (stderr, "\t-n :\tload new-order table\n");
  fprintf (stderr, "\t-o <oline file> :\tload order and order-line table\n");
  fprintf (stderr, "\t-b <ware#> :\tbeginning ware number\n");
  fprintf (stderr, "\t-e <ware#> :\tending ware number\n");
  fprintf (stderr, "\t-j <item#> :\tbeginning item number (with -S)\n");
  fprintf (stderr, "\t-k <item#> :\tending item number (with -S)\n");
  fprintf (stderr, "\t-l <cid#> :\tbeginning cid number (with -C)\n");
  fprintf (stderr, "\t-m <cid#> :\tending cid number (with -C)\n");
  fprintf (stderr, "\t-g :\tgenerate rows to standard output\n");
  fprintf (stderr,"\t   $tpcc_bench must be set to the location of the
kit\n");
  fprintf (stderr, "\n");
  exit(1);
}

int sqlfile(fnam,linebuf)
char   *fnam;
text   *linebuf;
{
   FILE *fd;
   int nulpt = 0;
   char realfile[512];

   sprintf(realfile,"%s",fnam);
```

```
    fd = fopen(realfile,"r");
    if (!fd)
    {
      return (0);
    }
    while (fgets((char *)linebuf+nulpt, SQL_BUF_SIZE, fd))
    {
        nulpt = strlen((char *)linebuf);
    }
    return(nulpt);
}

void quit()
{
   OCIERROR(errhp,OCISessionEnd ( tpcsvc,errhp, tpcusr,
OCI_DEFAULT));
   OCIERROR(errhp,OCIServerDetach ( tpcsrv, errhp,
OCI_DEFAULT));
   OCIHandleFree((dvoid *)tpcusr, OCI_HTYPE_SESSION);
   OCIHandleFree((dvoid *)tpcsvc, OCI_HTYPE_SVCCTX);
   OCIHandleFree((dvoid *)errhp, OCI_HTYPE_ERROR);
   OCIHandleFree((dvoid *)tpcsrv, OCI_HTYPE_SERVER);
   OCIHandleFree((dvoid *)tpcenv, OCI_HTYPE_ENV);
}

void main (argc, argv)
int argc;
char *argv[];
{
   char *uid="tpcc";
   char *pwd="tpcc";
   int scale=0;
   int i, j;
   int loop;
   int loopcount;
   int cid;
   int dwid;
   int cdid;
   int cwid;
   int sid;
   int swid;
   int olcnt;
   int nrows;
   int row;

   int w_id;
   char w_name[11];
   char w_street_1[21];
   char w_street_2[21];
   char w_city[21];
   char w_state[2];
   char w_zip[9];
   float w_tax;

   int d_id[10];
   int d_w_id[10];
   char d_name[10][11];
   char d_street_1[10][21];
   char d_street_2[10][21];
   char d_city[10][21];
   char d_state[10][2];
   char d_zip[10][9];
   float d_tax[10];

   int s_c_id;
   int s_c_d_id;
   int s_c_w_id;
   int s_c_count;

   int c_id[100];
   int c_d_id[100];
   int c_w_id[100];
   char c_first[100][17];
   char c_last[100][17];
   char c_street_1[100][21];
   char c_street_2[100][21];
   char c_city[100][21];
   char c_state[100][2];
   char c_zip[100][9];
   char c_phone[100][16];
   char c_credit[100][2];
   float c_discount[100];
   char c_data[100][501];

   int i_id[100];
   int i_im_id[100];
   int i_price[100];
   char i_name[100][25];
   char i_data[100][51];

   int s_s_count;
   int s_s_i_id;
   int s_s_w_id;

   int s_i_id[100];
   int s_w_id[100];
   int s_quantity[100];
   char s_dist_01[100][25];
   char s_dist_02[100][25];
   char s_dist_03[100][25];
   char s_dist_04[100][25];
   char s_dist_05[100][25];
   char s_dist_06[100][25];
   char s_dist_07[100][25];
   char s_dist_08[100][25];
   char s_dist_09[100][25];
   char s_dist_10[100][25];
   char s_data[100][51];

   int h_w_id[100];
   int h_d_id[100];
   int h_c_id[100];
   char h_data[100][25];

   int o_id[100];
   int o_d_id[100];
   int o_w_id[100];
   int o_c_id[100];
   int o_carrier_id[100];
   int o_ol_cnt[100];

   int ol_o_id[1500];
   int ol_d_id[1500];
   int ol_w_id[1500];
   int ol_number[1500];
   int ol_i_id[1500];
   int ol_supply_w_id[1500];
   int ol_amount[1500];
   char ol_dist_info[1500][24];
   int o_cnt;
   int ol_cnt;

   ub2 ol_o_id_len[1500];
   ub2 ol_d_id_len[1500];
   ub2 ol_w_id_len[1500];
   ub2 ol_number_len[1500];
   ub2 ol_i_id_len[1500];
   ub2 ol_supply_w_id_len[1500];
   ub2 ol_dist_info_len[1500];
   ub2 ol_amount_len[1500];

   ub4 ol_o_id_clen;
   ub4 ol_d_id_clen;
   ub4 ol_w_id_clen;
```

```
  ub4 ol_number_clen;
  ub4 ol_i_id_clen;
  ub4 ol_supply_w_id_clen;
  ub4 ol_dist_info_clen;
  ub4 ol_amount_clen;

  ub2 o_id_len[100];
  ub2 o_d_id_len[100];
  ub2 o_w_id_len[100];
  ub2 o_c_id_len[100];
  ub2 o_carrier_id_len[100];
  ub2 o_ol_cnt_len[100];

  ub4 o_id_clen;
  ub4 o_d_id_clen;
  ub4 o_w_id_clen;
  ub4 o_c_id_clen;
  ub4 o_carrier_id_clen;
  ub4 o_ol_cnt_clen;

  text stmbuf[16*1024];

  int no_o_id[100];
  int no_d_id[100];
  int no_w_id[100];

  char sdate[30];

#ifdef ORA_NT
  clock_t begin_time, end_time;
  clock_t begin_cpu, end_cpu;

  char *arg_ptr,  **end_args;
#else
  double begin_time, end_time;
  double begin_cpu, end_cpu;
  double gettime(), getcpu();

  extern int getopt();
  extern char *optarg;
  extern int optind, opterr;
  int opt;
#endif

  char   *argstr="M:AwdcCisShno:b:e:j:k:l:m:g";
  int do_A=0;
  int do_w=0;
  int do_d=0;
  int do_i=0;
  int do_c=0;
  int do_C=0;
  int do_s=0;
  int do_S=0;
  int do_h=0;
  int do_o=0;
  int do_n=0;
  int gen=0;
  int bware=1;
  int eware=0;
  int bitem=1;
  int eitem=0;
  int bcid=1;
  int ecid=0;

  FILE *olfp=NULL;
  char olfname[100];
  char* basename;
  int status;
#ifdef ORA_NT
  char fname[100];
  FILE *logfile;
#endif /* ORA_NT */

/*-------------------------------------------------------------+
 | Parse command line -- look for scale factor.        |
 +-------------------------------------------------------------*/

  if (argc == 1) {
    myusage ();
  }

#ifdef ORA_NT
  end_args = argv + argc;
  for (++argv; argv < end_args; )
  {
    arg_ptr = *argv++;

      if (*arg_ptr != '-')
      {
        myusage ();
      } else
      {
     switch (arg_ptr[1]) {
      case '?': myusage ();
                break;
      case 'M': scale = atoi (*argv++);
                break;
      case 'A': do_A = 1;
                break;
      case 'w': do_w = 1;
                break;
      case 'd': do_d = 1;
                break;
      case 'c': do_c = 1;
                break;
      case 'C': do_C = 1;
                break;
      case 'i': do_i = 1;
                break;
      case 's': do_s = 1;
                break;
      case 'S': do_S = 1;
                break;
      case 'h': do_h = 1;
                break;
      case 'n': do_n = 1;
                break;
      case 'o': do_o = 1;
                strcpy (olfname, *argv++);
                break;
      case 'b': bware = atoi (*argv++);
                break;
      case 'e': eware = atoi (*argv++);
                break;
      case 'j': bitem = atoi (*argv++);
                break;
      case 'k': eitem = atoi (*argv++);
                break;
      case 'l': bcid = atoi (*argv++);
                break;
      case 'm': ecid = atoi (*argv++);
                break;
      case 'g': gen = 1;
                strcpy (fname, *argv++);
                break;
      case 'l': logfile=fopen(*argv++,"w");
                break;
      default: fprintf (stderr, "THIS SHOULD NEVER HAPPEN!!!\n");
               fprintf (stderr, "(reached default case in getopt ())\n");
               myusage ();
     }
      }
  }
```

```
#else

   while ((opt = getopt (argc, argv, argstr)) != -1) {
      switch (opt) {
         case '?': myusage ();
                   break;
         case 'M': scale = atoi (optarg);
                   break;
         case 'A': do_A = 1;
                   break;
         case 'w': do_w = 1;
                   break;
         case 'd': do_d = 1;
                   break;
         case 'c': do_c = 1;
                   break;
         case 'C': do_C = 1;
                   break;
         case 'i': do_i = 1;
                   break;
         case 's': do_s = 1;
                   break;
         case 'S': do_S = 1;
                   break;
         case 'h': do_h = 1;
                   break;
         case 'n': do_n = 1;
                   break;
         case 'o': do_o = 1;
                   strcpy (olfname, optarg);
                   break;
         case 'b': bware = atoi (optarg);
                   break;
         case 'e': eware = atoi (optarg);
                   break;
         case 'j': bitem = atoi (optarg);
                   break;
         case 'k': eitem = atoi (optarg);
                   break;
         case 'l': bcid = atoi (optarg);
                   break;
         case 'm': ecid = atoi (optarg);
                   break;
         case 'g': gen = 1;
                   break;
         default: fprintf (stderr, "THIS SHOULD NEVER HAPPEN!!!\n");
                  fprintf (stderr, "(reached default case in getopt ())\n");
                  myusage ();
      }
   }

# endif /* ORA_NT */

/*-------------------------------------------------------------*|
|  Rudimentary error checking           |
|*-------------------------------------------------------------*/

   if (scale  < 1) {
      fprintf (stderr, "Invalid scale factor: '%d'\n", scale);
      myusage ();
   }

   if (!(do_A || do_w || do_d || do_c || do_C || do_i || do_s || do_S ||
do_h || do_o ||
         do_n)) {
      fprintf (stderr, "What should I load???\n");
      myusage ();
   }

   if (gen && (do_A || (do_w + do_d + do_c + do_C + do_i + do_s +
do_S + do_h + do_o +
                     do_n > 1))) {
      fprintf (stderr, "Can only generate table one at a time\n");
      myusage ();
   }

   if (do_S && (do_A || do_s)) {
      fprintf (stderr, "Cluster stock table around s_w_id or s_i_id?\n");
      myusage ();
   }

   if (do_C && (do_A || do_c)) {
      fprintf (stderr, "Cluster cust table around c_w_id or c_id?\n");
      myusage ();
   }

   if (eware <= 0)
      eware = scale;
   if (ecid <= 0)
      ecid = CUSTFAC;
   if (eitem <= 0)
      eitem = STOCFAC;

   if (do_C) {
      if ((bcid  < 1) || (bcid > CUSTFAC)) {
         fprintf (stderr, "Invalid beginning cid number: '%d'\n", bcid);
         myusage ();
      }

      if ((ecid  < bcid) || (ecid > CUSTFAC)) {
         fprintf (stderr, "Invalid ending cid number: '%d'\n", ecid);
         myusage ();
      }
   }
   if (do_S) {
      if ((bitem  < 1) || (bitem > STOCFAC)) {
         fprintf (stderr, "Invalid beginning item number: '%d'\n", bitem);
         myusage ();
      }

      if ((eitem  < bitem) || (eitem > STOCFAC)) {
         fprintf (stderr, "Invalid ending item number: '%d'\n", eitem);
         myusage ();
      }
   }
   if (do_o) {
      if ((basename = getenv ("tpcc_bench")) == NULL)
      {
         fprintf (stderr, "$tpcc_bench is not set");
         myusage ();
      }
   }

   if ((bware  < 1) || (bware > scale)) {
      fprintf (stderr, "Invalid beginning warehouse number: '%d'\n",
bware);
      myusage ();
   }

   if ((eware  < bware) || (eware > scale)) {
      fprintf (stderr, "Invalid ending warehouse number: '%d'\n",
eware);
      myusage ();
   }

   if (gen && do_o) {
      if ((olfp = fopen (olfname, "w")) == NULL) {
         fprintf (stderr, "Can't open '%s' for writing order lines\n",
olfname);
         myusage ();
      }
```

```
  }

/*------------------------------------------------------------+
 | Prepare to insert into database.           |
 +------------------------------------------------------------*/

  sysdate (sdate);
  if (!gen) {

     /* log on to Oracle */

     OCIInitialize(OCI_DEFAULT|OCI_OBJECT,(dvoid *)0,0,0,0);
     OCIEnvInit(&tpcenv, OCI_DEFAULT, 0, (dvoid **)0);
     OCIHandleAlloc((dvoid *)tpcenv, (dvoid **)&tpcsrv,
OCI_HTYPE_SERVER, 0 , (dvoid **)0);
     OCIHandleAlloc((dvoid *)tpcenv, (dvoid **)&errhp,
OCI_HTYPE_ERROR, 0 , (dvoid **)0);
     OCIHandleAlloc((dvoid *)tpcenv, (dvoid **)&tpcsvc,
OCI_HTYPE_SVCCTX, 0 , (dvoid **)0);
     OCIServerAttach(tpcsrv, errhp, (text *)0,0,OCI_DEFAULT);
     OCIAttrSet((dvoid *)tpcsvc, OCI_HTYPE_SVCCTX, (dvoid
*)tpcsrv,
             (ub4)0,OCI_ATTR_SERVER, errhp);
     OCIHandleAlloc((dvoid *)tpcenv, (dvoid **)&tpcusr,
OCI_HTYPE_SESSION, 0 , (dvoid **)0);
     OCIAttrSet((dvoid *)tpcusr, OCI_HTYPE_SESSION, (dvoid *)uid,
             (ub4)strlen(uid),OCI_ATTR_USERNAME, errhp);
     OCIAttrSet((dvoid *)tpcusr, OCI_HTYPE_SESSION, (dvoid
*)pwd, (ub4)strlen(pwd),
           OCI_ATTR_PASSWORD, errhp);
     OCIERROR(errhp, OCISessionBegin(tpcsvc, errhp, tpcusr,
OCI_CRED_RDBMS, OCI_DEFAULT));

     OCIAttrSet(tpcsvc, OCI_HTYPE_SVCCTX, tpcusr, 0,
OCI_ATTR_SESSION, errhp);

     fprintf (stderr, "\nConnected to Oracle userid '%s/%s'.\n", uid,
pwd);

     /* open cursors and parse statement */
     if (do_A || do_w)  {
        OCIERROR(errhp,OCIHandleAlloc(tpcenv,(dvoid **)(&curw),
OCI_HTYPE_STMT, 0, (dvoid**)0));
        OCIERROR(errhp,OCIStmtPrepare(curw, errhp, (text
*)SQLTXTW,
                strlen((char *)SQLTXTW), (ub4) OCI_NTV_SYNTAX,
(ub4) OCI_DEFAULT));
     }

     if (do_A || do_d) {
        OCIERROR(errhp,OCIHandleAlloc(tpcenv,(dvoid **)(&curd),
OCI_HTYPE_STMT, 0, (dvoid**)0));
        OCIERROR(errhp,OCIStmtPrepare(curd, errhp, (text
*)SQLTXTD,
                strlen((char *)SQLTXTD), (ub4) OCI_NTV_SYNTAX,
(ub4) OCI_DEFAULT));
     }

     if (do_A || do_c || do_C) {
        OCIERROR(errhp,OCIHandleAlloc(tpcenv,(dvoid **)(&curc),
OCI_HTYPE_STMT, 0, (dvoid**)0));
        OCIERROR(errhp,OCIStmtPrepare(curc, errhp, (text
*)SQLTXTC,
                strlen((char *)SQLTXTC), (ub4) OCI_NTV_SYNTAX,
(ub4) OCI_DEFAULT));
        OCIERROR(errhp,OCIHandleAlloc(tpcenv,(dvoid **)(&curcs),
OCI_HTYPE_STMT, 0, (dvoid**)0));
        OCIERROR(errhp,OCIStmtPrepare(curcs, errhp, (text
*)SQLTXTCQUERY,
                strlen((char *)SQLTXTCQUERY), (ub4)
OCI_NTV_SYNTAX, (ub4) OCI_DEFAULT));
     }

     if (do_A || do_h) {
        OCIERROR(errhp,OCIHandleAlloc(tpcenv,(dvoid **)(&curh),
OCI_HTYPE_STMT, 0, (dvoid**)0));
        OCIERROR(errhp,OCIStmtPrepare(curh, errhp, (text
*)SQLTXTH,
               strlen((char *)SQLTXTH), (ub4) OCI_NTV_SYNTAX,
(ub4) OCI_DEFAULT));
     }

     if (do_A || do_s || do_S) {
        OCIERROR(errhp,OCIHandleAlloc(tpcenv,(dvoid **)(&curs),
OCI_HTYPE_STMT, 0, (dvoid**)0));
        OCIERROR(errhp,OCIStmtPrepare(curs, errhp, (text
*)SQLTXTS,
               strlen((char *)SQLTXTS), (ub4) OCI_NTV_SYNTAX,
(ub4) OCI_DEFAULT));
        OCIERROR(errhp,OCIHandleAlloc(tpcenv,(dvoid **)(&curss),
OCI_HTYPE_STMT, 0, (dvoid**)0));
        OCIERROR(errhp,OCIStmtPrepare(curss, errhp, (text
*)SQLTXTSQUERY,
               strlen((char *)SQLTXTSQUERY), (ub4)
OCI_NTV_SYNTAX, (ub4) OCI_DEFAULT));
     }

     if (do_A || do_i) {
        OCIERROR(errhp,OCIHandleAlloc(tpcenv,(dvoid **)(&curi),
OCI_HTYPE_STMT, 0, (dvoid**)0));
        OCIERROR(errhp,OCIStmtPrepare(curi, errhp, (text
*)SQLTXTI,
               strlen((char *)SQLTXTI), (ub4) OCI_NTV_SYNTAX,
(ub4) OCI_DEFAULT));
     }

     if (do_A || do_o) {
        int stat;
        char fname[160];
        OCIERROR(errhp,OCIHandleAlloc(tpcenv,(dvoid **)(&curo1),
OCI_HTYPE_STMT, 0, (dvoid**)0));
        DISCARD strcpy(fname,basename);
        DISCARD strcat(fname, "/");
        DISCARD strcat(fname, "benchrun/blocks/load_ordordl.sql");
        stat = sqlfile(fname, stmbuf);
        if (!stat)
        {
          fprintf (stderr, "unable to open %s \n",fname);
          quit();
          exit(1);
        }
        OCIERROR(errhp,OCIStmtPrepare(curo1, errhp, stmbuf,
               strlen((char *)stmbuf), (ub4) OCI_NTV_SYNTAX, (ub4)
OCI_DEFAULT));
     }

     if (do_A || do_n) {
        OCIERROR(errhp,OCIHandleAlloc(tpcenv,(dvoid **)(&curno),
OCI_HTYPE_STMT, 0, (dvoid**)0));
        OCIERROR(errhp,OCIStmtPrepare(curno, errhp, (text
*)SQLTXTNO,
               strlen((char *)SQLTXTNO), (ub4) OCI_NTV_SYNTAX,
(ub4) OCI_DEFAULT));
     }

     /* bind variables */

     /* warehouse */

     if (do_A || do_w) {
        OCIERROR(errhp, OCIBindByName(curw, &w_id_bp, errhp,
(text *)(":w_id"), strlen((":w_id")),
                (ub1 *)&(w_id), sizeof(w_id), SQLT_INT, (dvoid *) 0,
(ub2 *)0, (ub2 *)0,
```

```
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curw, &w_name_bp,
errhp,(text *)":w_name", strlen(":w_name"),
                (ub1 *)w_name, 11, SQLT_STR, (dvoid *) 0, (ub2 *)0,
(ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curw, &w_street1_bp,
errhp, (text *)":w_street_1",
          strlen(":w_street_1"), (ub1 *)w_street_1, 21, SQLT_STR,
          (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curw, &w_street2_bp,
errhp, (text *)":w_street_2",
          strlen(":w_street_2"), (ub1 *)w_street_2, 21, SQLT_STR,
          (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curw, &w_city_bp, errhp,
(text *)":w_city",
          strlen(":w_city"), (ub1 *)w_city, 21, SQLT_STR,
          (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curw, &w_state_bp,
errhp, (text *)":w_state",
          strlen(":w_state"), (ub1 *)w_state, 2, SQLT_CHR,
          (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curw, &w_zip_bp, errhp,
(text *)":w_zip",
          strlen(":w_zip"), (ub1 *)w_zip, 9, SQLT_CHR,
          (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curw, &w_tax_bp, errhp,
(text *)":w_tax",
          strlen(":w_tax"), (ub1 *) & w_tax, sizeof(w_tax), SQLT_FLT,
          (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));
    }

    /* district */

    if (do_A || do_d) {
        OCIERROR(errhp, OCIBindByName(curd, &d_id_bp, errhp,
(text *)":d_id",
          strlen(":d_id"), (ub1 *)d_id, sizeof(int), SQLT_INT,
          (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curd, &d_w_id_bp, errhp,
(text *)":d_w_id",
          strlen(":d_w_id"), (ub1 *)d_w_id, sizeof(int), SQLT_INT,
          (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curd, &d_name_bp,
errhp, (text *)":d_name",
          strlen(":d_name"), (ub1 *)d_name, 11, SQLT_STR,
          (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curd, &d_street1_bp,
errhp, (text *)":d_street_1",
          strlen(":d_street_1"), (ub1 *)d_street_1, 21, SQLT_STR,
          (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curd, &d_street2_bp,
errhp, (text *)":d_street_2",
          strlen(":d_street_2"), (ub1 *)d_street_2, 21, SQLT_STR,
          (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curd, &d_city_bp, errhp,
(text *)":d_city",
          strlen(":d_city"), (ub1 *)d_city, 21, SQLT_STR,
          (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curd, &d_state_bp, errhp,
(text *)":d_state",
                strlen(":d_state"), (ub1 *)d_state, 2, SQLT_CHR,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curd, &d_zip_bp, errhp,
(text *)":d_zip",
                strlen(":d_zip"), (ub1 *)d_zip, 9, SQLT_CHR,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curd, &d_tax_bp, errhp,
(text *)":d_tax",
                strlen(":d_tax"), (ub1 *)d_tax, sizeof(float), SQLT_FLT,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));
    }

    /* customer */

    if (do_A || do_c || do_C) {
        OCIERROR(errhp, OCIBindByName(curcs, &s_c_id_bp, errhp,
(text *)":s_c_id",
                strlen(":s_c_id"), (ub1 *)&s_c_id, sizeof(int),
SQLT_INT,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curcs, &s_c_w_id_bp,
errhp, (text *)":s_c_w_id",
                strlen(":s_c_w_id"), (ub1 *)&s_c_w_id, sizeof(int),
SQLT_INT,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curcs, &s_c_d_id_bp,
errhp, (text *)":s_c_d_id",
                strlen(":s_c_d_id"), (ub1 *)&s_c_d_id, sizeof(int),
SQLT_INT,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));


OCIDefineByPos(curcs,&s_c_ret_bp,errhp,1,&s_c_count,sizeof(int),
SQLT_INT,\
                0,0,0,OCI_DEFAULT);

        OCIERROR(errhp, OCIBindByName(curc, &c_id_bp, errhp,
(text *)":c_id",
                strlen(":c_id"), (ub1 *)c_id, sizeof(int), SQLT_INT,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curc, &c_d_id_bp, errhp,
(text *)":c_d_id",
                strlen(":c_d_id"), (ub1 *)c_d_id, sizeof(int), SQLT_INT,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));
```

```
        OCIERROR(errhp, OCIBindByName(curc, &c_w_id_bp, errhp,
(text *)":c_w_id",
                strlen(":c_w_id"), (ub1 *)c_w_id, sizeof(int), SQLT_INT,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curc, &c_first_bp, errhp,
(text *)":c_first",
            strlen(":c_first"), (ub1 *)c_first, 17, SQLT_STR,
            (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curc, &c_last_bp, errhp,
(text *)":c_last",
            strlen(":c_last"), (ub1 *)c_last, 17, SQLT_STR,
            (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curc, &c_street1_bp,
errhp, (text *)":c_street_1",
                strlen(":c_street_1"), (ub1 *)c_street_1, 21,
SQLT_STR,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curc, &c_street2_bp,
errhp, (text *)":c_street_2",
                strlen(":c_street_2"), (ub1 *)c_street_2, 21,
SQLT_STR,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curc, &c_city_bp, errhp,
(text *)":c_city",
                strlen(":c_city"), (ub1 *)c_city, 21, SQLT_STR,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curc, &c_state_bp, errhp,
(text *)":c_state",
                strlen(":c_state"), (ub1 *)c_state, 2, SQLT_CHR,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curc, &c_zip_bp, errhp,
(text *)":c_zip",
                strlen(":c_zip"), (ub1 *)c_zip, 9, SQLT_CHR,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curc, &c_phone_bp,
errhp, (text *)":c_phone",
                strlen(":c_phone"), (ub1 *)c_phone, 16, SQLT_CHR,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curc, &c_credit_bp, errhp,
(text *)":c_credit",
                strlen(":c_credit"), (ub1 *)c_credit, 2, SQLT_CHR,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curc, &c_discount_bp,
errhp, (text *)":c_discount",
                strlen(":c_discount"), (ub1 *)c_discount, sizeof(float),
SQLT_FLT,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curc, &c_data_bp, errhp,
(text *)":c_data",
                strlen(":c_data"), (ub1 *)c_data, 501, SQLT_STR,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));
    }

    /* item */

    if (do_A || do_i) {
        OCIERROR(errhp, OCIBindByName(curi, &i_id_bp, errhp,
(text *)":i_id",
                strlen(":i_id"), (ub1 *)i_id, sizeof(int), SQLT_INT,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curi, &i_im_id_bp, errhp,
(text *)":i_im_id",
                strlen(":i_im_id"), (ub1 *)i_im_id, sizeof(int), SQLT_INT,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curi, &i_name_bp, errhp,
(text *)":i_name",
                strlen(":i_name"), (ub1 *)i_name, 25, SQLT_STR,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curi, &i_price_bp, errhp,
(text *)":i_price",
                strlen(":i_price"), (ub1 *)i_price, sizeof(int), SQLT_INT,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curi, &i_data_bp, errhp,
(text *)":i_data",
                strlen(":i_data"), (ub1 *)i_data, 51, SQLT_STR,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));
    }

    /* stock */

    if (do_A || do_s || do_S) {
        OCIERROR(errhp, OCIBindByName(curss, &s_s_i_id_bp,
errhp, (text *)":s_s_i_id",
                strlen(":s_s_i_id"), (ub1 *)&s_s_i_id, sizeof(int),
SQLT_INT,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curss, &s_s_w_id_bp,
errhp, (text *)":s_s_w_id",
                strlen(":s_s_w_id"), (ub1 *)&s_s_w_id, sizeof(int),
SQLT_INT,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

OCIDefineByPos(curss,&s_s_ret_bp,errhp,1,&s_s_count,sizeof(int),
SQLT_INT,\
                0,0,0,OCI_DEFAULT);

        OCIERROR(errhp, OCIBindByName(curs, &s_i_id_bp, errhp,
(text *)":s_i_id",
                strlen(":s_i_id"), (ub1 *)s_i_id, sizeof(int), SQLT_INT,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curs, &s_w_id_bp, errhp,
(text *)":s_w_id",
                strlen(":s_w_id"), (ub1 *)s_w_id, sizeof(int), SQLT_INT,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));
```

```
        OCIERROR(errhp, OCIBindByName(curs, &s_quantity_bp,
errhp, (text *)":s_quantity",
                strlen(":s_quantity"), (ub1 *)s_quantity, sizeof(int),
SQLT_INT,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curs, &s_dist_01_bp,
errhp, (text *)":s_dist_01",
                strlen(":s_dist_01"), (ub1 *)s_dist_01, 25, SQLT_STR,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));


        OCIERROR(errhp, OCIBindByName(curs, &s_dist_02_bp,
errhp, (text *)":s_dist_02",
                strlen(":s_dist_02"), (ub1 *)s_dist_02, 25, SQLT_STR,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));


        OCIERROR(errhp, OCIBindByName(curs, &s_dist_03_bp,
errhp, (text *)":s_dist_03",
                strlen(":s_dist_03"), (ub1 *)s_dist_03, 25, SQLT_STR,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));


        OCIERROR(errhp, OCIBindByName(curs, &s_dist_04_bp,
errhp, (text *)":s_dist_04",
                strlen(":s_dist_04"), (ub1 *)s_dist_04, 25, SQLT_STR,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));


        OCIERROR(errhp, OCIBindByName(curs, &s_dist_05_bp,
errhp, (text *)":s_dist_05",
                strlen(":s_dist_05"), (ub1 *)s_dist_05, 25, SQLT_STR,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));


        OCIERROR(errhp, OCIBindByName(curs, &s_dist_06_bp,
errhp, (text *)":s_dist_06",
                strlen(":s_dist_06"), (ub1 *)s_dist_06, 25, SQLT_STR,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));


        OCIERROR(errhp, OCIBindByName(curs, &s_dist_07_bp,
errhp, (text *)":s_dist_07",
                strlen(":s_dist_07"), (ub1 *)s_dist_07, 25, SQLT_STR,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));


        OCIERROR(errhp, OCIBindByName(curs, &s_dist_08_bp,
errhp, (text *)":s_dist_08",
                strlen(":s_dist_08"), (ub1 *)s_dist_08, 25, SQLT_STR,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));


        OCIERROR(errhp, OCIBindByName(curs, &s_dist_09_bp,
errhp, (text *)":s_dist_09",
                strlen(":s_dist_09"), (ub1 *)s_dist_09, 25, SQLT_STR,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));


        OCIERROR(errhp, OCIBindByName(curs, &s_dist_10_bp,
errhp, (text *)":s_dist_10",
                strlen(":s_dist_10"), (ub1 *)s_dist_10, 25, SQLT_STR,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curs, &s_data_bp, errhp,
(text *)":s_data",
                strlen(":s_data"), (ub1 *)s_data, 51, SQLT_STR,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));
    }

    /* history */

    if (do_A || do_h) {
        OCIERROR(errhp, OCIBindByName(curh, &h_c_id_bp, errhp,
(text *)":h_c_id",
                strlen(":h_c_id"), (ub1 *)h_c_id, sizeof(int), SQLT_INT,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curh, &h_c_d_id_bp,
errhp, (text *)":h_c_d_id",
                strlen(":h_c_d_id"), (ub1 *)h_d_id, sizeof(int),
SQLT_INT,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curh, &h_c_w_id_bp,
errhp, (text *)":h_c_w_id",
                strlen(":h_c_w_id"), (ub1 *)h_w_id, sizeof(int),
SQLT_INT,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curh, &h_d_id_bp, errhp,
(text *)":h_d_id",
                strlen(":h_d_id"), (ub1 *)h_d_id, sizeof(int), SQLT_INT,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curh, &h_w_id_bp, errhp,
(text *)":h_w_id",
                strlen(":h_w_id"), (ub1 *)h_w_id, sizeof(int), SQLT_INT,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curh, &h_data_bp, errhp,
(text *)":h_data",
                strlen(":h_data"), (ub1 *)h_data, 25, SQLT_STR,
                (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

    }

    /* order and order_line (delivered) */

    if (do_A || do_o) {

        for (i = 0; i < ORDEARR; i++ ) {
            o_id_len[i] = sizeof(int);
            o_d_id_len[i] = sizeof(int);
            o_w_id_len[i] = sizeof(int);
            o_c_id_len[i] = sizeof(int);
            o_carrier_id_len[i] = sizeof(int);
            o_ol_cnt_len[i] = sizeof(int);
        }

        OCIERROR(errhp, OCIBindByName(curo1, &ol_o_id_bp,
errhp, (text *)":ol_o_id",
                strlen(":ol_o_id"), (ub1 *)ol_o_id, sizeof(int),
SQLT_INT,
                (dvoid *) 0, (ub2 *)ol_o_id_len, (ub2 *)0,
```

```
                    (ub4) 15*ORDEARR, (ub4 *)&ol_o_id_clen, (ub4)
OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curo1, &ol_d_id_bp,
errhp, (text *)":ol_d_id",
                    strlen(":ol_d_id"), (ub1 *)ol_d_id, sizeof(int),
SQLT_INT,
                    (dvoid *) 0, (ub2 *)ol_d_id_len, (ub2 *)0,
                    (ub4) 15*ORDEARR, (ub4 *) &ol_d_id_clen, (ub4)
OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curo1, &ol_w_id_bp,
errhp, (text *)":ol_w_id",
                    strlen(":ol_w_id"), (ub1 *)ol_w_id, sizeof(int),
SQLT_INT,
                    (dvoid *) 0, (ub2 *)ol_w_id_len, (ub2 *)0,
                    (ub4) 15*ORDEARR, (ub4 *) &ol_w_id_clen, (ub4)
OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curo1, &ol_number_bp,
errhp, (text *)":ol_number",
                    strlen(":ol_number"), (ub1 *)ol_number, sizeof(int),
SQLT_INT,
                    (dvoid *) 0, (ub2 *)ol_number_len, (ub2 *)0,
                    (ub4) 15*ORDEARR, (ub4 *) &ol_number_clen, (ub4)
OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curo1, &ol_i_id_bp, errhp,
(text *)":ol_i_id",
                    strlen(":ol_i_id"), (ub1 *)ol_i_id, sizeof(int), SQLT_INT,
                    (dvoid *) 0, (ub2 *)ol_i_id_len, (ub2 *)0,
                    (ub4) 15*ORDEARR, (ub4 *) &ol_i_id_clen, (ub4)
OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curo1,
&ol_supply_w_id_bp, errhp, (text *)":ol_supply_w_id",
                    strlen(":ol_supply_w_id"), (ub1 *)ol_supply_w_id,
sizeof(int), SQLT_INT,
                    (dvoid *) 0, (ub2 *)ol_supply_w_id_len, (ub2 *)0,
                    (ub4) 15*ORDEARR, (ub4 *) &ol_supply_w_id_clen,
(ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curo1, &ol_dist_info_bp,
errhp, (text *)":ol_dist_info",
                    strlen(":ol_dist_info"), (ub1 *)ol_dist_info, 24,
SQLT_CHR,
                    (dvoid *) 0, (ub2 *)ol_dist_info_len, (ub2 *)0,
                    (ub4) 15*ORDEARR, (ub4 *) &ol_dist_info_clen, (ub4)
OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curo1, &ol_amount_bp,
errhp, (text *)":ol_amount",
                    strlen(":ol_amount"), (ub1 *)ol_amount, sizeof(int),
SQLT_INT,
                    (dvoid *) 0, (ub2 *)ol_amount_len, (ub2 *)0,
                    (ub4) 15*ORDEARR, (ub4 *) &ol_amount_clen, (ub4)
OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curo1, &o_id_bp, errhp,
(text *)":o_id",
                    strlen(":o_id"), (ub1 *)o_id, sizeof(int), SQLT_INT,
                    (dvoid *) 0, (ub2 *)o_id_len, (ub2 *)0,
                    (ub4) ORDEARR, (ub4 *) &o_id_clen, (ub4)
OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curo1, &o_d_id_bp, errhp,
(text *)":o_d_id",
                    strlen(":o_d_id"), (ub1 *)o_d_id, sizeof(int), SQLT_INT,
                    (dvoid *) 0, (ub2 *)o_d_id_len, (ub2 *)0,
                    (ub4) ORDEARR, (ub4 *) &o_d_id_clen, (ub4)
OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curo1, &o_w_id_bp,
errhp, (text *)":o_w_id",
                    strlen(":o_w_id"), (ub1 *)o_w_id, sizeof(int), SQLT_INT,
                    (dvoid *) 0, (ub2 *)o_w_id_len, (ub2 *)0,
                    (ub4) ORDEARR, (ub4 *) &o_w_id_clen, (ub4)
OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curo1, &o_c_id_bp, errhp,
(text *)":o_c_id",
                    strlen(":o_c_id"), (ub1 *)o_c_id, sizeof(int), SQLT_INT,
                    (dvoid *) 0, (ub2 *)o_c_id_len, (ub2 *)0,
                    (ub4) ORDEARR, (ub4 *) &o_c_id_clen, (ub4)
OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curo1, &o_carrier_id_bp,
errhp, (text *)":o_carrier_id",
                    strlen(":o_carrier_id"), (ub1 *)o_carrier_id, sizeof(int),
SQLT_INT,
                    (dvoid *) 0, (ub2 *)o_carrier_id_len, (ub2 *)0,
                    (ub4) ORDEARR, (ub4 *) &o_carrier_id_clen, (ub4)
OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curo1, &o_ol_cnt_bp,
errhp, (text *)":o_ol_cnt",
                    strlen(":o_ol_cnt"), (ub1 *)o_ol_cnt, sizeof(int),
SQLT_INT,
                    (dvoid *) 0, (ub2 *)o_ol_cnt_len, (ub2 *)0,
                    (ub4) ORDEARR, (ub4 *) &o_ol_cnt_clen, (ub4)
OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curo1, &o_ocnt_bp, errhp,
(text *)":order_rows",
                    strlen(":order_rows"), (ub1 *)&o_cnt, sizeof(int),
SQLT_INT,
                    (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                    (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curo1, &o_olcnt_bp,
errhp, (text *)":ordl_rows",
                    strlen(":ordl_rows"), (ub1 *)&ol_cnt, sizeof(int),
SQLT_INT,
                    (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                    (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));
      }

      /* new order */

      if (do_A || do_n) {
        OCIERROR(errhp, OCIBindByName(curno, &no_o_id_bp,
errhp, (text *)":no_o_id",
                    strlen(":no_o_id"), (ub1 *)no_o_id, sizeof(int),
SQLT_INT,
                    (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                    (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curno, &no_d_id_bp,
errhp, (text *)":no_d_id",
                    strlen(":no_d_id"), (ub1 *)no_d_id, sizeof(int),
SQLT_INT,
                    (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                    (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));

        OCIERROR(errhp, OCIBindByName(curno, &no_w_id_bp,
errhp, (text *)":no_w_id",
                    strlen(":no_w_id"), (ub1 *)no_w_id, sizeof(int),
SQLT_INT,
                    (dvoid *) 0, (ub2 *)0, (ub2 *)0,
                    (ub4) 0, (ub4 *) 0, (ub4) OCI_DEFAULT));
      }
    }

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

```
 | Initialize random number generator           |
 +--------------------------------------------------------------*/

   srand (SEED);
#ifndef ORA_NT
   srand48 (SEED);
#endif
   initperm ();


/*--------------------------------------------------------------+
 | Load the WAREHOUSE table.             |
 +--------------------------------------------------------------*/

   if (do_A || do_w) {
      nrows = eware - bware + 1;

      fprintf (stderr, "Loading/generating warehouse: w%d - w%d (%d
rows)\n",
             bware, eware, nrows);

      begin_time = gettime ();
      begin_cpu = getcpu ();

      for (loop = bware; loop <= eware; loop++) {

         w_tax = (float) ((lrand48 () % 2001) * 0.0001);
         randstr (w_name, 6, 10);
         randstr (w_street_1, 10, 20);
         randstr (w_street_2, 10, 20);
         randstr (w_city, 10, 20);
         randstr (str2, 2, 2);
         randnum (num9, 9);
         num9[4] = num9[5] = num9[6] = num9[7] = num9[8] = '1';

         if (gen) {
            printf ("%d 30000000 %6.4f %s %s %s %s %s %s\n", loop,
w_tax,
                  w_name, w_street_1, w_street_2, w_city, str2, num9);
            fflush (stdout);
         }
         else {
            w_id = loop;
            strncpy (w_state, str2, 2);
            strncpy (w_zip, num9, 9);

       status = OCIStmtExecute(tpcsvc, curw, errhp, (ub4) 1, (ub4) 0,
                   (CONST OCISnapshot*) 0, (OCISnapshot*) 0,
                   (ub4) OCI_DEFAULT |
OCI_COMMIT_ON_SUCCESS);
       if (status != OCI_SUCCESS) {
          fprintf (stderr, "Error at ware %d\n", loop);
          OCIERROR(errhp, status);
          quit ();
             exit (1);
           }
         }
      }

      end_time = gettime ();
      end_cpu = getcpu ();
      fprintf (stderr, "Done.  %d rows loaded/generated in %10.2f sec.
(%10.2f cpu)\n\n",
             nrows, end_time - begin_time, end_cpu - begin_cpu);
   }

/*--------------------------------------------------------------+
 | Load the DISTRICT table.             |
 +--------------------------------------------------------------*/

   if (do_A || do_d) {
      nrows = (eware - bware + 1) * DISTFAC;

      fprintf (stderr, "Loading/generating district: w%d - w%d (%d
rows)\n",
             bware, eware, nrows);

      begin_time = gettime ();
      begin_cpu = getcpu ();

      dwid = bware - 1;

      for (row = 0; row < nrows; ) {
         dwid++;

         for (i = 0; i < DISTARR; i++, row++) {
            d_tax[i] = (float) ((lrand48 () % 2001) * 0.0001);
            randstr (d_name[i], 6, 10);
            randstr (d_street_1[i], 10, 20);
            randstr (d_street_2[i], 10, 20);
            randstr (d_city[i], 10, 20);
            randstr (str2, 2, 2);
            randnum (num9, 9);
            num9[4] = num9[5] = num9[6] = num9[7] = num9[8] = '1';

            if (gen) {
               printf ("%d %d 3000000 %6.4f 3001 %s %s %s %s %s
%s\n",
                    i + 1, dwid, d_tax[i], d_name[i], d_street_1[i],
             d_street_2[i], d_city[i], str2, num9 );
            }
            else {
               d_id[i] = i + 1;
               d_w_id[i] = dwid;
               strncpy (d_state[i], str2, 2);
               strncpy (d_zip[i], num9, 9);
            }
         }

         if (gen) {
            fflush (stdout);
         }
         else {
            status = OCIStmtExecute(tpcsvc, curd, errhp, (ub4)
DISTARR, (ub4) 0,
                    (CONST OCISnapshot*) 0, (OCISnapshot*) 0,
                    (ub4) OCI_DEFAULT |
OCI_COMMIT_ON_SUCCESS);
            if (status != OCI_SUCCESS) {
         fprintf (stderr, "Aborted at ware %d, dist 1\n", dwid);
                OCIERROR(errhp, status);
                quit ();
                exit (1);
            }
         }
      }

      end_time = gettime ();
      end_cpu = getcpu ();
      fprintf (stderr, "Done.  %d rows loaded/generated in %10.2f sec.
(%10.2f cpu)\n\n",
             nrows, end_time - begin_time, end_cpu - begin_cpu);
   }

/*--------------------------------------------------------------+
 | Load the CUSTOMER table.             |
 +--------------------------------------------------------------*/

   if (do_A || do_c) {

      nrows = (eware - bware + 1) * CUSTFAC * DISTFAC;

      fprintf (stderr, "Loading/generating customer: w%d - w%d (%d
rows)\n   ",
```

```
          bware, eware, nrows);

    if (getenv("tpcc_hash_overflow")) {
      fprintf(stderr,"Hash overflow is enabled\n");
      OCIHandleAlloc(tpcenv, (dvoid **)&curi, OCI_HTYPE_STMT, 0,
(dvoid**)0);
      sprintf ((char *) stmbuf, SQLTXTENHA);
      OCIStmtPrepare(curi, errhp, stmbuf, strlen((char *)stmbuf),
               OCI_NTV_SYNTAX, OCI_DEFAULT);
      OCIERROR(errhp,OCIStmtExecute(tpcsvc, curi,
errhp,1,0,0,0,OCI_DEFAULT));
      OCIHandleFree(curi, OCI_HTYPE_STMT);
      fprintf (stderr,"Customer loaded for horizontal partitioning\n");
    }
    else
    {
      fprintf (stderr,"Customer not loaded for horizontal
partitioning\n");
    }
    begin_time = gettime ();
    begin_cpu = getcpu ();

    s_c_id = 1;
    s_c_d_id = 1;
    s_c_w_id = bware;

    while (s_c_w_id <= eware) {
       status = OCIStmtExecute(tpcsvc, curcs, errhp, (ub4) 1, (ub4) 0,
            (CONST OCISnapshot*) 0, (OCISnapshot*) 0,
            (ub4) OCI_DEFAULT | OCI_COMMIT_ON_SUCCESS);
         if (status != OCI_SUCCESS) {
            OCIERROR(errhp, status);
            quit ();
            exit (1);
         }

         if (s_c_count == 0) {
           s_c_w_id--;
           break;
         }
         else s_c_w_id++;
    }

    if (s_c_w_id < bware ) s_c_w_id = bware;
    else {
      if (s_c_w_id > eware ) s_c_w_id = eware;
      while (s_c_d_id <= DISTFAC) {
         status = OCIStmtExecute(tpcsvc, curcs, errhp, (ub4) 1, (ub4)
0,
             (CONST OCISnapshot*) 0, (OCISnapshot*) 0,
             (ub4) OCI_DEFAULT | OCI_COMMIT_ON_SUCCESS);
          if (status != OCI_SUCCESS) {
        fprintf (stderr, "Select failed\n");
             OCIERROR(errhp, status);
             quit ();
             exit (1);
          }
          if (s_c_count == 0) {
            s_c_d_id--;
            break;
          }
          else s_c_d_id++;
      }
      if (s_c_d_id > DISTFAC) s_c_d_id = DISTFAC;

      while (s_c_id <= CUSTFAC) {
         status = OCIStmtExecute(tpcsvc, curcs, errhp, (ub4) 1, (ub4)
0,
             (CONST OCISnapshot*) 0, (OCISnapshot*) 0,
             (ub4) OCI_DEFAULT | OCI_COMMIT_ON_SUCCESS);
          if (status != OCI_SUCCESS) {
             OCIERROR(errhp, status);
```

```
             quit ();
             exit (1);
          }
          if (s_c_count == 0) break;
          else s_c_id++;
      }
    }
    if (s_c_id > CUSTFAC) {
      if (s_c_d_id == DISTFAC) {
        s_c_d_id=1;
        s_c_w_id++;
      } else {
   s_c_d_id++;
      }
      s_c_id=1;
    }

    fprintf (stderr, "start at wid: %d, did: %d, cid: %d\n   ",s_c_w_id,
s_c_d_id, s_c_id);
    cid = s_c_id - 1;
    cdid = s_c_d_id;
    cwid = s_c_w_id;
    nrows = (eware - s_c_w_id + 1) * DISTFAC * CUSTFAC -
(s_c_d_id - 1) * CUSTFAC - s_c_id + 1;
    fprintf (stderr, "remaining rows: %d\n   ", nrows);
    loopcount = 0;

    for (row = 0; row < nrows; ) {
      for (i = 0; i < CUSTARR && row < nrows; i++, row++) {
        cid++;
        if (cid > CUSTFAC) {        /* cycle cust id */
          cid = 1;                  /* cheap mod */
          cdid++;                   /* shift dist cycle */
          if (cdid > DISTFAC) {
            cdid = 1;
            cwid++;                 /* shift ware cycle */
          }
        }
        c_id[i] = cid;
        c_d_id[i] = cdid;
        c_w_id[i] = cwid;
        if (cid <= 1000)
          randlastname (c_last[i], cid - 1);
        else
          randlastname (c_last[i], NURand (255, 0, 999, CNUM1));
        c_credit[i][1] = 'C';
        if (lrand48 () % 10)
          c_credit[i][0] = 'G';
        else
          c_credit[i][0] = 'B';
        c_discount[i] = (float)((lrand48 () % 5001) * 0.0001);
        randstr (c_first[i], 8, 16);
        randstr (c_street_1[i], 10, 20);
        randstr (c_street_2[i], 10, 20);
        randstr (c_city[i], 10, 20);
        randstr (str2, 2, 2);
        randnum (num9, 9);
        num9[4] = num9[5] = num9[6] = num9[7] = num9[8] = '1';
        randnum (num16, 16);
        randstr (c_data[i], 300, 500);

        if (gen) {
          printf ("%d %d %d %s OE %s %s %s %s %s %s %s %s
%cC 5000000 %6.4f -1000 1000 1 0 %s\n",
                cid, cdid, cwid, c_first[i], c_last[i],
                c_street_1[i], c_street_2[i], c_city[i], str2, num9,
                num16, sdate, c_credit[i][0], c_discount[i], c_data[i]);
        }
        else {
          strncpy (c_state[i], str2, 2);
          strncpy (c_zip[i], num9, 9);
          strncpy (c_phone[i], num16, 16);
```

```
          }
        }

        if (gen) {
          fflush (stdout);
        }
        else {
          status = OCIStmtExecute(tpcsvc, curc, errhp, (ub4) i, (ub4) 0,
                    (CONST OCISnapshot*) 0, (OCISnapshot*) 0,
                    (ub4) OCI_DEFAULT |
OCI_COMMIT_ON_SUCCESS);

          if (status != OCI_SUCCESS) {
        fprintf (stderr, "Aborted at w_id %d, d_id %d, c_id %d\n",
                    c_w_id[0], c_d_id[0], c_id[0]);
               OCIERROR(errhp, status);
               quit ();
               exit (1);
          }
        }

        if ((++loopcount) % 50)
          fprintf (stderr, ".");
        else
          fprintf (stderr, " %d rows committed\n   ", row);
      }

      end_time = gettime ();
      end_cpu = getcpu ();
      fprintf (stderr, "Done.  %d rows loaded/generated in %10.2f sec.
(%10.2f cpu)\n\n",
             nrows < 0 ? 0 : nrows, end_time - begin_time, end_cpu -
begin_cpu);
      if (getenv("tpcc_hash_overflow")) {
        fprintf(stderr,"Hash overflow is disabled\n");
        OCIHandleAlloc(tpcenv, (dvoid **)&curi, OCI_HTYPE_STMT, 0,
(dvoid**)0);
        sprintf ((char *) stmbuf, SQLTXTDIHA);
        OCIStmtPrepare(curi, errhp, stmbuf, strlen((char *)stmbuf),
                   OCI_NTV_SYNTAX, OCI_DEFAULT);
        OCIERROR(errhp,OCIStmtExecute(tpcsvc, curi,
errhp,1,0,0,0,OCI_DEFAULT));
        OCIHandleFree(curi, OCI_HTYPE_STMT);
      }
    }


/*--------------------------------------------------------------+
 | Load the CUSTOMER table (cluster around c_id)       |
 +--------------------------------------------------------------*/

    if (do_C) {

      srand (bcid);
#ifndef ORA_NT
      srand48 (bcid);
#endif

      nrows = (ecid - bcid + 1) * (eware - bware +1) * DISTFAC;

      fprintf (stderr, "Loading/generating customer: c%d - c%d, w%d -
w%d (%d rows)\n   ",
             bcid, ecid, bware, eware, nrows);

      if (getenv("tpcc_hash_overflow")) {
        fprintf(stderr,"Hash overflow is enabled\n");
        OCIHandleAlloc(tpcenv, (dvoid **)&curi, OCI_HTYPE_STMT, 0,
(dvoid**)0);
        sprintf ((char *) stmbuf, SQLTXTENHA);
        OCIStmtPrepare(curi, errhp, stmbuf, strlen((char *)stmbuf),
                   OCI_NTV_SYNTAX, OCI_DEFAULT);
        OCIERROR(errhp,OCIStmtExecute(tpcsvc, curi,
errhp,1,0,0,0,OCI_DEFAULT));
        OCIHandleFree(curi, OCI_HTYPE_STMT);
        fprintf (stderr,"Customer loaded for horizontal partitioning\n");
      }
      else
      {
        fprintf (stderr,"Customer not loaded for horizontal
partitioning\n");
      }
      begin_time = gettime ();
      begin_cpu = getcpu ();

      s_c_id = bcid;
      s_c_d_id = 1;
      s_c_w_id = bware;

      while (s_c_id <= ecid) {
        status = OCIStmtExecute(tpcsvc, curcs, errhp, (ub4) 1, (ub4) 0,
                (CONST OCISnapshot*) 0, (OCISnapshot*) 0,
                (ub4) OCI_DEFAULT | OCI_COMMIT_ON_SUCCESS);
          if (status != OCI_SUCCESS) {
                OCIERROR(errhp, status);
                quit ();
                exit (1);
          }

          if (s_c_count == 0) {
            s_c_id--;
            break;
          }
          else s_c_id++;
      }

      if (s_c_id < bcid ) s_c_id = bcid;
      else {
        if (s_c_id > ecid ) s_c_id = ecid;
        while (s_c_w_id <= eware) {
          status = OCIStmtExecute(tpcsvc, curcs, errhp, (ub4) 1, (ub4)
0,
                 (CONST OCISnapshot*) 0, (OCISnapshot*) 0,
                 (ub4) OCI_DEFAULT | OCI_COMMIT_ON_SUCCESS);
            if (status != OCI_SUCCESS) {
          fprintf (stderr, "Select failed\n");
                 OCIERROR(errhp, status);
                 quit ();
                 exit (1);
            }
            if (s_c_count == 0) {
              s_c_w_id--;
              break;
            }
            else s_c_w_id++;
        }
        if (s_c_w_id > eware) s_c_w_id = eware;
        else if (s_c_w_id < bware) s_c_w_id = bware;

        while (s_c_d_id <= DISTFAC) {
          status = OCIStmtExecute(tpcsvc, curcs, errhp, (ub4) 1, (ub4)
0,
                 (CONST OCISnapshot*) 0, (OCISnapshot*) 0,
                 (ub4) OCI_DEFAULT | OCI_COMMIT_ON_SUCCESS);
            if (status != OCI_SUCCESS) {
                 OCIERROR(errhp, status);
                 quit ();
                 exit (1);
            }
            if (s_c_count == 0) break;
            else s_c_d_id++;
        }
      }
```

```
      if (s_c_d_id > DISTFAC) {
        s_c_d_id=1;
        if (s_c_w_id==eware) {
          s_c_w_id=bware;
          s_c_id++;
        }
        else s_c_w_id++;
      }

      fprintf (stderr, "start at cid: %d, wid: %d, did: %d\n   ",s_c_id,
s_c_w_id, s_c_d_id);
      cid = s_c_id;
      cdid = s_c_d_id-1;
      cwid = s_c_w_id;
      nrows = (ecid - s_c_id + 1) * (eware - bware + 1) * DISTFAC -
(s_c_w_id - 1) * DISTFAC - s_c_d_id + 1;
      fprintf (stderr, "remaining rows: %d\n   ", nrows);
      loopcount = 0;

      for (row = 0; row < nrows; ) {
        for (i = 0; i < CUSTARR && row < nrows; i++, row++) {
          cdid++;
          if (cdid > DISTFAC) {        /* cycle dist id */
            cdid = 1;                /* cheap mod */
            cwid++;                  /* shift dist cycle */
            if (cwid > eware) {
              cwid = bware;              /* shift ware cycle */
              cid++;
            }
          }
          c_id[i] = cid;
          c_d_id[i] = cdid;
          c_w_id[i] = cwid;
          if (cid <= 1000)
            randlastname (c_last[i], cid - 1);
          else
            randlastname (c_last[i], NURand (255, 0, 999, CNUM1));
          c_credit[i][1] = 'C';
          if (lrand48 () % 10)
            c_credit[i][0] = 'G';
          else
            c_credit[i][0] = 'B';
          c_discount[i] = (float)((lrand48 () % 5001) * 0.0001);
          randstr (c_first[i], 8, 16);
          randstr (c_street_1[i], 10, 20);
          randstr (c_street_2[i], 10, 20);
          randstr (c_city[i], 10, 20);
          randstr (str2, 2, 2);
          randnum (num9, 9);
          num9[4] = num9[5] = num9[6] = num9[7] = num9[8] = '1';
          randnum (num16, 16);
          randstr (c_data[i], 300, 500);

          if (gen) {
            printf ("%d %d %d %s OE %s %s %s %s %s %s %s %s
%cC 5000000 %6.4f -1000 1000 1 0 %s\n",
                    cid, cdid, cwid, c_first[i], c_last[i],
                    c_street_1[i], c_street_2[i], c_city[i], str2, num9,
                    num16, sdate, c_credit[i][0], c_discount[i], c_data[i]);
          }
          else {
            strncpy (c_state[i], str2, 2);
            strncpy (c_zip[i], num9, 9);
            strncpy (c_phone[i], num16, 16);
          }
        }

        if (gen) {
          fflush (stdout);
        }
        else {
          status = OCIStmtExecute(tpcsvc, curc, errhp, (ub4) i, (ub4) 0,
                        (CONST OCISnapshot*) 0, (OCISnapshot*) 0,
                        (ub4) OCI_DEFAULT |
OCI_COMMIT_ON_SUCCESS);

            if (status != OCI_SUCCESS) {
          fprintf (stderr, "Aborted at w_id %d, d_id %d, c_id %d\n",
                        c_w_id[0], c_d_id[0], c_id[0]);
                OCIERROR(errhp, status);
                quit ();
                exit (1);
            }
          }

          if ((++loopcount) % 50)
            fprintf (stderr, ".");
          else
            fprintf (stderr, " %d rows committed\n   ", row);
        }

        end_time = gettime ();
        end_cpu = getcpu ();
        fprintf (stderr, "Done.  %d rows loaded/generated in %10.2f sec.
(%10.2f cpu)\n\n",
              nrows < 0 ? 0 : nrows, end_time - begin_time, end_cpu -
begin_cpu);
        if (getenv("tpcc_hash_overflow")) {
          fprintf(stderr,"Hash overflow is disabled\n");
          OCIHandleAlloc(tpcenv, (dvoid **)&curi, OCI_HTYPE_STMT, 0,
(dvoid**)0);
          sprintf ((char *) stmbuf, SQLTXTDIHA);
          OCIStmtPrepare(curi, errhp, stmbuf, strlen((char *)stmbuf),
                    OCI_NTV_SYNTAX, OCI_DEFAULT);
          OCIERROR(errhp,OCIStmtExecute(tpcsvc, curi,
errhp,1,0,0,0,OCI_DEFAULT));
          OCIHandleFree(curi, OCI_HTYPE_STMT);
        }
      }


/*---------------------------------------------------------------+
 | Load the ITEM table.                   |
 +---------------------------------------------------------------*/

    if (do_A || do_i) {
      nrows = ITEMFAC;

      fprintf (stderr, "Loading/generating item: (%d rows)\n   ", nrows);

      begin_time = gettime ();
      begin_cpu = getcpu ();

      loopcount = 0;

      for (row = 0; row < nrows; ) {
        for (i = 0; i < ITEMARR; i++, row++) {
          i_im_id[i] = (lrand48 () % 10000) + 1;
          i_price[i] = ((lrand48 () % 9901) + 100);
          randstr (i_name[i], 14, 24);
          randdatastr (i_data[i], 26, 50);

          if (gen) {
            printf ("%d %d %s %d %s\n", row + 1, i_im_id[i], i_name[i],
                  i_price[i], i_data[i]);
          }
          else {
            i_id[i] = row + 1;
          }
        }

        if (gen) {
          fflush (stdout);
        }
```

```
        else {
          status = OCIStmtExecute(tpcsvc, curi, errhp, (ub4)
ITEMARR, (ub4) 0,
                  (CONST OCISnapshot*) 0, (OCISnapshot*) 0,
                  (ub4) OCI_DEFAULT |
OCI_COMMIT_ON_SUCCESS);
          if (status != OCI_SUCCESS) {
        fprintf (stderr, "Aborted at i_id %d\n", i_id[0]);
              OCIERROR(errhp, status);
              quit ();
              exit (1);
          }
        }

        if ((++loopcount) % 50)
          fprintf (stderr, ".");
        else
          fprintf (stderr, " %d rows committed\n   ", row);
      }

      end_time = gettime ();
      end_cpu = getcpu ();
      fprintf (stderr, "Done.  %d rows loaded/generated in %10.2f sec.
(%10.2f cpu)\n\n",
             nrows, end_time - begin_time, end_cpu - begin_cpu);
  }


/*-------------------------------------------------------------+
 | Load the STOCK table.              |
 +-------------------------------------------------------------*/

  if (do_A || do_s) {

      nrows = (eware - bware + 1) * STOCFAC;

      fprintf (stderr, "Loading/generating stock: w%d - w%d (%d
rows)\n   ",
             bware, eware, nrows);

      begin_time = gettime ();
      begin_cpu = getcpu ();

      s_s_i_id = 1;
      s_s_w_id = bware;

      while (s_s_w_id <= eware) {
        status = OCIStmtExecute(tpcsvc, curss, errhp, (ub4) 1, (ub4) 0,
              (CONST OCISnapshot*) 0, (OCISnapshot*) 0,
              (ub4) OCI_DEFAULT | OCI_COMMIT_ON_SUCCESS);
          if (status != OCI_SUCCESS) {
              OCIERROR(errhp, status);
              quit ();
              exit (1);
          }
          if (s_s_count == 0) {
            s_s_w_id--;
            break;
          }
          else s_s_w_id++;
      }

      if (s_s_w_id < bware ) s_s_w_id = bware;
      else {
        if (s_s_w_id > eware) s_s_w_id = eware;
        while (s_s_i_id<=STOCFAC) {
          status = OCIStmtExecute(tpcsvc, curss, errhp, (ub4) 1, (ub4)
0,
                (CONST OCISnapshot*) 0, (OCISnapshot*) 0,
                (ub4) OCI_DEFAULT | OCI_COMMIT_ON_SUCCESS);
            if (status != OCI_SUCCESS) {
                OCIERROR(errhp, status);
                quit ();
                exit (1);
            }
            if (s_s_count == 0) {
              break;
            }
            else s_s_i_id++;
        }
      }
      if (s_s_i_id > STOCFAC) {
        s_s_i_id=1;
        s_s_w_id++;
      }

      fprintf(stderr,"start at s_i_id: %d, s_w_id: %d\n   ", s_s_i_id,
s_s_w_id);

      sid = s_s_i_id - 1;
      swid = s_s_w_id;
      nrows = (eware - s_s_w_id + 1) * STOCFAC - ( s_s_i_id - 1);
      fprintf (stderr, "remaining rows: %d\n   ", nrows);
      loopcount = 0;

      for (row = 0; row < nrows; ) {
        /* added row < nrows condition on next line - alex.ni */
    for (i = 0; (i < STOCARR) && (row < nrows); i++, row++) {
          if (++sid > STOCFAC) {        /* cheap mod */
            sid = 1;
            swid++;
          }
          s_quantity[i] = (lrand48 () % 91) + 10;
          randstr (s_dist_01[i], 24, 24);
          randstr (s_dist_02[i], 24, 24);
          randstr (s_dist_03[i], 24, 24);
          randstr (s_dist_04[i], 24, 24);
          randstr (s_dist_05[i], 24, 24);
          randstr (s_dist_06[i], 24, 24);
          randstr (s_dist_07[i], 24, 24);
          randstr (s_dist_08[i], 24, 24);
          randstr (s_dist_09[i], 24, 24);
          randstr (s_dist_10[i], 24, 24);
          randdatastr (s_data[i], 26, 50);

          if (gen) {
            printf ("%d %d %d %s %s %s %s %s %s %s %s %s 0
0 0 %s\n",
                sid, swid, s_quantity[i], s_dist_01[i], s_dist_02[i],
                s_dist_03[i], s_dist_04[i], s_dist_05[i], s_dist_06[i],
                s_dist_07[i], s_dist_08[i], s_dist_09[i], s_dist_10[i],
                s_data[i]);
          }
          else {
            s_i_id[i] = sid;
            s_w_id[i] = swid;
          }
        }

        if (gen) {
          fflush (stdout);
        }
        else {
      /* Changed to STOCKARR to i - alex.ni */
          status = OCIStmtExecute(tpcsvc, curs, errhp, (ub4) i, (ub4) 0,
                  (CONST OCISnapshot*) 0, (OCISnapshot*) 0,
                  (ub4) OCI_DEFAULT |
OCI_COMMIT_ON_SUCCESS);
          if (status != OCI_SUCCESS) {
           fprintf (stderr, "Aborted at w_id %d, s_i_id %d\n", s_w_id[0],
s_i_id[0]);
              OCIERROR(errhp, status);
              quit ();
              exit (1);
```

```
      }
    }

    if ((++loopcount) % 50)
      fprintf (stderr, ".");
    else
      fprintf (stderr, " %d rows committed\n   ", row);
  }

  end_time = gettime ();
  end_cpu = getcpu ();
  fprintf (stderr, "Done.  %d rows loaded/generated in %10.2f sec.
(%10.2f cpu)\n\n",
        nrows < 0 ? 0 : nrows, end_time - begin_time, end_cpu -
begin_cpu);
  }

/*--------------------------------------------------------------+
 | Load the STOCK table (cluster around s_i_id).    |
 +--------------------------------------------------------------*/

  if (do_S) {

    nrows = (eitem - bitem + 1) * (eware - bware + 1);

    fprintf (stderr, "Loading/generating stock: i%d - i%d, w%d - w%d
(%d rows)\n   ",
          bitem, eitem, bware, eware, nrows);

    begin_time = gettime ();
    begin_cpu = getcpu ();

    s_s_i_id = bitem;
    s_s_w_id = bware;

    while (s_s_i_id <= eitem) {
      status = OCIStmtExecute(tpcsvc, curss, errhp, (ub4) 1, (ub4) 0,
            (CONST OCISnapshot*) 0, (OCISnapshot*) 0,
            (ub4) OCI_DEFAULT | OCI_COMMIT_ON_SUCCESS);
        if (status != OCI_SUCCESS) {
            OCIERROR(errhp, status);
            quit ();
            exit (1);
        }
        if (s_s_count == 0) {
          s_s_i_id--;
          break;
        }
        else s_s_i_id++;
    }

    if (s_s_i_id < bitem ) s_s_i_id = bitem;
    else {
      if (s_s_i_id > eitem) s_s_i_id = eitem;
      while (s_s_w_id <= eware) {
        status = OCIStmtExecute(tpcsvc, curss, errhp, (ub4) 1, (ub4)
0,
              (CONST OCISnapshot*) 0, (OCISnapshot*) 0,
              (ub4) OCI_DEFAULT | OCI_COMMIT_ON_SUCCESS);
          if (status != OCI_SUCCESS) {
              OCIERROR(errhp, status);
              quit ();
              exit (1);
          }
          if (s_s_count == 0) {
            break;
          }
          else s_s_w_id++;
      }
    }
    if (s_s_w_id > eware) {
      s_s_w_id=bware;
```

```
      s_s_i_id++;
    }

    fprintf(stderr,"start at s_i_id: %d, s_w_id: %d\n   ", s_s_i_id,
s_s_w_id);

    sid = s_s_i_id;
    swid = s_s_w_id - 1;
    nrows = (eitem - s_s_i_id + 1) * (eware - bware + 1) - (s_s_w_id
- bware);
    fprintf (stderr, "remaining rows: %d\n   ", nrows);
    loopcount = 0;

    for (row = 0; row < nrows; ) {
      for (i = 0; i < STOCARR && row < nrows; i++, row++) {
        if (++swid > eware) {          /* cheap mod */
          swid = bware;
          sid++;
        }
        s_quantity[i] = (lrand48 () % 91) + 10;
        randstr (s_dist_01[i], 24, 24);
        randstr (s_dist_02[i], 24, 24);
        randstr (s_dist_03[i], 24, 24);
        randstr (s_dist_04[i], 24, 24);
        randstr (s_dist_05[i], 24, 24);
        randstr (s_dist_06[i], 24, 24);
        randstr (s_dist_07[i], 24, 24);
        randstr (s_dist_08[i], 24, 24);
        randstr (s_dist_09[i], 24, 24);
        randstr (s_dist_10[i], 24, 24);
        randdatastr (s_data[i], 26, 50);

        if (gen) {
          printf ("%d %d %d %s %s %s %s %s %s %s %s %s %s 0
0 0 %s\n",
                sid, swid, s_quantity[i], s_dist_01[i], s_dist_02[i],
                s_dist_03[i], s_dist_04[i], s_dist_05[i], s_dist_06[i],
                s_dist_07[i], s_dist_08[i], s_dist_09[i], s_dist_10[i],
                s_data[i]);
        }
        else {
          s_i_id[i] = sid;
          s_w_id[i] = swid;
        }
      }

      if (gen) {
        fflush (stdout);
      }
      else {
        status = OCIStmtExecute(tpcsvc, curs, errhp, (ub4) i, (ub4) 0,
                (CONST OCISnapshot*) 0, (OCISnapshot*) 0,
                (ub4) OCI_DEFAULT |
OCI_COMMIT_ON_SUCCESS);
        if (status != OCI_SUCCESS) {
            fprintf (stderr, "Aborted at w_id %d, s_i_id %d\n",
s_w_id[0], s_i_id[0]);
            OCIERROR(errhp, status);
            quit ();
            exit (1);
        }
      }

      if ((++loopcount) % 50)
        fprintf (stderr, ".");
      else
        fprintf (stderr, " %d rows committed\n   ", row);
    }

    end_time = gettime ();
    end_cpu = getcpu ();
```

```
    fprintf (stderr, "Done.  %d rows loaded/generated in %10.2f sec.
(%10.2f cpu)\n\n",
             nrows < 0 ? 0 : nrows, end_time - begin_time, end_cpu -
begin_cpu);
  }

/*-------------------------------------------------------------+
 | Load the HISTORY table.              |
 +-------------------------------------------------------------*/

  if (do_A || do_h) {
    nrows = (eware - bware + 1) * HISTFAC;

    fprintf (stderr, "Loading/generating history: w%d - w%d (%d
rows)\n   ",
             bware, eware, nrows);

    begin_time = gettime ();
    begin_cpu = getcpu ();

    cid = 0;
    cdid = 1;
    cwid = bware;
    loopcount = 0;

    for (row = 0; row < nrows; ) {
      for (i = 0; i < HISTARR; i++, row++) {
        cid++;
        if (cid > CUSTFAC) {        /* cycle cust id */
          cid = 1;                 /* cheap mod */
          cdid++;                  /* shift district cycle */
          if (cdid > DISTFAC) {
            cdid = 1;
            cwid++;               /* shift warehouse cycle */
          }
        }
        h_c_id[i] = cid;
        h_d_id[i] = cdid;
        h_w_id[i] = cwid;
        randstr (h_data[i], 12, 24);
        if (gen) {
          printf ("%d %d %d %d %d %s 1000 %s\n", cid, cdid, cwid,
cdid,
                  cwid, sdate, h_data[i]);
        }
      }

      if (gen) {
        fflush (stdout);
      }
      else {
        status = OCIStmtExecute(tpcsvc, curh, errhp, (ub4)
HISTARR, (ub4) 0,
                     (CONST OCISnapshot*) 0, (OCISnapshot*) 0,
                     (ub4) OCI_DEFAULT |
OCI_COMMIT_ON_SUCCESS);
        if (status != OCI_SUCCESS) {
      fprintf (stderr, "Aborted at w_id %d, d_id %d, c_id %d\n",
                     h_w_id[0], h_d_id[0], h_c_id[0]);
            OCIERROR(errhp, status);
            quit ();
            exit (1);
        }
      }

      if ((++loopcount) % 50)
        fprintf (stderr, ".");
      else
        fprintf (stderr, " %d rows committed\n   ", row);
    }

    end_time = gettime ();
```

```
    end_cpu = getcpu ();
    fprintf (stderr, "Done.  %d rows loaded/generated in %10.2f sec.
(%10.2f cpu)\n\n",
             nrows, end_time - begin_time, end_cpu - begin_cpu);
  }

/*-------------------------------------------------------------+
 | Load the ORDERS and ORDER-LINE table.        |
 +-------------------------------------------------------------*/

  if (do_A || do_o) {

    int batch_olcnt;

    nrows = (eware - bware + 1) * ORDEFAC * DISTFAC;

    fprintf (stderr, "Loading/generating orders and order-line: w%d -
w%d (%d ord, ~%d ordl)\n   ",
             bware, eware, nrows, nrows * 10);

    begin_time = gettime ();
    begin_cpu = getcpu ();

    cid = 0;
    cdid = 1;
    cwid = bware;
    loopcount = 0;

    for (row = 0; row < nrows; ) {

      batch_olcnt = 0;

      for (i = 0; i < ORDEARR; i++, row++) {
        cid++;
        if (cid > ORDEFAC) {        /* cycle cust id */
          cid = 1;                 /* cheap mod */
          cdid++;                  /* shift district cycle */
          if (cdid > DISTFAC) {
            cdid = 1;
            cwid++;               /* shift warehouse cycle */
          }
        }
        o_carrier_id[i] = lrand48 () % 10 + 1;
        o_ol_cnt[i] = olcnt = lrand48 () % 11 + 5;

        if (gen) {
          if (cid < 2101) {
            printf ("%d %d %d %d %s %d %d 1\n", cid, cdid, cwid,
                   randperm3000[cid - 1], sdate,o_carrier_id[i],
                   o_ol_cnt[i]);
          }
          else {
         /* set carrierid to 11 instead of null */
            printf ("%d %d %d %d %s 11 %d 1\n", cid, cdid, cwid,
                   randperm3000[cid - 1], sdate, o_ol_cnt[i]);
          }
        }
        else {
          o_id[i] = cid;
          o_d_id[i] = cdid;
          o_w_id[i] = cwid;
          o_c_id[i] = randperm3000[cid - 1];
          if (cid >= 2101 ) {
             o_carrier_id[i] = 11;
          }
        }

        for (j = 0; j < o_ol_cnt[i]; j++, batch_olcnt++ ) {
          ol_i_id[batch_olcnt] = sid = lrand48 () % 100000 + 1;
          if (cid < 2101)
            ol_amount[batch_olcnt] = 0;
          else
```

```
            ol_amount[batch_olcnt] = (lrand48 () % 999999 + 1) ;
          randstr (str24[j], 24, 24);

          if (gen) {
            if (cid < 2101) {
              fprintf (olfp, "%d %d %d %d %s %d %d 5 %ld %s\n",
cid,
                     cdid, cwid, j + 1, sdate, ol_i_id[batch_olcnt], cwid,
                     ol_amount[batch_olcnt], str24[j]);
            }
            else {
              /* Insert a default date instead of null date */
              fprintf (olfp, "%d %d %d %d 01-Jan-1811 %d %d 5 %ld
%s\n", cid,
                     cdid, cwid, j + 1, ol_i_id[batch_olcnt], cwid,
                     ol_amount[batch_olcnt], str24[j]);
            }
          }
          else {
            ol_o_id[batch_olcnt] = cid;
            ol_d_id[batch_olcnt] = cdid;
            ol_w_id[batch_olcnt] = cwid;
            ol_number[batch_olcnt] = j + 1;
            ol_supply_w_id[batch_olcnt] = cwid;
            strncpy (ol_dist_info[batch_olcnt], str24[j], 24);
          }
        }
        if (gen) {
          fflush (olfp);
        }
      }

      o_cnt =  ORDEARR;
      ol_cnt =  batch_olcnt;

      for (j = 0; j < batch_olcnt; j++) {
        ol_o_id_len[j] = sizeof(int);
        ol_d_id_len[j] = sizeof(int);
        ol_w_id_len[j] = sizeof(int);
        ol_number_len[j] = sizeof(int);
        ol_i_id_len[j] = sizeof(int);
        ol_supply_w_id_len[j] = sizeof(int);
        ol_dist_info_len[j] = 24;
        ol_amount_len[j] = sizeof(int);
      }
      for (j = batch_olcnt; j < 15*ORDEARR; j++) {
        ol_o_id_len[j] = 0;
        ol_d_id_len[j] = 0;
        ol_w_id_len[j] = 0;
        ol_number_len[j] = 0;
        ol_i_id_len[j] = 0;
        ol_supply_w_id_len[j] = 0;
        ol_dist_info_len[j] = 0;
        ol_amount_len[j] = 0;
      }

      o_id_clen = ORDEARR;
      o_d_id_clen = ORDEARR;
      o_w_id_clen = ORDEARR;
      o_c_id_clen = ORDEARR;
      o_carrier_id_clen = ORDEARR;
      o_ol_cnt_clen = ORDEARR;

      ol_o_id_clen = batch_olcnt;
      ol_d_id_clen = batch_olcnt;
      ol_w_id_clen = batch_olcnt;
      ol_number_clen = batch_olcnt;
      ol_i_id_clen = batch_olcnt;
      ol_supply_w_id_clen = batch_olcnt;
      ol_dist_info_clen = batch_olcnt;
      ol_amount_clen = batch_olcnt;
```

```
      OCIERROR(errhp, OCIStmtExecute(tpcsvc, curo1, errhp, (ub4)
1, (ub4) 0,
                  (CONST OCISnapshot*) 0, (OCISnapshot*) 0,
                  (ub4) OCI_DEFAULT |
OCI_COMMIT_ON_SUCCESS ));

      if ((++loopcount) % 50) {
        fprintf (stderr, ".");
      } else {
        fprintf (stderr, " %d orders committed\n   ", row);
      }
    }

    end_time = gettime ();
    end_cpu = getcpu ();
    fprintf (stderr, "Done.  %d orders loaded/generated in %10.2f sec.
(%10.2f cpu)\n\n",
           nrows, end_time - begin_time, end_cpu - begin_cpu);
  }

/*-------------------------------------------------------------+
 | Load the NEW-ORDER table.              |
 +-------------------------------------------------------------*/

  if (do_A || do_n) {
    nrows = (eware - bware + 1) * NEWOFAC * DISTFAC;

    fprintf (stderr, "Loading/generating new-order: w%d - w%d (%d
rows)\n   ",
           bware, eware, nrows);

    begin_time = gettime ();
    begin_cpu = getcpu ();

    cid = 0;
    cdid = 1;
    cwid = bware;
    loopcount = 0;

    for (row = 0; row < nrows; ) {
      for (i = 0; i < NEWOARR; i++, row++) {
        cid++;
        if (cid > NEWOFAC) {
          cid = 1;
          cdid++;
          if (cdid > DISTFAC) {
            cdid = 1;
            cwid++;
          }
        }

        if (gen) {
          printf ("%d %d %d\n", cid + 2100, cdid, cwid);
        }
        else {
          no_o_id[i] = cid + 2100;
          no_d_id[i] = cdid;
          no_w_id[i] = cwid;
        }
      }

      if (gen) {
        fflush (stdout);
      }
      else {
        status = OCIStmtExecute(tpcsvc, curno, errhp, (ub4)
NEWOARR, (ub4) 0,
                    (CONST OCISnapshot*) 0, (OCISnapshot*) 0,
                    (ub4) OCI_DEFAULT |
OCI_COMMIT_ON_SUCCESS);
        if (status != OCI_SUCCESS) {
```

```
      fprintf (stderr, "Aborted at w_id %d, d_id %d, o_id %d\n", cwid,
cdid, cid + 2100);
              OCIERROR(errhp, status);
              quit ();
              exit (1);
           }
        }

        if ((++loopcount) % 45)
           fprintf (stderr, ".");
        else
           fprintf (stderr, " %d rows committed\n   ", row);
     }

     end_time = gettime ();
     end_cpu = getcpu ();
     fprintf (stderr, "Done.  %d rows loaded/generated in %10.2f sec.
(%10.2f cpu)\n\n",
             nrows, end_time - begin_time, end_cpu - begin_cpu);
  }

/*-------------------------------------------------------------+
 | clean up and exit.                |
 +-------------------------------------------------------------*/

  if (olfp)
     fclose (olfp);
  if (!gen)
     quit ();
  exit (0);

}

void initperm ()
{
  int i;
  int pos;
  int temp;

  /* init randperm3000 */

  for (i = 0; i < 3000; i++)
     randperm3000[i] = i + 1;
  for (i = 3000; i > 0; i--) {
     pos = lrand48 () % i;
     temp = randperm3000[i - 1];
     randperm3000[i - 1] = randperm3000[pos];
     randperm3000[pos] = temp;
  }
}

void randstr (str, x, y)
char *str;
int x;
int y;
{
  int i, j;
  int len;

  len = (lrand48 () % (y - x + 1)) + x;
  for (i = 0; i < len; i++) {
     j = lrand48 () % 62;
     if (j < 26)
        str[i] = (char) (j + 'a');
     else if (j < 52)
        str[i] = (char) (j - 26 + 'A');
     else
        str[i] = (char) (j - 52 + '0');
  }
  str[len] = '\0';

}

void randdatastr (str, x, y)
char *str;
int x;
int y;
{
  int i, j;
  int len;
  int pos;

  len = (lrand48 () % (y - x + 1)) + x;
  for (i = 0; i < len; i++) {
     j = lrand48 () % 62;
     if (j < 26)
        str[i] = (char) (j + 'a');
     else if (j < 52)
        str[i] = (char) (j - 26 + 'A');
     else
        str[i] = (char) (j - 52 + '0');
  }
  str[len] = '\0';
  if ((lrand48 () % 10) == 0) {
     pos = (lrand48 () % (len - 8));
     str[pos] = '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';
  }
}

void randnum (str, len)
char *str;
int len;
{
  int i;

  for (i = 0; i < len; i++)
     str[i] = (char) (lrand48 () % 10 + '0');
  str[len] = '\0';

}

void randlastname (str, id)
char *str;
int id;
{
  id = id % 1000;
  strcpy (str, lastname[id / 100]);
  strcat (str, lastname[(id / 10) % 10]);
  strcat (str, lastname[id % 10]);
}

int NURand (A, x, y, cnum)
int A, x, y, cnum;
{
  int a, b;

  a = lrand48 () % (A + 1);
  b = (lrand48 () % (y - x + 1)) + x;
  return ((((a | b) + cnum) % (y - x + 1)) + x);

}

void sysdate (sdate)
char *sdate;
{
  time_t tp;
  struct tm *tmptr;
```

```
  time (&tp);
  tmptr = localtime (&tp);
  strftime (sdate, 29, "%d-%b-%Y", tmptr);
}

int ocierror(fname, lineno, errhp, status)
char *fname;
int lineno;
OCIError *errhp;
sword status;
{
  text errbuf[512];
  sb4 errcode;
  sb4 lstat;
  ub4 recno=2;

  switch (status) {
  case OCI_SUCCESS:
    break;
  case OCI_SUCCESS_WITH_INFO:
    fprintf(stderr,"Module %s Line %d\n", fname, lineno);
    fprintf(stderr,"Error - OCI_SUCCESS_WITH_INFO\n");
    lstat = OCIErrorGet (errhp, recno++, (text *) NULL, &errcode,
errbuf,
                         (ub4) sizeof(errbuf), OCI_HTYPE_ERROR);
    fprintf(stderr,"Error - %s\n", errbuf);
    break;
  case OCI_NEED_DATA:
    fprintf(stderr,"Module %s Line %d\n", fname, lineno);
    fprintf(stderr,"Error - OCI_NEED_DATA\n");
    return (IRRECERR);
  case OCI_NO_DATA:
    fprintf(stderr,"Module %s Line %d\n", fname, lineno);
    fprintf(stderr,"Error - OCI_NO_DATA\n");
    return (IRRECERR);
  case OCI_ERROR:
    lstat = OCIErrorGet (errhp, (ub4) 1,
          (text *) NULL, &errcode, errbuf,
          (ub4) sizeof(errbuf), OCI_HTYPE_ERROR);
    if (errcode == NOT_SERIALIZABLE) return (errcode);
    if (errcode == SNAPSHOT_TOO_OLD) return (errcode);
    while (lstat != OCI_NO_DATA)
    {
      fprintf(stderr,"Module %s Line %d\n", fname, lineno);
      fprintf(stderr,"Error - %s\n", errbuf);
      lstat = OCIErrorGet (errhp, recno++, (text *) NULL, &errcode,
errbuf,
                         (ub4) sizeof(errbuf), OCI_HTYPE_ERROR);
    }
    return (errcode);
  case OCI_INVALID_HANDLE:
    fprintf(stderr,"Module %s Line %d\n", fname, lineno);
    fprintf(stderr,"Error - OCI_INVALID_HANDLE\n");
    exit(-1);
  case OCI_STILL_EXECUTING:
    fprintf(stderr,"Module %s Line %d\n", fname, lineno);
    fprintf(stderr,"Error - OCI_STILL_EXECUTE\n");
    return (IRRECERR);
  case OCI_CONTINUE:
    fprintf(stderr,"Module %s Line %d\n", fname, lineno);
    fprintf(stderr,"Error - OCI_CONTINUE\n");
    return (IRRECERR);
  default:
    fprintf(stderr,"Module %s Line %d\n", fname, lineno);
    fprintf(stderr,"Status - %s\n", status);
    return (IRRECERR);
  }
  return (RECOVERR);
}
```

Appendix - D: Pricing Information

IBM

Compagnie IBM France
Tour Descartes - La Défense 5
2, avenue Gambetta
92066 Paris La Défense Cedex

BULL
68, route de Versailles
78430 - LOUVECIENNES

Date: November 29, 2007

Dear Mr Sébastien Brachet,

Thank you for your interest in IBM Hardware and Software.
Please find the requested quote for the IBM storage DS4800 and X system packages.

Description	Part Number	Unit Price	Quantity	Extended Price	3-year Maint. Price
Storage					
DS4800 Disk System Model 82	1815-82A	$53 995	5	$269 975	
DS4800 8-Storage Partitions	8870	$10 000	5	$50 000	
(22R4255) DS4800 AIX Host Kit	7711	$7 000	5	$35 000	
DS4000 EXP810 Enclosure	1812-81A	$6 000	52	$312 000	
36GB/15K Drive 4Gb FC disks	5412	$892	780	$695 760	
Short Wave SFP	2410	$998	52	$51 896	
Fiber Cable 25m	5625	$189	10	$1 890	
Fiber Cable 1m	5601	$79	104	$8 216	
3 Year Warranty Service Upgrade 1812-81A 24x7x4		$960	52		$49 920
3 Year Warranty Service Upgrade 1815-82A 24x7x4		$3 200	5		$16 000
			Subtotal	**$1 424 737**	**$65 920**
Client Hardware					
Base or packages: x346 Base w/3.2GHz,DVD,IO,POWER	8840AC1	$1 803	16	$28 848	$9 600
3.2GHz 800MHz 2MB L2 Cache Xeon Processor	1356	$699	16	$11 184	
Memory: 512MB DDR-II SDRAM DIMM	541	$135	64	$8 640	
36GB 15K Hot Swap SCSI	5168	$249	16	$3 984	
NetBAY S2 42U Standard Rack Cabinet	93074RX	$1 489	4	$5 956	
Optical 3-Button Mouse - USB	40K9201	$19	1	$19	
Preferred Pro Full Size PS/2 Keyboard	40K9584	$29	1	$29	
IBM C117 17" CRT Monitor	49387NU	$149	1	$149	
			Subtotal	**$58 809**	**$9 600**
			TOTAL	**$1 483 546**	**$75 520**
		Total IBM Discounts		**-$649 482**	

Effective Date: November 29, 2007
Termination Date: March 31, 2008

Guillaume Barral
Bull account manager

Société par actions simplifiée
au capital de 542 323 943,70 Euros
Siège social : Tour Descartes - La Défense 5
2, avenue Gambetta - 92400 Courbevoie
552 118 465 R.C.S. Nanterre
Siret 552 118 465 02430 - Tél. 01 49 05 70 00

Z8F1.1686/A

ORACLE PRICING

Sujet: Oracle Price
De: MaryBeth Pierantoni
Date: Wed, 12 Dec 2007 12:54:49 -0800
Pour :: jean-francois.lemerre@bull.net

Product	**Price**	**Quantity**	**Extended**
Oracle Database 10g Enterprise Edition, Per Processor, Unlimited Users for 3 years	$20,000	3*	$60,000
Oracle Database Server Support Package for 3 years	$2,000	3*	$6,000
Oracle Mandatory E-Business Discount			<$6,600>
TOTAL			$59,400

*3 = 0.75 * 4. Explanation: For the purposes of counting the number of processors which require licensing, a multicore chip with "n" cores shall be determined by multiplying "n" cores by a factor of .75.

Microsoft Corporation
One Microsoft Way
Redmond, WA 98052-6399

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

Microsoft

December 14, 2007

Bull SAS
Marc Simon
rue Jean Jaures
Les clayes sous bois - France, LA 78340

Here is the information you requested regarding pricing for several Microsoft products to be used in conjunction with your TPC-C benchmark testing.

All pricing shown is in US Dollars ($).

Part Number	Description	Unit Price	Quantity	Price
P73-01972	**Windows Server 2003 R2 Standard Edition** *Server License Only - No CALs* *Discount Schedule: Open Program - No Level* *Unit Price reflects a 28% discount from the retail unit price of $999.*	$719	16	$11,504
127-00012	**Visual Studio Standard 2005** *Full License* *No Discount Applied*	$250	1	$250
N/A	**Microsoft Problem Resolution Services** *Professional Support* *(1 Incident)*	$245	1	$245

All products are currently orderable through Microsoft's normal distribution channels. A list of Microsoft's resellers can be found at **http://www.microsoft.com/products/info/render.aspx?view=22&type=mnp&content=22/licensing**

Defect support is included in the purchase price. Additional support is available from Microsoft PSS on an incident by incident basis at $245 per call.

This quote is valid for the next 90 days.

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

Reference ID: PCmasi0712140000002704.
Please include this Reference ID in any correspondence regarding this price quote.