HP 9000 Superdome Enterprise Server
using
HP-UX 11.i 64-bit
and
Oracle8 Enterprise Database Server v8.1.7.1

TPC Benchmark® C
Full Disclosure Report

Second Edition

Submitted for Review
November 30, 2001

Second Edition - November 30**,** 2001

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Benchmark results are highly dependent upon workload, specific application requirements, and system design and implementation. Relative system performance will vary as a result of these and other factors. Therefore, TPC Benchmark® C should not be used as a substitute for a specific customer application benchmark when critical capacity planning and/or product evaluation decisions are contemplated.
All performance data contained in this report was obtained in a rigorously controlled environment. Results obtained in other operating environments may vary significantly. Hewlett-Packard Company does not warrant or represent that a user can or will achieve similar performance expressed in transactions per minute (tpmC®) or normalized price/performance ($/tpmC®). No warranty of system performance or price/performance is expressed or implied in this report.

Printed in U.S.A., November 30, 2001.

Abstract

Overview

This report documents the methodology and results of the TPC Benchmark® C test conducted on the HP 9000 Superdome Enterprise Server in a client/server configuration, using Oracle8 Enterprise Database Server v8.1.7.1 and the TUXEDO 6.4 transaction monitor. The operating system used for the benchmark was Hewlett-Packard's HP-UX 11.i 64-bit. The application was written in C and compiled using HP C/ANSI C/HP-UX.

TPC Benchmark C Metrics

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

Standard and Executive Summary Statements

Page *iii* contains the standard system summary and pages ***iv-vi*** contain the executive summary of the benchmark results for the HP 9000 Superdome Enterprise Server.

Auditor

The benchmark configuration, environment and methodology used to produce and validate the test results, and the pricing model used to calculate the price/performance, were audited by Lorna Livingtree for Performance Metrics, Inc. to verify compliance with the relevant TPC specifications.

Standard System Summary

Company Name	**System Name**	**Database Software**	**Operating System Software**
Hewlett-Packard Company	HP 9000 Superdome Enterprise Server	Oracle8 Enterprise Database Server v8.1.7.1	HP-UX 11.i 64-bit
HP H/W Availability Date - Now S/W Availability Date - May 1, 2001			
Total System Cost	**TPC-C® Throughput**	**Price/Performance**	
Hardware Software 5-year maintenance	Sustained maximum throughput of System running TPC-C® expressed in transactions per minute	Total system cost/tpmC ($6,329,547/197024.17)	
$6,329,547	**197,024.17 tpmC**	**$32.13 per tpmC**	

HP 9000 Superdome Enterprise Server

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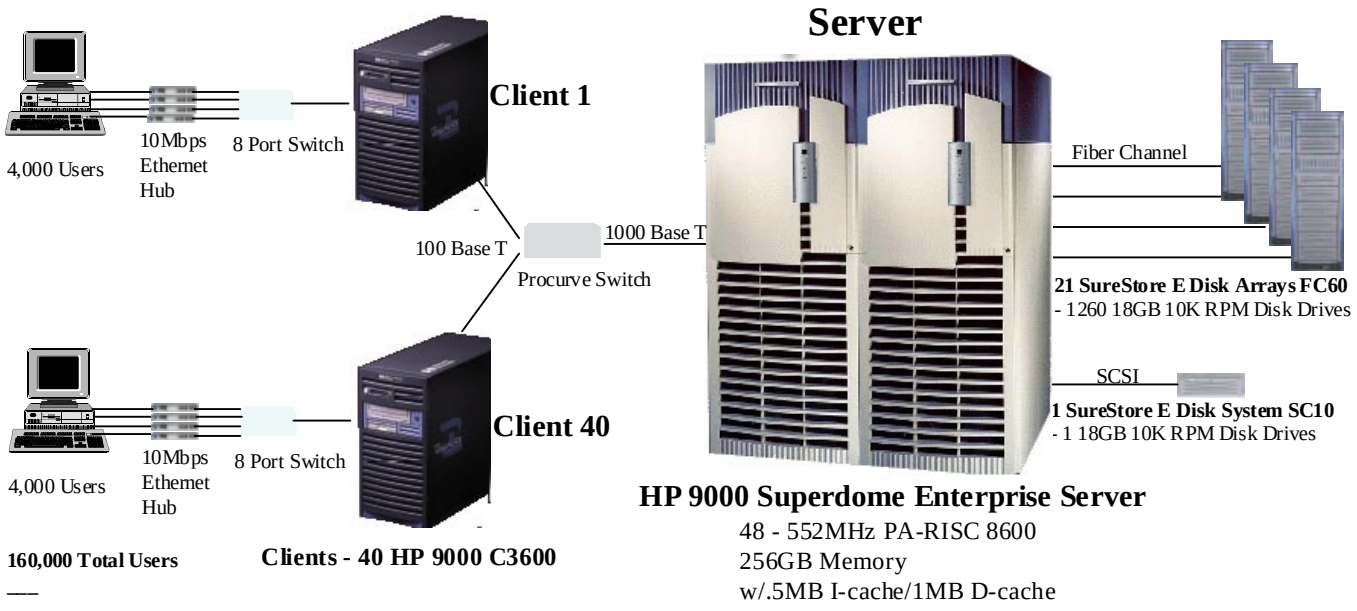
Total System Cost	TPC Throughput	Price/Performance	Availability Date
$6,329,547	**197,024.17 tpmC**	**$32.13/tpmC**	**May 1, 2001**

Processors	Database Manager	Operating System	Other Software	Number of Users
48 PA-RISC 8600 552MHz	**Oracle8 Enterprise Database Server v8.1.7.1**	**HP-UX 11.i 64-bit**	**TUXEDO 6.4**	**160,000**



System Components	*Server (Superdome)*		*each Client (40 C3600s)*	
	Qty	*Type*	*Qty*	*Type*
Processors	48	552MHz PA-RISC 8600	1	552MHz PA-RISC 8600
Cache Memory	each	.5 MB I-cache, 1 MB D-cache	each	512 KB I-cache/1 MB D-cache
Memory	256	GB	1	3 GB
Disk Controllers	42	PCI Fibre Channel 2X	1	Ultra2 SCSI LVD
Disk Drives	1	SureStore E Disk System SC10 with 1 18GB 10K RPM drive	1	18 GB disk
	21	SureStore E Disk Array FC 60 with 1260 18GB 10K RPM drives		
Total Storage	19289	GB		
Tape Drives	1	DVD ROM		
Terminals	1	Console Terminal	1	Console Terminal

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Description	Part Number	Brand	Price Key	Unit Price	Qty	Price	3 Year Main.Price
Server Hardware							
Super Dome left chassis	A5201A, Opt. 101		1	317,429	1	317,429	147,264
Super Dome right chassis	A5202A, Opt. 101		1	235,655	1	235,655	
Memory module - 2 GB	A5198A, Opt. 0D1		1	14,000	128	1,792,000	
I/O enclosures	A4856A, Opt. 0D1		1	14,805	4	59,220	
PDCA Redundant Power Source	A5800A, Opt. 0D1		1	578	2	1,156	
Cell Board with 4 PA-8600 552MHz Processors	A5206A, Opt. 0D1		1	14,600	16	233,600	
ICOD right to use processor	A6161A, Opt 104		1	21,806	48	1,046,688	267,264
ICOD right to access processor	A6162A		1	4,000	16	64,000	
Super Dome PCI Core I/O card	A5210A, Opt. 0D1		1	1,045	1	1,045	
PCI Dual FWD SCSI-2 Card	A5159A, Opt 0D1		1	1,245	1	1,245	
PCI 1000BT Lan Adapter	A4926A, Opt. 0D1		1	2,135	1	2,135	
PCI Fibre Channel 2X	A5158A, Opt 0D1		1	2,240	42	94,080	
Rack Installation Kit	A5170A, Opt. 0D1		1	410	1	410	
HP Smart 2U Storage Enclosure	C4317A		1	450	1	450	
DVD-ROM (includes SCSI-2 card, cables, enclosures)	C4318SZ		1	3,738	1	3,738	
HP9000 A500 Support Management Station (includes memory,CPU,lan card,disk,OS, etc)	A5570B		1	11,780	1	11,780	
.5m 68pin SCSI Terminator	Opt. 001		1	99	1	99	
WSE 68pin SCSI Teminator	Opt. 835		1	46	1	46	
HP-UX 11.i Sys Media, CD-ROM	B3920EA, Opt. AAF		1	520	1	520	
8kW 12kVA UPS 230V	A6585A		1	10,999	8	87,992	4,382
5M Ultra SCSI Cable	A5277A, Opt. 861		1	190	1	190	
SureStore E Disk Array FC60	A5277A		1	5,160	21	108,360	179,046
HP Rack System/E33 Inc. Rear & Foot	A4901A		1	2,240	21	47,040	
Dual Controllers	A5277A, Opt 204		1	32,080	21	673,680	
SureStore E Disk System SC10	A5294A		1	6,400	127	812,800	
16m Fibre Channel Cable	A5277A, Opt AFY		1	160	42	6,720	
18GB 10K RPM Disk Drive	A6262A		1	1,600	1260	2,016,000	
				Subtotal		**7,618,077**	**597,956**
Server Software							
Oracle8i Enterprise Edition 8.1.7.1	Runtime	Oracle	2	741,600	1	741,600	950,400
				Subtotal		**741,600**	**950,400**
Client Hardware							
Hewlett Packard Model C3600 Workstation	A5992A		1	11,500	40	460,000	155,240
1 GB Memory Moudle	A6016A, Opt. OD1		1	1,395	80	111600	
512MB Memory Module	A4995A, Opt. OD1		1	695	40	27800	
700/96 Console	C1064GX		1	550	1	550	
18 GB LVD 10K RPM Disk	A4998A, Opt. OD1		1	595	40	23,800	
				Subtotal		**623,750**	**155,240**
Client Software							
HP C/ANSI C Compiler	B3901BA, Option AH0		1	1,600	1	1,600	170
BEA Tuxedo 6.4		Bea Sys.	3	2,700	40	108,000	82,800
				Subtotal		**109,600**	**82,970**
User Connectivity							
HP ProCurve Switch 4000M	J4121A		1	2,379	1	2,379	588
HP ProCurve Switch Gigabit-SX Module	J4113A		1	1,189	1	1,189	
				Subtotal		**3,568**	**588**
	Large Configuration Discoun and Support Payment					(4,302,698)	(251,505)
				Total		**4,793,898**	**1,535,649**

Notes:1=HP, 2=Oracle pricing includes defect support and product updates for 3 years.
3=BEA Systems

Audited by Lorna Livingtree for Performance Metrics, Inc.

Three Year Cost of Ownership:	**$6,329,547**
tpmC Rating:	**197,024**
$/tpmC:	**$32.13**

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

Numerical Quantities Summary for HP 9000 Superdome Enterprise Server

MQTH, Computed Maximum Qualified Throughput **197,024.17 tpmC**

Response Times (in seconds)

	90th %-ile	Maximum	Average
New-Order	1.46s	7.91s	0.83s
Payment	1.38s	7.38s	0.75s
Order-Status	1.40s	7.31s	0.77s
Delivery (interactive portion)	0.08s	0.18s	0.08s
Delivery (deferred portion)	1.49s	7.27s	0.85s
Stock-Level	1.31s	5.13s	0.69s
Menu	0.10s	0.29s	0.001s

Transaction Mix, in percent of total transactions

New-Order	44.80%
Payment	43.06%
Order-Status	4.05%
Delivery	4.05%
Stock-Level	4.05%

Keying/Think Times

	Keying Time			Think Time		
	Min	Avg	Max	Min	Avg	Max
New-Order	18.02s	18.03s	18.04s	0.01s	12.13s	191.14s
Payment	3.01s	3.02s	3.03s	0.01s	12.06s	205.68s
Order-Status	2.01s	2.02s	2.03s	0.01s	10.12s	154.63s
Delivery (interactive)	2.01s	2.02s	2.03s	0.01s	5.07s	79.61s
Stock-Level	2.01s	2.02s	2.03s	0.01s	5.06s	67.56s

Test Duration

Ramp up time	37 minutes
Measurement interval	112 minutes
Transactions during measurement interval	49,257,556
Ramp down time	8.65 minutes

Checkpointing

Number of checkpoints in measurement interval	4
Checkpoint Interval	28 minutes

Reproducibility Run

Throughput	195,575.23 tpmC
Relative to MQTH	-0.74%

TPC Benchmark C Overview

This is the full disclosure report for a benchmark test of the HP 9000 Superdome Enterprise Server using Oracle8 Enterprise Database Server v8.1.7.1. It meets the requirements of the TPC Benchmark® C Standard Specification, Revision 5 dated March, 2001.

TPC Benchmark® C was developed by the **T**ransaction Processing **P**erformance **C**ouncil (TPC). It is the intent of this group to develop a suite of benchmarks to measure the performance of computer systems executing a wide range of applications. Hewlett-Packard Company Oracle Corporation are active participants in the TPC.

*TPC Benchmark® C is an **O**n **L**ine **T**ransaction **P**rocessing (OLTP) workload. It is a mixture of read-only and update intensive transactions that simulate the activities found in complex OLTP application environments. It does so by exercising a breadth of system components associated with such environments, which are characterized by:*

- The simultaneous execution of multiple transaction types that span a breadth of complexity
- On-line and deferred transaction execution modes
- Multiple on-line terminal sessions
- Moderate system and application execution time
- Significant disk input/output
- Transaction integrity (ACID properties)
- Non-uniform distribution of data access through primary and secondary keys
- Databases consisting of many tables with a wide variety of sizes, attributes, and relationships
- Contention of data access and update

The performance metric reported by TPC-C® is a "business throughput" measuring the number of orders processed per minute. Multiple transactions are used to simulate the business activity of processing an order, and each transaction is subject to a response time constraint. The performance metric for this benchmark is expressed in transactions-per-minute-C® (tpmC®). To be compliant with the TPC-C standard, all references to tpmC® results must include the tpmC® rate, the associated price-per-tpmC®, and the availability date of the priced configuration.

Despite the fact that this benchmark offers a rich environment that emulates many OLTP applications, this benchmark does not reflect the entire range of OLTP requirements. In addition, the extent to which a customer can achieve the results reported by a vendor is highly dependent on how closely TPC-C® approximates the customer application. The relative performance of systems derived from this benchmark does not necessarily hold for other workloads or environments. Extrapolations to other environments are not recommended.

Hewlett-Packard Company does not warrant or represent that a user can or will achieve performance similar to the benchmark results contained in this report. No warranty of system performance or price/performance is expressed or implied by this report.

1 General Items

1.1 Application Code and Definition Statements

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

Appendix A contains the HP C/ANSI C/HP-UX application code used in this TPC-C® test.

1.2 Test Sponsor

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

The High Performance Systems Division of Hewlett-Packard Company and Oracle Corporation are the test sponsors of this TPC Benchmark® C.

1.3 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:

- Database options
- Recover/commit options
- Consistency/locking options
- Operating system and application configuration parameter
- Compilation and linkage options and run-time optimizations used to create/install applications, OS, and/or databases

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

The intent of the above clause is that anyone attempting to recreate the benchmark environment has sufficient information to compile, link, optimize, and execute all software used to produce the disclosed benchmark result.

Appendix A contains the application "make" files. Appendix C contains the HP-UX operating system parameters used to generate the kernel for the configuration used in this benchmark. Also included are all of the Oracle8 Enterprise Database Server v8.1.7.1 database parameters and the TUXEDO 6.4 transaction monitor parameters used.

1.4 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)*

The server System Under Test, an HP 9000 Superdome Enterprise Server depicted in Figure 1.1, consisted of:

- 48 552MHz PA-RISC 8600 System Processors

- 256 GB of memory
- 42 PCI Fibre Channel 2X Adapters
- 21 SureStore E Disk Array FC 60 (with 1,260 18GB 10K RPM disk)
- One LAN interfaces

As indicated in Figure 1.2, this benchmark configuration used Remote Terminal Emulator (RTE) programs that executed on 20 L2000 Enterprise Server drivers to emulate TPC-C user sessions. The emulated users on the driver systems were directly connected to the client systems under test via 40 separate 100 Base-T local area network (LAN) and communicated using TCP/IP. The clients were connected to the SUT via two 1000BT Ethernet switches.

The priced configuration for the HP 9000 Superdome Enterprise Server is shown in Figure 1.1. In the priced configuration, the RTE shown in the benchmark configuration is replaced by the appropriate number of workstations (emulating ANSI terminals) connected to hubs.

Figure 1.1: HP 9000 Superdome Enterprise Server Priced Configuration

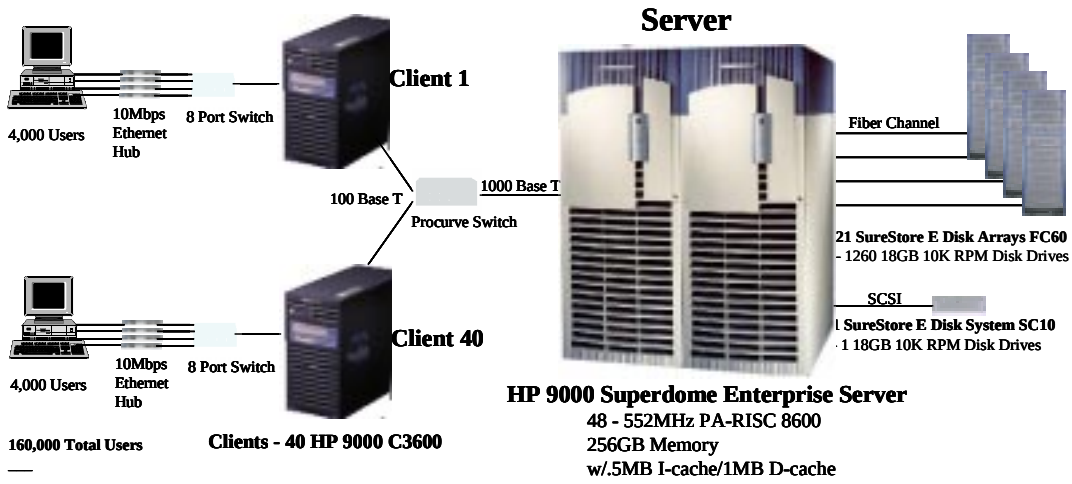
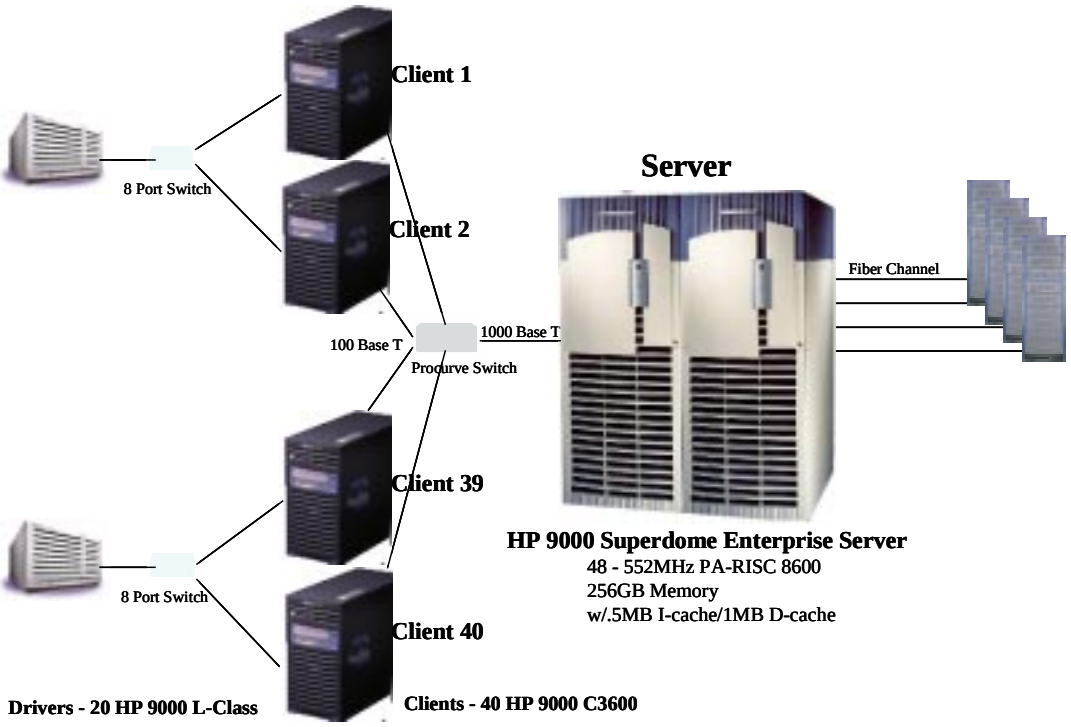


Figure 1.2: HP 9000 Superdome Enterprise Server Benchmark Configuration



2 Clause 1 Related Items

2.1 Table Definitions

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

Appendix B describes the programs that define, create, and populate the Oracle8 Enterprise Database Server v8.1.7.1 database for TPC-C® testing.

2.2 Physical Organization of Database

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

Space was allocated to Oracle8 Enterprise Database Server v8.1.7.1 according to the data in section 5.2. The size of the database table space on each disk drive was calculated to provide even distribution of load across the disk drives.

2.3 Insert and Delete Operations

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

There were no restrictions on insert and delete operations to any tables.

2.4 Partitioning

While there are a few restrictions placed upon horizontal or vertical partitioning of tables and rows in the TPC-C® benchmark, any such partitioning must be disclosed. Replication of tables, if used, must be disclosed. Additional and/or duplicated attributes in any table must be disclosed along with a statement on the impact on performance.

Partitioning, replication, and additional or duplicated attributes were not used in this implementation.

3 Clause 2 Related Items

3.1 Random Number Generation

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

The library routine SRAND48 (3C) was used to seed the library routine DRAND48 (3C) which generated pseudo-random numbers using the well-known linear congruential algorithm and 48-bit integer arithmetic. Further information on SRAND48 (3C) and DRAND48 (3C) can be found in the HP-UX Reference Manual Vol. 3.

3.2 Input/Output Screen Layout

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

The screen layouts corresponded exactly to those in Clauses 2.4.3, 2.5.3, 2.6.3, 2.7.3, and 2.8.3 of the TPC-C® Standard Specification.

3.3 Priced Terminal Feature Verification

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

The terminal features were verified by manually exercising each specification on an HP 712/80 workstation running an ANSI terminal emulator.

3.4 Presentation Manager or Intelligent Terminal

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

Application code running on the client implemented the TPC-C user interface. A listing of this code is included in Appendix A. Used capabilities of the terminal beyond basic ASCII entry and display were restricted to cursor positioning.

A presentation manager was not used.

Table 3.1: Transaction Statistics

Type	Item	Value
New Order	Home warehouse items	99.00%
	Remote warehouse items	1.00%
	Rolled back transactions	1.00%
	Average items per order	10.00
Payment	Home warehouse	85.01%
	Remote warehouse	14.99%
	Non primary key access	60.01%
Order Status	Non primary key access	60.06%
Delivery	Skipped transactions	0
Transaction Mix	New Order	44.80%
	Payment	43.06%
	Order Status	4.05%
	Delivery	4.05%
	Stock Level	4.05%

3.5 Transaction Statistics

Table 3.1 lists the numerical quantities that Clauses 8.1.3.5 to 8.1.3.11 require.

3.6 Queuing Mechanism

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

Delivery transactions were submitted to servers using the same TUXEDO mechanism that other transactions used. The only difference was that the call was asynchronous, i.e., control would return to the client process immediately and the deferred delivery part would complete asynchronously.

4 Clause 3 Related Items

4.1 Transaction System Properties (ACID)

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

The TPC Benchmark® C Standard Specification defines a set of transaction processing system properties that a system under test (SUT) must support during the execution of the benchmark. Those properties are Atomicity, Consistency, Isolation, and Durability (ACID). This section quotes the specification definition of each of these properties and describes the tests done as specified and monitored by the auditor to demonstrate compliance.

4.2 Atomicity

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

4.2.1 Completed Transaction

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

The values of w_ytd, d_ytd, c_balance, c_ytd_payment, and c_payment_cnt of a randomly selected warehouse, district, and customer were retrieved. The Payment transaction was executed on the same warehouse, district, and customer. The transaction was committed. The values w_ytd, d_ytd, c_balance, c_ytd_payment, and c_payment_cnt were retrieved again. It was verified that all values had been changed appropriately.

4.2.2 Aborted Transaction

Perform the Payment transaction for a randomly selected warehouse, district, and customer (by customer number as specified in Clause 2.5.1.2) and substitute a ROLLBACK of the transaction for the COMMIT of the transaction. Verify that the records in the CUSTOMER, WAREHOUSE, and DISTRICT tables have NOT been changed

The values of w_ytd, d_ytd, c_balance, c_ytd_payment and c_payment_cnt of a randomly selected warehouse, district, and customer were retrieved. The Payment transaction was executed on the same warehouse, district, and customer. The transaction was rolled back. The values of w_ytd, d_ytd, c_balance, c_ytd_payment, c_payment_cnt were retrieved again. It was verified that none of the values had changed.

4.3 Consistency

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

The TPC Benchmark C standard requires the System Under Test to meet the following 12 consistency conditions (c.f. *TPC Standard Specification, Clauses 3.3.2.1 to 3.3.2.12*):

1. the sum of the district balances in a warehouse is equal to the warehouse balance;
2. for each district, the next order-id minus one is equal to maximum order-id in the ORDER table and equal to the maximum new-order-id in the NEW-ORDER table;
3. for each district, the maximum order-id minus minimum order-id in the ORDER table plus one equals the number of rows in the NEW-ORDER table for that district;
4. for each district, the sum of the order-line counts equals the number of rows in the ORDER-LINE table for that district;
5. for each row in the ORDER table, the carrier-id is set to a null value only if there is a corresponding row in the NEW-ORDER table;
6. for each row in the ORDER table, the order-line count must equal the number of rows in the ORDER-LINE table for that order;
7. for any row in the ORDER-LINE table, the delivery date/time is set to a null value only if the corresponding row in the ORDER table has the carrier-id set to a null value;
8. for each warehouse, the year-to-date amount must equal the sum of the amounts in the HISTORY table for that warehouse;
9. for each district, the year-to-date amount must equal the sum of the amounts in the HISTORY table for that district;
10. for each customer, the balance must equal the sum of the order-line amount minus the sum of the history amount for that customer;

11. for each district, the total orders minus the total new-orders must equal the sum of the customer delivery count;
12. for any randomly selected customer, the balance plus the year-to-date payment must equal the sum of the order-line amount.

The TPC Benchmark C Standard Specification requires explicit demonstration that the conditions are satisfied for the first four conditions only.

To demonstrate that consistency is maintained, conditions 1-4 were verified for a sample of warehouses before and after the durability tests.

4.4 Isolation

Operations of concurrent 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.

*This property is commonly called **serializability**. Sufficient conditions must be enabled at either the system or application level to ensure serializability of transactions under any arbitrary mix of TPC-C transactions, unless otherwise specified by the transaction profile. The system or application must have full serializability enabled (i.e., repeated reads of the same rows within any committed transaction must return identical data when run concurrently with any arbitrary mix of TPC-C transactions), except in the case of Stock-Level transaction. For the Stock-Level transaction, the isolation requirement is relaxed to simply require that the transaction see only committed data.*

The TPC Benchmark C Standard (Revision 3.5) defines nine required tests to be performed to demonstrate that the required levels of transaction isolation are met.

For conventional locking schemes, isolation should be tested as described below. Systems that implement other isolation schemes may require different validation techniques. It is the responsibility of the test sponsor to disclose those techniques and the tests for them. If isolation schemes other than conventional locking are used, it is permissible to implement these tests differently provided full details are disclosed. (Examples of different validation techniques are shown in Isolation Test 7, Clause 3.4.2.7).

4.4.1 Isolation Test 1

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

The execution of the above test proceeded as follows:

1. An Order-Status transaction T0 was executed for a randomly selected customer, and the order returned was noted. T0 was committed
2. A New-Order transaction T1 was started for the same customer used in T0. T1 was stopped prior to COMMIT.
3. An Order-Status transaction T2 was started for the same customer used in T1. T2 completed and was committed without being blocked by T1. T2 returned the same order that T0 had returned.
4. T1 was allowed to complete and was committed.
5. An Order-Status transaction T3 was started for the same customer used in T1. T3 returned the order inserted by T1.

This outcome demonstrates serialization of T2 before T1. It has equivalent validity to the outcome specified in the Standard which supposes T1 to be serialized before T2.

4.4.2 Isolation Test 2

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

The execution of the above test proceeded as follows:

1. An Order-Status transaction T0 was executed for a randomly selected customer and the order returned was noted. T0 was committed.
2. A New-Order transaction T1 with an invalid item number, was started for the same customer used in T0. T1 was stopped immediately prior to ROLLBACK.
3. An Order-Status transaction T2 was started for the same customer used in T1. T2 completed and was committed without being blocked by T1. T2 returned the same order that T0 had returned.
4. T1 was allowed to ROLLBACK.
5. An Order-Status transaction T3 was started for the same customer used in T1. T3 returned the same order that T0 had returned.

4.4.3 Isolation Test 3

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

The execution of the above test proceeded as follows:

1. The D_NEXT_O_ID of a randomly selected district was retrieved.
2. A New-Order transaction T1 was started for a randomly selected customer within the district used in step 1. T1 was stopped immediately prior to COMMIT.
3. Another New-Order transaction T2 was started for the same customer used in T1. T2 waited.
4. T1 was allowed to complete. T2 completed and was committed.
5. The order number returned by T1 was the same as the D_NEXT_O_ID retrieved in step 1. The order number returned by T2 was one greater than the order number returned by T1.
6. The D_NEXT_O_ID of the same district was retrieved again. It had been incremented by two (i.e. it was one greater than the order number returned by T2).

4.4.4 Isolation Test 4

This test demonstrates isolation for write-write conflicts of two New-Order transactions when one transaction is ROLLED BACK.

The execution of the above test proceeded as follows:

1. The D_NEXT_O_ID of a randomly selected district was retrieved.
2. A New-Order transaction T1, with an invalid item number, was started for a randomly selected customer within the district used in step 1. T1 was stopped immediately prior to ROLLBACK.
3. Another New-Order transaction T2 was started for the same customer used in T1. T2 waited.
4. T1 was allowed to roll back, and T2 completed and was committed.
5. The order number returned by T2 was the same as the D_NEXT_O_ID retrieved in step 1.

6. The D_NEXT_O_ID of the same district was retrieved again. It had been incremented by one (i.e. one greater than the order number returned by T2).

4.4.5 Isolation Test 5

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

The execution of the above test proceeded as follows:

1. A query was executed to find out the customer who would be updated by the next delivery transaction for a randomly selected warehouse and district.
2. The C_BALANCE of the customer found in step 1 was retrieved.
3. A Delivery business transaction T1 was started for the same warehouse used in step 1. T1 was stopped immediately prior to the COMMIT of the database transaction corresponding to the district used in step 1.
4. A Payment transaction T2 was started for the same customer found in step 1. T2 waited.
5. T1 was allowed to complete. T2 completed and was committed.
6. The C_BALANCE of the customer found in step 1 was retrieved again. The C_BALANCE reflected the results of both T1 and T2.

4.4.6 Isolation Test 6

This test demonstrates isolation for write-write conflicts of Payment and Delivery transactions when the Delivery transaction is ROLLED BACK.

The execution of the above test proceeded as follows:

1. A query was executed to find out the customer who would be updated by the next delivery transaction for a randomly selected warehouse and district.
2. The C_BALANCE of the customer found in step 1 was retrieved.
3. A Delivery business transaction T1 was started for the same warehouse used in step 1. T1 was stopped immediately prior to the ROLLBACK of the database transaction corresponding to the district used in step 1.
4. A Payment transaction T2 was started for the same customer found in step 1. T2 waited.
5. T1 was allowed to ROLLBACK. T2 completed and was committed.

The C_BALANCE of the customer found in step 1 was retrieved again. The C_BALANCE reflected the results of only T2.

4.4.7 Isolation Test 7

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

The execution of the above test proceeded as follows:

1. The I_PRICE of two randomly selected items X and Y were retrieved.

2. A New-Order transaction T2 with a group of items including items X and Y was started. T2 was stopped immediately after retrieving the prices of all items. The prices of items X and Y retrieved matched those retrieved in step 1.
3. A transaction T3 was started to increase the price of items X and Y by 10%.
4. T3 did not stall and no transaction was rolled back. T3 was committed.
5. T2 was resumed, and the prices of all items were retrieved again within T2. The prices of items X and Y matched those retrieved in step 1.
6. T2 was committed.
7. The prices of items X and Y were retrieved again. The values matched the values set by T3.

- Execution followed *Case D* of *Clause 3.4.2.7*.

4.4.8 Isolation Test 8

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

The execution of the above test proceeded as follows:

1. An Order-Status transaction T1 was started for a randomly selected customer.
2. T1 was stopped immediately after reading the order table for the selected customer. The most recent order for that customer was found.
3. A New-Order transaction T2 was started for the same customer. T2 completed and was committed without being blocked by T1.
4. T1 was resumed and the ORDER table was read again to determine the most recent order for the same customer. The order found was the same as the one found in step 2.
5. T1 completed and was committed.

4.4.9 Isolation Test 9

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

The execution of the above test proceeded as follows:

1. The NO_D_ID of all new_ORDER rows for a randomly selected warehouse and district was changed to 11. The changes were committed.
2. A Delivery transaction T1 was started for the selected warehouse.
3. T1 was stopped immediately after reading the new_ORDER table for the selected warehouse and district. No qualifying row was found.
4. A New-Order transaction T2 was started for the same warehouse and district. T2 completed and was committed without being blocked by T1.
5. T1 was resumed and the new_ORDER table was read again. No qualifying row was found.
6. T1 completed and was committed.
7. The NO_D_ID of all new_ORDER rows for the selected warehouse and district was restored to the original value. The changes were committed.

4.5 Durability

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

List of single failures:

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

Specified durability tests were executed to demonstrate satisfaction of the durability requirements for this implementation of TPC Benchmark C. One durability test, described below, covering the following failure situations was performed under the auditor's supervision:

- *Permanent irrecoverable failure of any single durable medium containing TPC-C database tables or recovery log data (Clause 3.5.3.1).*

Three tests were performed to satisfy this clause. A test was performed under a load of 160,000 users on the full-scale database for the loss of recovery log data test. Another test under the load of 1000 users was conducted on a 100-warehouse database for the loss of database data test . Another durability test, described below, combining the following failure situations was performed under the auditor's supervision:

- *instantaneous interruption which requires system reboot [of processors] to recover. (Clause 3.5.3.2*)
- *failure of all or part of memory. (Clause 3.5.3.3).*

This test was performed under the full performance-measurement load of 160,000 users on the full-scale database built for 160,000 users.

4.5.1 Loss of Log Disk

Because the log devices are Redundant Disk Arrays which each function independently of the rest of the system in ensuring data integrity under loss and/or replacement of any individual disk drive (and other failures as well), integrity under such failure and replacement does not entail any interruption in processing. The test below validates the durability by demonstrating persistence of the results of transactions processed both before and during these failures, validating the durability upon database recovery (in this instance, forced) of transactions which completed before the failure and the non-effect of transactions which did not complete.

1. The D_NEXT_O_ID fields for all rows in the DISTRICT table were summed up to determine the initial count of the total number of orders (count1).
2. A test was initiated with 160,000 terminals. On the driver system, completed/rolled-back transactions (including New-Orders) were recorded in a "success" file.
3. After 10 minutes, one of the individual disks containing recovery log was unplugged from its array.
4. Because of the built-in redundancy in the disk array, the test continued normally.
5. On the system log files, messages appeared indicating that a disk was missing. A new disk was plugged in the slot of the missing disk. The disk array automatically copied the mirrored-pair mate of the missing disk onto the new disk.

6. The test was finished on the driver.
7. The contents of the "success" file on the driver and the ORDER table were spot-compared to verify that records in the "success" file for completed New-Order transactions had corresponding records in the ORDER table.
8. Step 1 was repeated to determine the total number of orders (count2). Count2-count1 matched exactly the number of records for successful New Orders in the RTE "success" file.

4.5.2 Loss of Data Disk

The test below validates the durability by demonstrating persistence of the results of transactions processed both before and during these failures, validating the durability upon database recovery (in this instance, forced) of transactions which completed before the failure and the non-effect of transactions which did not complete.

1. A 100-warehouse database was created.
2. The D_NEXT_O_ID fields for all rows in the DISTRICT table were summed up to determine the initial count of the total number of orders (count1).
3. A test was initiated with 1,000 terminals. On the driver system, completed/rolled-back transactions (including New-Orders) were recorded in a "success" file.
4. After 5 minutes, one of the individual disks containing Oracle system tablespace (in particular, the file containing the customer table) was unplugged from its array. On the system log files, console messages appeared indicating that a disk was missing.
5. Oracle detected the failed disk and terminated the database instance.
6. The test was aborted on the driver.
7. A new disk was placed in the array. After recognizing and configuring in the new disk, the array was back in normal condition, but data was lost.
8. The customer file was restored from its (old) copy.
9. The database instance was started. Oracle discovered that the customer file was out of date. We manually started a roll forward process, which finished successfully. The database was recovered using the transaction log.
10. The contents of the "success" file on the driver and the ORDER table were spot-compared to verify that records in the "success" file for completed New-Order transactions had corresponding records in the ORDER table.
11. Step 1 was repeated to determine the total number of orders (count2). Count2-count1 matched exactly the number of records for successful New Orders in the RTE "success" file.

4.5.3 Instantaneous Interruption and Loss of Memory

Instantaneous interruption and loss of memory tests were combined because the loss of power erases the contents of memory. This failure was induced while the benchmark was running by turning off the power supplies to the server.

1. The D_NEXT_O_ID fields for all rows in district table were summed up to determine the initial count of the total number of orders (count1).
2. Transactions were started at full load. On the driver system, completed/rolled-back transactions (including New-Orders) were recorded in a "success" file.

3. After six minutes the server systems were de-powered.
4. The test was aborted on the driver.
5. The server system was restarted.
6. The database was restarted and a recovery performed using the transaction log.
7. The contents of the "success" file on the driver and the ORDERs table were spot-compared to verify that records in the "success" file for completed New-Order transactions had corresponding records in the ORDERs table.
8. Step 1 was repeated to determine the current total number of orders (count2). Count2-count1 (= 1,262,865) was 66 more than the number of records for successful New Orders in the RTE "success" file (= 1,275,719 - 12,920 rolled-back). *This difference would be due only to transactions which were committed on the system under test but for which the output data was not displayed on the [emulated] input/output screen before the failure.*

5 Clause 4 Related Items

5.1 Initial Cardinality of Tables

The cardinality (e.g. number of rows) of each table, as it existed at the start of the benchmark run, must be disclosed. If the database was overscaled and inactive rows of the WAREHOUSE table were deleted the cardinality of the WAREHOUSE table as initially configured and the number of rows deleted must be disclosed.

The TPC-C database for this test was configured with 18,000 warehouses.

Table	Occurrences
Warehouse	18,000
District	180,000
Customer	540,000,000
History	540,000,000
Orders	540,000,000
New Orders	162,000,000
Order Line	5,399,271,200
Item	100,000
Stock	180,000,000

During the measurement only 16,000 warehouses and their associated data were accessed. This was confirmed using D_NEXT_O_1D and W_YTD as described in *Clause 4.2.2 Comment (2).*

5.2 Database and Growth Layout

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

Table 5.2 indicates the distribution of the database tables over the disks of the tested and priced systems**.**

Table 5.2: Disk Usage in Tested System

Note:
====
This file describes the disk arrays attached to the sut. We use 21 arrays. Every array is attached to the system via two independent Fibre Channel links. So, each array shows up twice in the ioscan output.

List of all the arrays:
======================

For each disk array connected to the server, the list below gives the (unique) array id, the corresponding raw devices, and the disk size in the array.

Each array contains 60 18.2-GB disks, with about 17GB of formatted capacity each. The disks are arranged 10 per LUN. There are 6 LUNs on each array. The LUNs on the 17 data arrays are in RAID 0 mode and have 169.2 GB of space each. The LUNs on the 4 log arrays are in RAID 1 mode and have 84.6 GB of space each.

On each array, controller A is used to access LUNs 0, 2, and 4; controller B for LUNs 1, 3, and 5.

Use	Array Id	Controller A LUNs	Controller B LUNs	Size
Data	000A00A0B8067F28	/dev/rdsk/c91t0d[0|2|4]	/dev/rdsk/c95t0d[1|3|5]	169.2 GB
Data	000A00A0B8067F2A	/dev/rdsk/c109t0d[0|2|4]	/dev/rdsk/c89t0d[1|3|5]	169.2 GB
Data	001600A0B8067E96	/dev/rdsk/c93t0d[0|2|4]	/dev/rdsk/c97t0d[1|3|5]	169.2 GB
Data	000E00A0B807A1F8	/dev/rdsk/c105t0d[0|2|4]	/dev/rdsk/c107t0d[1|3|5]	169.2 GB
Data	000800A0B807A0EC	/dev/rdsk/c103t0d[0|2|4]	/dev/rdsk/c99t0d[1|3|5]	169.2 GB
Data	001200A0B8067998	/dev/rdsk/c101t0d[0|2|4]	/dev/rdsk/c67t0d[1|3|5]	169.2 GB
Data	000800A0B807A182	/dev/rdsk/c61t0d[0|2|4]	/dev/rdsk/c63t0d[1|3|5]	169.2 GB
Data	000800A0B807A1E8	/dev/rdsk/c59t0d[0|2|4]	/dev/rdsk/c65t0d[1|3|5]	169.2 GB
Data	000400A0B807A30C	/dev/rdsk/c53t0d[0|2|4]	/dev/rdsk/c73t0d[1|3|5]	169.2 GB
Data	000E00A0B806795A	/dev/rdsk/c55t0d[0|2|4]	/dev/rdsk/c87t0d[1|3|5]	169.2 GB
Data	000800A0B807A12A	/dev/rdsk/c57t0d[0|2|4]	/dev/rdsk/c86t0d[1|3|5]	169.2 GB
Data	000800A0B807A0E6	/dev/rdsk/c51t0d[0|2|4]	/dev/rdsk/c82t0d[1|3|5]	169.2 GB
Data	000600A0B807A25C	/dev/rdsk/c69t0d[0|2|4]	/dev/rdsk/c76t0d[1|3|5]	169.2 GB
Data	001600A0B8067658	/dev/rdsk/c35t0d[0|2|4]	/dev/rdsk/c43t0d[1|3|5]	169.2 GB
Data	000400A0B807A2EC	/dev/rdsk/c78t0d[0|2|4]	/dev/rdsk/c80t0d[1|3|5]	169.2 GB
Data	000800A0B807A18E	/dev/rdsk/c29t0d[0|2|4]	/dev/rdsk/c31t0d[1|3|5]	169.2 GB
Data	000600A0B8091384	/dev/rdsk/c71t0d[0|2|4]	/dev/rdsk/c74t0d[1|3|5]	169.2 GB
Log	000400A0B8090BB2	/dev/rdsk/c77t0d[0|2|4]	/dev/rdsk/c84t0d[1|3|5]	84.6 GB
Log	000600A0B8090DEA	/dev/rdsk/c33t0d[0|2|4]	/dev/rdsk/c41t0d[1|3|5]	84.6 GB
Log	000C00A0B8067C00	/dev/rdsk/c37t0d[0|2|4]	/dev/rdsk/c47t0d[1|3|5]	84.6 GB
Log	000800A0B807A19C	/dev/rdsk/c39t0d[0|2|4]	/dev/rdsk/c45t0d[1|3|5]	84.6 GB

I) root, swap, file systems:
==========================

Use	Device	Size (MB)	Device Model
root	/dev/dsk/c0t2d5	8192	HP 5447A
file system	/dev/dsk/c0t2d3	8192	HP C5447A
swap	/dev/dsk/c4t2d7	9000	HP C5447A

swap	/dev/dsk/c0t1d0	10000	HP C5447A
swap	/dev/dsk/c0t1d1	10000	HP C5447A
swap	/dev/dsk/c0t1d2	10000	HP C5447A
swap	/dev/dsk/c0t1d3	10000	HP C5447A
swap	/dev/dsk/c0t1d4	10000	HP C5447A
swap	/dev/dsk/c0t1d5	10000	HP C5447A
swap	/dev/dsk/c0t1d6	10000	HP C5447A
swap	/dev/dsk/c0t4d0	86176	HP C5447A
swap	/dev/dsk/c0t6d0	86176	HP C5447A

II) Database files:
==========

1) Log files:

The Oracle visible logs are two 85-GB logical volumes striped over 4 arrays. Each array is subdivided into 6 RAID1 LUNs with 84.6 GB of capacity (more accurately, 88711360 Kbytes of capacity). Each LUN is introduced to the hp-ux LVM subsystem as a separate device. So, the vglog Volume Group has 24 84.6GB devices, over which each of the two 85-GB log file logical volumes is striped.

So, most of the space in vglog is unused but is used to satisfy the 8-hour log requirements.

The 24 vglog devices are:

Disk Array/LUN	Capacity
/dev/rdsk/c77t0d0	84.6 GB
/dev/rdsk/c33t0d0	84.6 GB
/dev/rdsk/c37t0d0	84.6 GB
/dev/rdsk/c39t0d0	84.6 GB
/dev/rdsk/c84t0d1	84.6 GB
/dev/rdsk/c41t0d1	84.6 GB
/dev/rdsk/c47t0d1	84.6 GB
/dev/rdsk/c45t0d1	84.6 GB
/dev/rdsk/c77t0d2	84.6 GB
/dev/rdsk/c33t0d2	84.6 GB
/dev/rdsk/c37t0d2	84.6 GB
/dev/rdsk/c39t0d2	84.6 GB
/dev/rdsk/c84t0d3	84.6 GB
/dev/rdsk/c41t0d3	84.6 GB
/dev/rdsk/c47t0d3	84.6 GB
/dev/rdsk/c45t0d3	84.6 GB
/dev/rdsk/c77t0d4	84.6 GB
/dev/rdsk/c33t0d4	84.6 GB
/dev/rdsk/c37t0d4	84.6 GB
/dev/rdsk/c39t0d4	84.6 GB
/dev/rdsk/c84t0d5	84.6 GB
/dev/rdsk/c41t0d5	84.6 GB
/dev/rdsk/c47t0d5	84.6 GB
/dev/rdsk/c45t0d5	84.6 GB

Oracle file name	Size in MB	Raw/VG	Device(s)
log1	85,000	VG	4 vglog arrays
log2	85,000	VG	4 vglog arrays

The total 8-Hour log space is visible from the OS as follow:

Total = 84.6 GB X 6 X 4 = 2,030.4 GB

2) Data files

17 arrays are used to store the database data files. There are 102 LUNs on these arrays assigned to one of 3 Volume Groups. Each Volume Group uses two of the 6 LUNs on each array, and accesses each of these two LUNs through a different controller. For example, the array that can be accessed through paths c91 and c95 is used in this manner:

Device	Volume Group
/dev/rdsk/c91t0d0	vgdata1
/dev/rdsk/c95t0d1	vgdata1
/dev/rdsk/c91t0d2	vgdata2
/dev/rdsk/c95t0d3	vgdata2
/dev/rdsk/c91t0d4	vgdata3
/dev/rdsk/c95t0d5	vgdata3

Overall, this is the distribution of the 102 LUNs to the 3 Volume Groups:

Device	Volume Group
/dev/rdsk/c91t0d0	vgdata1
/dev/rdsk/c109t0d0	vgdata1
/dev/rdsk/c93t0d0	vgdata1
/dev/rdsk/c105t0d0	vgdata1
/dev/rdsk/c103t0d0	vgdata1
/dev/rdsk/c101t0d0	vgdata1
/dev/rdsk/c61t0d0	vgdata1
/dev/rdsk/c59t0d0	vgdata1
/dev/rdsk/c53t0d0	vgdata1
/dev/rdsk/c55t0d0	vgdata1
/dev/rdsk/c57t0d0	vgdata1
/dev/rdsk/c51t0d0	vgdata1
/dev/rdsk/c69t0d0	vgdata1
/dev/rdsk/c35t0d0	vgdata1
/dev/rdsk/c78t0d0	vgdata1
/dev/rdsk/c29t0d0	vgdata1
/dev/rdsk/c71t0d0	vgdata1
/dev/rdsk/c95t0d1	vgdata1
/dev/rdsk/c89t0d1	vgdata1
/dev/rdsk/c97t0d1	vgdata1
/dev/rdsk/c107t0d1	vgdata1
/dev/rdsk/c99t0d1	vgdata1
/dev/rdsk/c67t0d1	vgdata1
/dev/rdsk/c63t0d1	vgdata1
/dev/rdsk/c65t0d1	vgdata1
/dev/rdsk/c73t0d1	vgdata1
/dev/rdsk/c87t0d1	vgdata1
/dev/rdsk/c86t0d1	vgdata1
/dev/rdsk/c82t0d1	vgdata1

/dev/rdsk/c76t0d1	vgdata1
/dev/rdsk/c43t0d1	vgdata1
/dev/rdsk/c80t0d1	vgdata1
/dev/rdsk/c31t0d1	vgdata1
/dev/rdsk/c74t0d1	vgdata1
/dev/rdsk/c91t0d2	vgdata2
/dev/rdsk/c109t0d2	vgdata2
/dev/rdsk/c93t0d2	vgdata2
/dev/rdsk/c105t0d2	vgdata2
/dev/rdsk/c103t0d2	vgdata2
/dev/rdsk/c101t0d2	vgdata2
/dev/rdsk/c61t0d2	vgdata2
/dev/rdsk/c59t0d2	vgdata2
/dev/rdsk/c53t0d2	vgdata2
/dev/rdsk/c55t0d2	vgdata2
/dev/rdsk/c57t0d2	vgdata2
/dev/rdsk/c51t0d2	vgdata2
/dev/rdsk/c69t0d2	vgdata2
/dev/rdsk/c35t0d2	vgdata2
/dev/rdsk/c78t0d2	vgdata2
/dev/rdsk/c29t0d2	vgdata2
/dev/rdsk/c71t0d2	vgdata2
/dev/rdsk/c95t0d3	vgdata2
/dev/rdsk/c89t0d3	vgdata2
/dev/rdsk/c97t0d3	vgdata2
/dev/rdsk/c107t0d3	vgdata2
/dev/rdsk/c99t0d3	vgdata2
/dev/rdsk/c67t0d3	vgdata2
/dev/rdsk/c63t0d3	vgdata2
/dev/rdsk/c65t0d3	vgdata2
/dev/rdsk/c73t0d3	vgdata2
/dev/rdsk/c87t0d3	vgdata2
/dev/rdsk/c86t0d3	vgdata2
/dev/rdsk/c82t0d3	vgdata2
/dev/rdsk/c76t0d3	vgdata2
/dev/rdsk/c43t0d3	vgdata2
/dev/rdsk/c80t0d3	vgdata2
/dev/rdsk/c31t0d3	vgdata2
/dev/rdsk/c74t0d3	vgdata2
/dev/rdsk/c91t0d4	vgdata3
/dev/rdsk/c109t0d4	vgdata3
/dev/rdsk/c93t0d4	vgdata3
/dev/rdsk/c105t0d4	vgdata3
/dev/rdsk/c103t0d4	vgdata3
/dev/rdsk/c101t0d4	vgdata3
/dev/rdsk/c61t0d4	vgdata3
/dev/rdsk/c59t0d4	vgdata3
/dev/rdsk/c53t0d4	vgdata3
/dev/rdsk/c55t0d4	vgdata3
/dev/rdsk/c57t0d4	vgdata3
/dev/rdsk/c51t0d4	vgdata3
/dev/rdsk/c69t0d4	vgdata3
/dev/rdsk/c35t0d4	vgdata3
/dev/rdsk/c78t0d4	vgdata3
/dev/rdsk/c29t0d4	vgdata3
/dev/rdsk/c71t0d4	vgdata3

/dev/rdsk/c95t0d5	vgdata3
/dev/rdsk/c89t0d5	vgdata3
/dev/rdsk/c97t0d5	vgdata3
/dev/rdsk/c107t0d5	vgdata3
/dev/rdsk/c99t0d5	vgdata3
/dev/rdsk/c67t0d5	vgdata3
/dev/rdsk/c63t0d5	vgdata3
/dev/rdsk/c65t0d5	vgdata3
/dev/rdsk/c73t0d5	vgdata3
/dev/rdsk/c87t0d5	vgdata3
/dev/rdsk/c86t0d5	vgdata3
/dev/rdsk/c82t0d5	vgdata3
/dev/rdsk/c76t0d5	vgdata3
/dev/rdsk/c43t0d5	vgdata3
/dev/rdsk/c80t0d5	vgdata3
/dev/rdsk/c31t0d5	vgdata3
/dev/rdsk/c74t0d5	vgdata3

Each LUN (e.g., /dev/rdsk/c74t0d5) has 169.2GB of capacity (more accurately, 177422720 Kbytes of capacity). The overall RAID 0 capacity is:

Total = 169.2 * 6 * 17 = 17,258.8 GB

4) List of all Oracle datafiles and the corresponding device: (sorted by name)

Each oracle data file is assigned to one of these three volume groups and is striped over the 34 devices in the volume group.

Datafile	Oracle size	Logical Volume	LV Size (MB)
control01	2	/dev/vgdata3/control01	544
control02	2	/dev/vgdata1/control02	544
cust01	8001	/dev/vgdata3/cust01	8160
cust02	8001	/dev/vgdata1/cust02	8160
cust03	8001	/dev/vgdata2/cust03	8160
cust04	8001	/dev/vgdata3/cust04	8160
cust05	8001	/dev/vgdata1/cust05	8160
cust06	8001	/dev/vgdata2/cust06	8160
cust07	8001	/dev/vgdata3/cust07	8160
cust08	8001	/dev/vgdata1/cust08	8160
cust09	8001	/dev/vgdata2/cust09	8160
cust10	8001	/dev/vgdata3/cust10	8160
cust11	8001	/dev/vgdata1/cust11	8160
cust12	8001	/dev/vgdata2/cust12	8160
cust13	8001	/dev/vgdata3/cust13	8160
cust14	8001	/dev/vgdata1/cust14	8160
cust15	8001	/dev/vgdata2/cust15	8160
cust16	8001	/dev/vgdata3/cust16	8160
cust17	8001	/dev/vgdata1/cust17	8160
cust18	8001	/dev/vgdata2/cust18	8160
cust19	8001	/dev/vgdata3/cust19	8160
cust20	8001	/dev/vgdata1/cust20	8160
cust21	8001	/dev/vgdata2/cust21	8160

cust22	8001	/dev/vgdata3/cust22	8160
cust23	8001	/dev/vgdata1/cust23	8160
cust24	8001	/dev/vgdata2/cust24	8160
cust25	8001	/dev/vgdata3/cust25	8160
cust26	8001	/dev/vgdata1/cust26	8160
cust27	8001	/dev/vgdata2/cust27	8160
cust28	8001	/dev/vgdata3/cust28	8160
cust29	8001	/dev/vgdata1/cust29	8160
cust30	8001	/dev/vgdata2/cust30	8160
cust31	8001	/dev/vgdata3/cust31	8160
cust32	8001	/dev/vgdata1/cust32	8160
cust33	8001	/dev/vgdata2/cust33	8160
cust34	8001	/dev/vgdata3/cust34	8160
cust35	8001	/dev/vgdata1/cust35	8160
cust36	8001	/dev/vgdata2/cust36	8160
cust37	8001	/dev/vgdata3/cust37	8160
cust38	8001	/dev/vgdata1/cust38	8160
cust39	8001	/dev/vgdata2/cust39	8160
cust40	8001	/dev/vgdata3/cust40	8160
cust41	8001	/dev/vgdata1/cust41	8160
cust42	8001	/dev/vgdata2/cust42	8160
cust43	8001	/dev/vgdata3/cust43	8160
cust44	8001	/dev/vgdata1/cust44	8160
cust45	8001	/dev/vgdata2/cust45	8160
cust46	8001	/dev/vgdata3/cust46	8160
cust47	8001	/dev/vgdata1/cust47	8160
cust48	8001	/dev/vgdata2/cust48	8160
cust49	8001	/dev/vgdata3/cust49	8160
cust50	8001	/dev/vgdata1/cust50	8160
cust51	8001	/dev/vgdata2/cust51	8160
cust52	8001	/dev/vgdata3/cust52	8160
cust53	8001	/dev/vgdata1/cust53	8160
cust54	8001	/dev/vgdata2/cust54	8160
cust55	8001	/dev/vgdata3/cust55	8160
cust56	8001	/dev/vgdata1/cust56	8160
cust57	8001	/dev/vgdata2/cust57	8160
cust58	8001	/dev/vgdata3/cust58	8160
cust59	8001	/dev/vgdata1/cust59	8160
cust60	8001	/dev/vgdata2/cust60	8160
cust61	8001	/dev/vgdata3/cust61	8160
cust62	8001	/dev/vgdata1/cust62	8160
cust63	8001	/dev/vgdata2/cust63	8160
cust64	8001	/dev/vgdata3/cust64	8160
cust65	8001	/dev/vgdata1/cust65	8160
cust66	8001	/dev/vgdata2/cust66	8160
cust67	8001	/dev/vgdata3/cust67	8160
cust68	8001	/dev/vgdata1/cust68	8160
cust69	8001	/dev/vgdata2/cust69	8160
cust70	8001	/dev/vgdata3/cust70	8160
cust71	8001	/dev/vgdata1/cust71	8160
cust72	8001	/dev/vgdata2/cust72	8160
cust73	8001	/dev/vgdata3/cust73	8160
cust74	8001	/dev/vgdata1/cust74	8160
cust75	8001	/dev/vgdata2/cust75	8160
cust76	8001	/dev/vgdata3/cust76	8160
cust77	8001	/dev/vgdata1/cust77	8160

cust78	8001	/dev/vgdata2/cust78	8160
cust79	8001	/dev/vgdata3/cust79	8160
cust80	8001	/dev/vgdata1/cust80	8160
hist01	8001	/dev/vgdata2/hist01	8160
hist02	8001	/dev/vgdata3/hist02	8160
hist03	8001	/dev/vgdata1/hist03	8160
hist04	8001	/dev/vgdata2/hist04	8160
hist05	8001	/dev/vgdata3/hist05	8160
hist06	8001	/dev/vgdata1/hist06	8160
hist07	8001	/dev/vgdata2/hist07	8160
hist08	8001	/dev/vgdata3/hist08	8160
icust101	8001	/dev/vgdata1/icust101	8160
icust102	8001	/dev/vgdata2/icust102	8160
icust103	8001	/dev/vgdata3/icust103	8160
icust104	8001	/dev/vgdata1/icust104	8160
icust201	8001	/dev/vgdata2/icust201	8160
icust202	8001	/dev/vgdata3/icust202	8160
icust203	8001	/dev/vgdata1/icust203	8160
icust204	8001	/dev/vgdata2/icust204	8160
icust205	8001	/dev/vgdata3/icust205	8160
icust206	8001	/dev/vgdata1/icust206	8160
iord101	8001	/dev/vgdata2/iord101	8160
iord102	8001	/dev/vgdata3/iord102	8160
iord103	8001	/dev/vgdata1/iord103	8160
iord104	8001	/dev/vgdata2/iord104	8160
iord201	8001	/dev/vgdata3/iord201	8160
iord202	8001	/dev/vgdata1/iord202	8160
iord203	8001	/dev/vgdata2/iord203	8160
iord204	8001	/dev/vgdata3/iord204	8160
iord205	8001	/dev/vgdata1/iord205	8160
iord206	8001	/dev/vgdata2/iord206	8160
istk01	8001	/dev/vgdata2/istk01	8160
istk02	8001	/dev/vgdata3/istk02	8160
istk03	8001	/dev/vgdata1/istk03	8160
istk04	8001	/dev/vgdata2/istk04	8160
istk05	8001	/dev/vgdata3/istk05	8160
istk06	8001	/dev/vgdata1/istk06	8160
istk07	8001	/dev/vgdata2/istk07	8160
istk08	8001	/dev/vgdata3/istk08	8160
istk09	8001	/dev/vgdata1/istk09	8160
istk10	8001	/dev/vgdata2/istk10	8160
log01	85000	/dev/vglog/log01	150144
log02	85000	/dev/vglog/log02	150144
nord01	5001	/dev/vgdata1/nord01	5440
ordl01	8001	/dev/vgdata1/ordl01	8160
ordl02	8001	/dev/vgdata2/ordl02	8160
ordl03	8001	/dev/vgdata3/ordl03	8160
ordl04	8001	/dev/vgdata1/ordl04	8160
ordl05	8001	/dev/vgdata2/ordl05	8160
ordl06	8001	/dev/vgdata3/ordl06	8160
ordl07	8001	/dev/vgdata1/ordl07	8160
ordl08	8001	/dev/vgdata2/ordl08	8160
ordl09	8001	/dev/vgdata3/ordl09	8160
ordl10	8001	/dev/vgdata1/ordl10	8160
ordl11	8001	/dev/vgdata2/ordl11	8160
ordl12	8001	/dev/vgdata3/ordl12	8160

ordl13	8001	/dev/vgdata1/ordl13	8160
ordl14	8001	/dev/vgdata2/ordl14	8160
ordl15	8001	/dev/vgdata3/ordl15	8160
ordl16	8001	/dev/vgdata1/ordl16	8160
ordl17	8001	/dev/vgdata2/ordl17	8160
ordl18	8001	/dev/vgdata3/ordl18	8160
ordl19	8001	/dev/vgdata1/ordl19	8160
ordl20	8001	/dev/vgdata2/ordl20	8160
ordl21	8001	/dev/vgdata3/ordl21	8160
ordl22	8001	/dev/vgdata1/ordl22	8160
ordl23	8001	/dev/vgdata2/ordl23	8160
ordl24	8001	/dev/vgdata3/ordl24	8160
ordl25	8001	/dev/vgdata1/ordl25	8160
ordl26	8001	/dev/vgdata2/ordl26	8160
ordl27	8001	/dev/vgdata3/ordl27	8160
ordl28	8001	/dev/vgdata1/ordl28	8160
ordl29	8001	/dev/vgdata2/ordl29	8160
ordl30	8001	/dev/vgdata3/ordl30	8160
ordl31	8001	/dev/vgdata1/ordl31	8160
ordl32	8001	/dev/vgdata2/ordl32	8160
ordl33	8001	/dev/vgdata3/ordl33	8160
ordl34	8001	/dev/vgdata1/ordl34	8160
ordl35	8001	/dev/vgdata2/ordl35	8160
ordl36	8001	/dev/vgdata3/ordl36	8160
ordl37	8001	/dev/vgdata1/ordl37	8160
ordl38	8001	/dev/vgdata2/ordl38	8160
ordl39	8001	/dev/vgdata3/ordl39	8160
ordl40	8001	/dev/vgdata1/ordl40	8160
ordl41	8001	/dev/vgdata2/ordl41	8160
ordl42	8001	/dev/vgdata3/ordl42	8160
ordl43	8001	/dev/vgdata1/ordl43	8160
ordl44	8001	/dev/vgdata2/ordl44	8160
ordl45	8001	/dev/vgdata3/ordl45	8160
ordl46	8001	/dev/vgdata1/ordl46	8160
ordl47	8001	/dev/vgdata2/ordl47	8160
ordl48	8001	/dev/vgdata3/ordl48	8160
ordl49	8001	/dev/vgdata1/ordl49	8160
ordl50	8001	/dev/vgdata2/ordl50	8160
ordl51	8001	/dev/vgdata3/ordl51	8160
ordl52	8001	/dev/vgdata1/ordl52	8160
ordl53	8001	/dev/vgdata2/ordl53	8160
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ordl55	8001	/dev/vgdata1/ordl55	8160
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ordl60	8001	/dev/vgdata3/ordl60	8160
ordl61	8001	/dev/vgdata1/ordl61	8160
ordl62	8001	/dev/vgdata2/ordl62	8160
ordl63	8001	/dev/vgdata3/ordl63	8160
ordl64	8001	/dev/vgdata1/ordl64	8160
ordl65	8001	/dev/vgdata2/ordl65	8160
ordl66	8001	/dev/vgdata3/ordl66	8160
ordl67	8001	/dev/vgdata1/ordl67	8160
ordl68	8001	/dev/vgdata2/ordl68	8160

ordl69	8001	/dev/vgdata3/ordl69	8160
ordl70	8001	/dev/vgdata1/ordl70	8160
ordl71	8001	/dev/vgdata2/ordl71	8160
ordl72	8001	/dev/vgdata3/ordl72	8160
ordl73	8001	/dev/vgdata1/ordl73	8160
ordl74	8001	/dev/vgdata2/ordl74	8160
ordl75	8001	/dev/vgdata3/ordl75	8160
ordl76	8001	/dev/vgdata1/ordl76	8160
ordl77	8001	/dev/vgdata2/ordl77	8160
ordl78	8001	/dev/vgdata3/ordl78	8160
ordl79	8001	/dev/vgdata1/ordl79	8160
ordl80	8001	/dev/vgdata2/ordl80	8160
ordl81	8001	/dev/vgdata3/ordl81	8160
ordl82	8001	/dev/vgdata1/ordl82	8160
ordl83	8001	/dev/vgdata2/ordl83	8160
ordl84	8001	/dev/vgdata3/ordl84	8160
ordl85	8001	/dev/vgdata1/ordl85	8160
ordl86	8001	/dev/vgdata2/ordl86	8160
ordl87	8001	/dev/vgdata3/ordl87	8160
ordl88	8001	/dev/vgdata1/ordl88	8160
ordr01	8001	/dev/vgdata3/ordr01	8160
ordr02	8001	/dev/vgdata1/ordr02	8160
ordr03	8001	/dev/vgdata2/ordr03	8160
ordr04	8001	/dev/vgdata3/ordr04	8160
roll01	2001	/dev/vgdata3/roll01	2176
stock001	8001	/dev/vgdata2/stock001	8160
stock002	8001	/dev/vgdata3/stock002	8160
stock003	8001	/dev/vgdata1/stock003	8160
stock004	8001	/dev/vgdata2/stock004	8160
stock005	8001	/dev/vgdata3/stock005	8160
stock006	8001	/dev/vgdata1/stock006	8160
stock007	8001	/dev/vgdata2/stock007	8160
stock008	8001	/dev/vgdata3/stock008	8160
stock009	8001	/dev/vgdata1/stock009	8160
stock010	8001	/dev/vgdata2/stock010	8160
stock011	8001	/dev/vgdata3/stock011	8160
stock012	8001	/dev/vgdata1/stock012	8160
stock013	8001	/dev/vgdata2/stock013	8160
stock014	8001	/dev/vgdata3/stock014	8160
stock015	8001	/dev/vgdata1/stock015	8160
stock016	8001	/dev/vgdata2/stock016	8160
stock017	8001	/dev/vgdata3/stock017	8160
stock018	8001	/dev/vgdata1/stock018	8160
stock019	8001	/dev/vgdata2/stock019	8160
stock020	8001	/dev/vgdata3/stock020	8160
stock021	8001	/dev/vgdata1/stock021	8160
stock022	8001	/dev/vgdata2/stock022	8160
stock023	8001	/dev/vgdata3/stock023	8160
stock024	8001	/dev/vgdata1/stock024	8160
stock025	8001	/dev/vgdata2/stock025	8160
stock026	8001	/dev/vgdata3/stock026	8160
stock027	8001	/dev/vgdata1/stock027	8160
stock028	8001	/dev/vgdata2/stock028	8160
stock029	8001	/dev/vgdata3/stock029	8160
stock030	8001	/dev/vgdata1/stock030	8160
stock031	8001	/dev/vgdata2/stock031	8160

stock032	8001	/dev/vgdata3/stock032	8160
stock033	8001	/dev/vgdata1/stock033	8160
stock034	8001	/dev/vgdata2/stock034	8160
stock035	8001	/dev/vgdata3/stock035	8160
stock036	8001	/dev/vgdata1/stock036	8160
stock037	8001	/dev/vgdata2/stock037	8160
stock038	8001	/dev/vgdata3/stock038	8160
stock039	8001	/dev/vgdata1/stock039	8160
stock040	8001	/dev/vgdata2/stock040	8160
stock041	8001	/dev/vgdata3/stock041	8160
stock042	8001	/dev/vgdata1/stock042	8160
stock043	8001	/dev/vgdata2/stock043	8160
stock044	8001	/dev/vgdata3/stock044	8160
stock045	8001	/dev/vgdata1/stock045	8160
stock046	8001	/dev/vgdata2/stock046	8160
stock047	8001	/dev/vgdata3/stock047	8160
stock048	8001	/dev/vgdata1/stock048	8160
stock049	8001	/dev/vgdata2/stock049	8160
stock050	8001	/dev/vgdata3/stock050	8160
stock051	8001	/dev/vgdata1/stock051	8160
stock052	8001	/dev/vgdata2/stock052	8160
stock053	8001	/dev/vgdata3/stock053	8160
stock054	8001	/dev/vgdata1/stock054	8160
stock055	8001	/dev/vgdata2/stock055	8160
stock056	8001	/dev/vgdata3/stock056	8160
stock057	8001	/dev/vgdata1/stock057	8160
stock058	8001	/dev/vgdata2/stock058	8160
stock059	8001	/dev/vgdata3/stock059	8160
stock060	8001	/dev/vgdata1/stock060	8160
stock061	8001	/dev/vgdata2/stock061	8160
stock062	8001	/dev/vgdata3/stock062	8160
stock063	8001	/dev/vgdata1/stock063	8160
stock064	8001	/dev/vgdata2/stock064	8160
stock065	8001	/dev/vgdata3/stock065	8160
stock066	8001	/dev/vgdata1/stock066	8160
stock067	8001	/dev/vgdata2/stock067	8160
stock068	8001	/dev/vgdata3/stock068	8160
stock069	8001	/dev/vgdata1/stock069	8160
stock070	8001	/dev/vgdata2/stock070	8160
stock071	8001	/dev/vgdata3/stock071	8160
stock072	8001	/dev/vgdata1/stock072	8160
stock073	8001	/dev/vgdata2/stock073	8160
stock074	8001	/dev/vgdata3/stock074	8160
stock075	8001	/dev/vgdata1/stock075	8160
stock076	8001	/dev/vgdata2/stock076	8160
stock077	8001	/dev/vgdata3/stock077	8160
stock078	8001	/dev/vgdata1/stock078	8160
stock079	8001	/dev/vgdata2/stock079	8160
stock080	8001	/dev/vgdata3/stock080	8160
stock081	8001	/dev/vgdata1/stock081	8160
stock082	8001	/dev/vgdata2/stock082	8160
stock083	8001	/dev/vgdata3/stock083	8160
stock084	8001	/dev/vgdata1/stock084	8160
stock085	8001	/dev/vgdata2/stock085	8160
stock086	8001	/dev/vgdata3/stock086	8160
stock087	8001	/dev/vgdata1/stock087	8160

stock088	8001	/dev/vgdata2/stock088	8160
stock089	8001	/dev/vgdata3/stock089	8160
stock090	8001	/dev/vgdata1/stock090	8160
stock091	8001	/dev/vgdata2/stock091	8160
stock092	8001	/dev/vgdata3/stock092	8160
stock093	8001	/dev/vgdata1/stock093	8160
stock094	8001	/dev/vgdata2/stock094	8160
stock095	8001	/dev/vgdata3/stock095	8160
stock096	8001	/dev/vgdata1/stock096	8160
stock097	8001	/dev/vgdata2/stock097	8160
stock098	8001	/dev/vgdata3/stock098	8160
stock099	8001	/dev/vgdata1/stock099	8160
stock100	8001	/dev/vgdata2/stock100	8160
stock101	8001	/dev/vgdata3/stock101	8160
stock102	8001	/dev/vgdata1/stock102	8160
stock103	8001	/dev/vgdata2/stock103	8160
sys01	801	/dev/vgdata2/sys01	1088

The distribution of the database tables over the disk arrays of the priced system is an extension of the distribution described in Table 5.2; some ancillary details are mentioned in Appendix E. 180-day storage growth requirements are met with the unused space of this configuration. Figure 1.2 shows the configuration of the priced-system disks.

5.3 Data Model & Interfaces

A statement must be provided that describes:

1. *The data model implemented by the DBMS used (e.g. relational, network, hierarchical)*

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

Oracle8 Enterprise Database Server v8.1.7.1 is a relational DBMS. SQL stored procedures were used, invoked through the Oracle Call Interface (OCI); the application code appears in Appendix A.

5.4 Partitions/Replications

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

No partitioning or replication was used.

5.5 Growth Requirements

Details of the 180 day space computations along with proof that the database is configured to sustain 8 hours for the dynamic tables (Order, Order-Line, and History) must be disclosed.

See Appendix E.

6 Clause 5 Related Items

6.1 Throughput

Measured tpmC must be reported.

Table 6.1: Measured tpmC

tpmC®	197,024.17

6.2 Response Time

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

Table 6.2: Response Times

Response Times	Average	90th %-ile	Maximum
New-Order	0.83s	1.46s	7.91s
Payment	0.75s	1.38s	7.38s
Order-Status	0.77s	1.40s	7.31s
Delivery (interactive portion)	0.08s	0.08s	0.18s
Delivery (deferred portion)	0.85s	1.49s	7.27s
Stock-Level	0.69s	1.31s	5.13s
Menu	0.001s	0.10s	0.29s

6.3 Keying and Think Times

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

Table 6.3: Keying Times

Keying Times	Minimum	Average	Maximum
New Order	18.02s	18.03s	18.04s
Payment	3.01s	3.02s	3.03s
Order Status	2.01s	2.02s	2.03s
Interactive Delivery	2.01s	2.02s	2.03s
Stock Level	2.01s	2.02s	2.03s

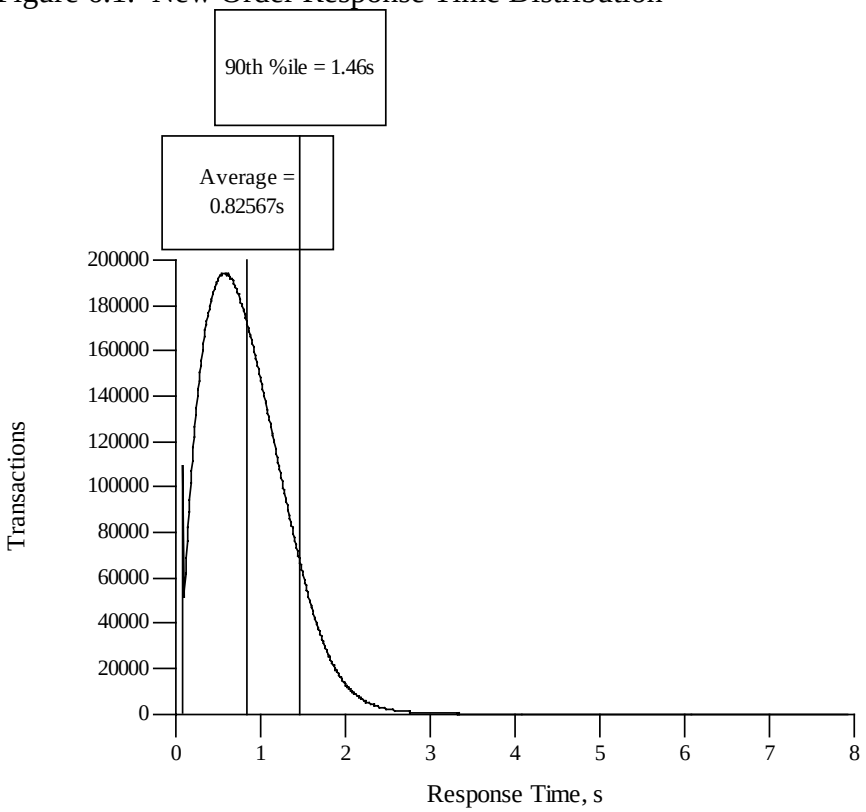
Table 6.4: Think Times

Think Times	Minimum	Average	Maximum
New Order	0.01s	12.13s	191.14s
Payment	0.01s	12.06s	205.68s
Order Status	0.01s	10.12s	154.63s
Interactive Delivery	0.01s	5.07s	79.61s
Stock Level	0.01s	5.06s	67.56s

6.4 Response Time Frequency Distribution Curves and Other Graphs

Response Time frequency distribution curves (see Clause 5.6.1) must be reported for each transaction type. The performance curve for response times versus throughput (see Clause 5.6.2) must be reported for the New-Order transaction. The Think Time frequency distribution curve (see Clause 5.6.3) must be reported for the New-Order transaction. A graph of throughput versus elapsed time (see Clause 5.6.5) must be reported for the New-Order transaction, and the measurement interval indicated.

Figure 6.1: New Order Response Time Distribution



Response time frequency distribution for New Order transaction

Figure 6.2: Payment Response Time Distribution

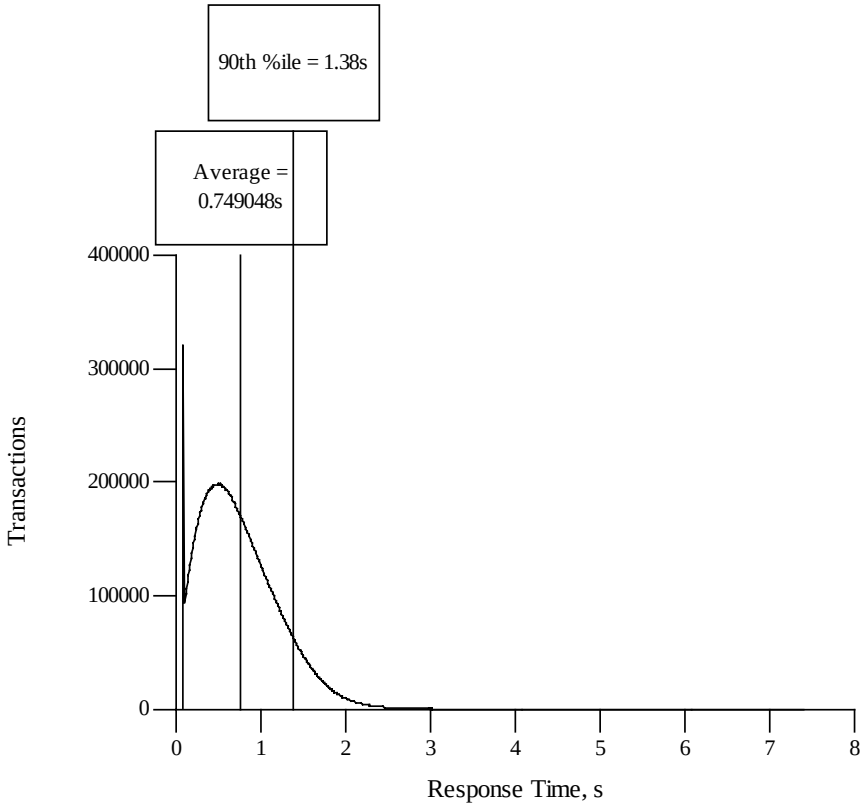


Figure 6.3: Order Status Response Time Distribution

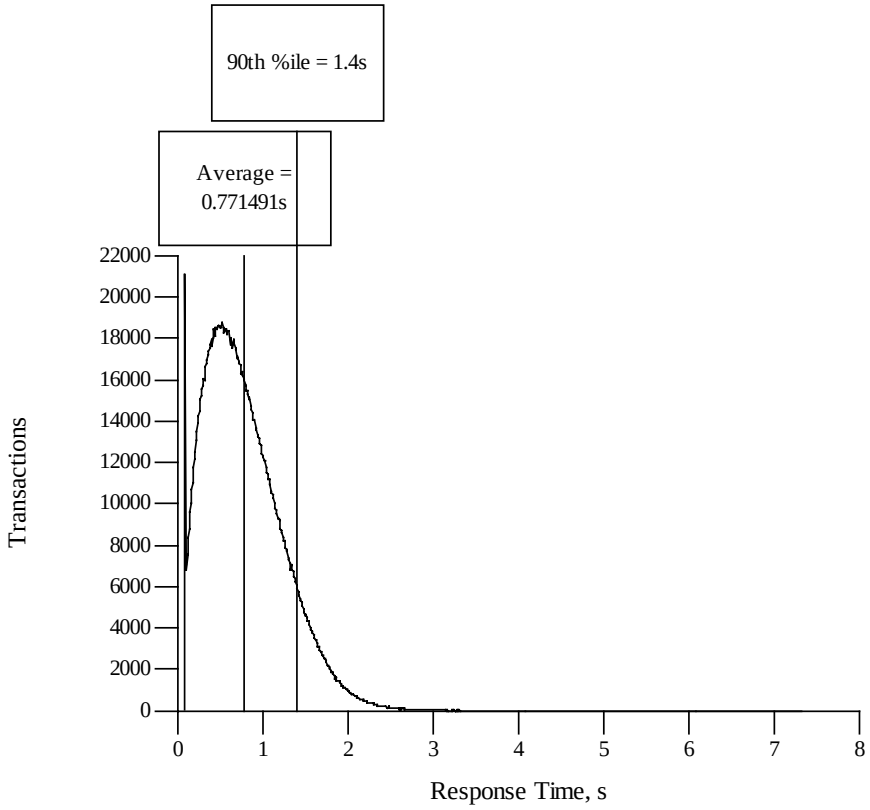
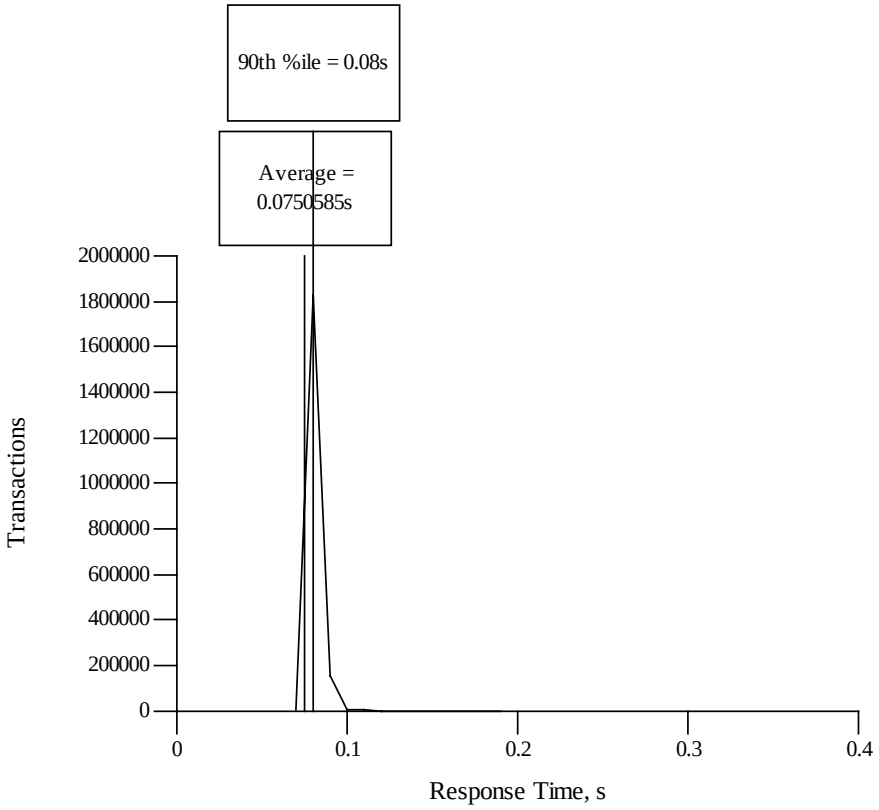
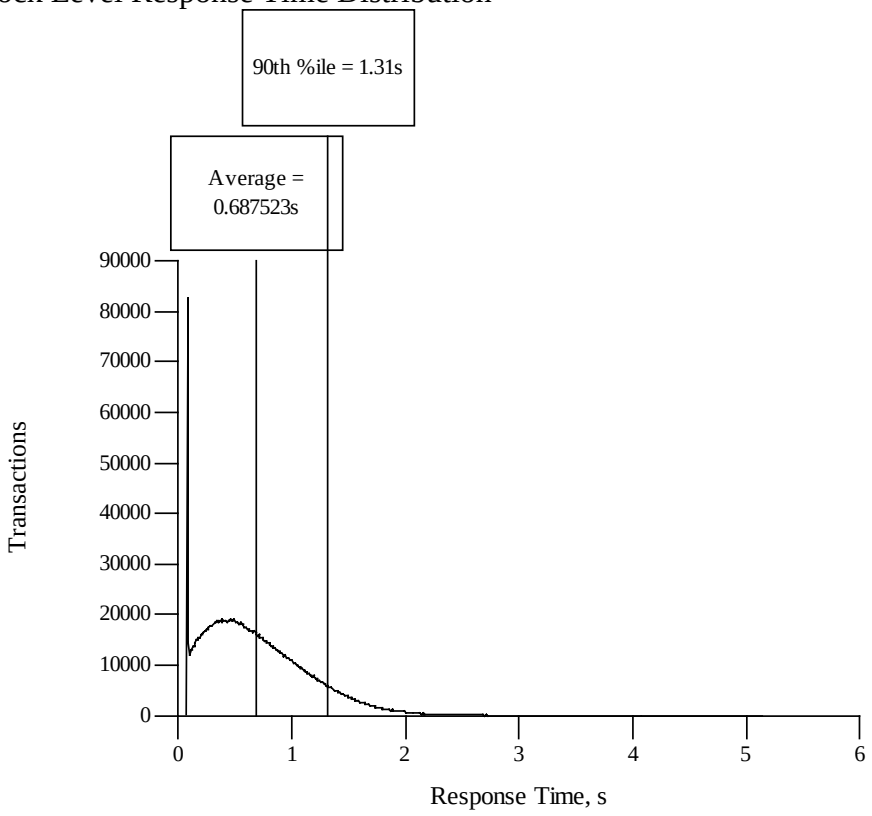


Figure 6.4: (Interactive) Delivery Response Time Distribution



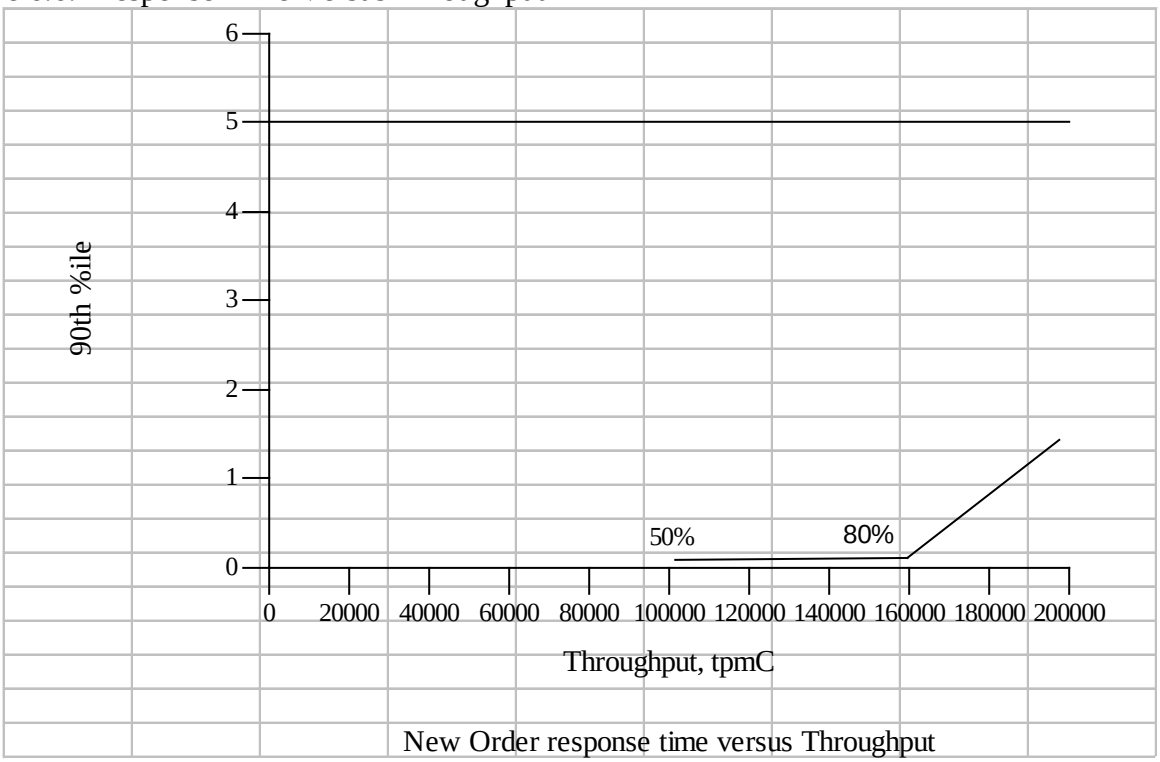
Response time frequency distribution for Delivery transaction

Figure 6.5: Stock Level Response Time Distribution



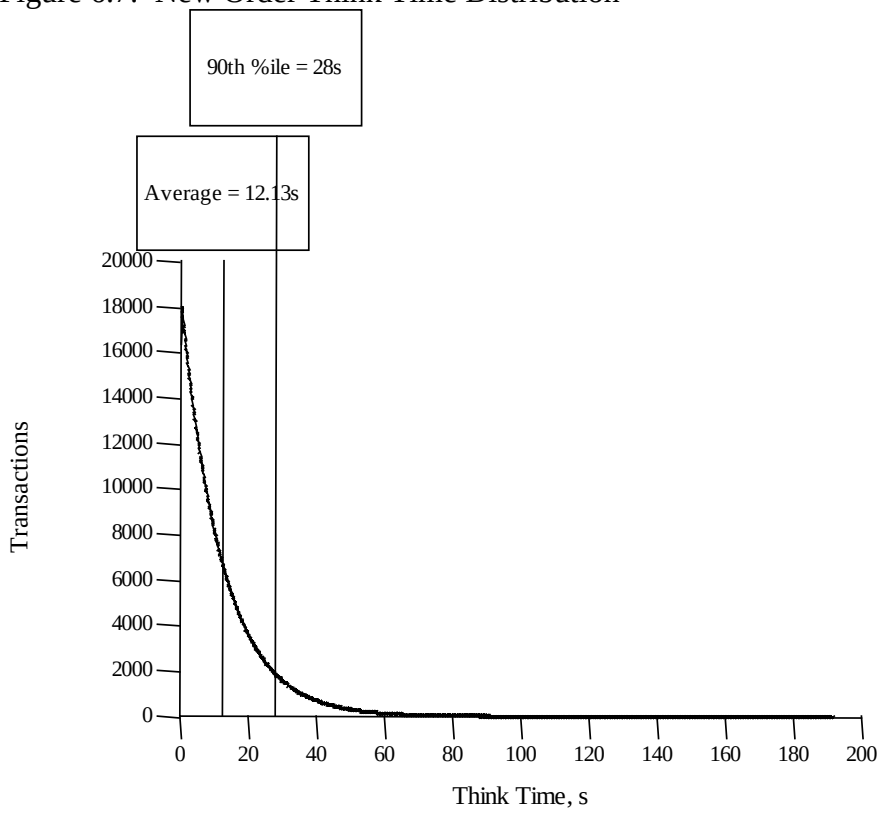
Response time frequency distribution for Stock Level transaction

Figure 6.6: Response Time Versus Throughput



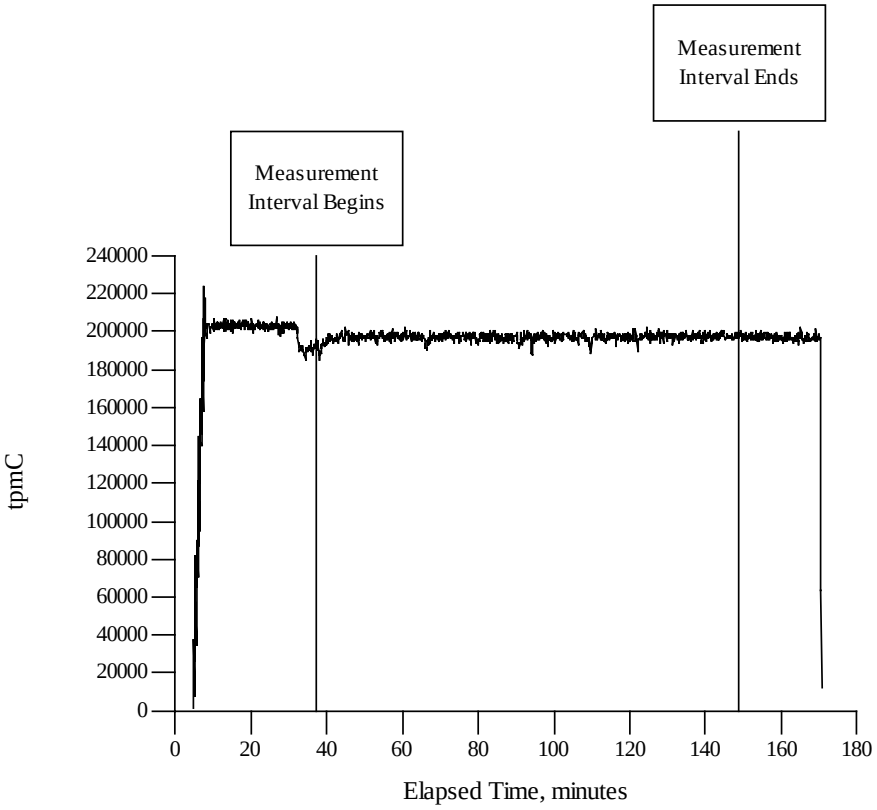
New Order response time versus Throughput

Figure 6.7: New Order Think Time Distribution



Think time frequency distribution for New Order transaction

Figure 6.8: Throughput Versus Time



Throughput of the New-Order transaction versus elapsed time

6.5 Steady State Determination

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

Synchronization techniques employed in the benchmark process ensure that all emulated users are logged into the client and have opened the application before submitting transactions. Once all users are connected, each pauses a random amount of time before submitting transactions. The pause time distribution is controlled by a benchmark input parameter. The ramp-up interval is discernible in the graph of throughput over time. The data reduction also tracks the user load and indicates the point in time at which all users have submitted at least one transaction. The throughput is observed to be steady within the systematic and statistical variability of the measurement after all users are submitting transactions. A checkpoint is initiated upon the end of ramp-up.

6.6 Work Performed During Steady State

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

Modified database buffers migrated to disk on a least-recently-used basis independent of transaction commits. In addition, every block modification was protected by redo log records. These redo log records were written to the redo log buffer (in memory) and were flushed to a redo log file on disk either when the transaction committed or when the redo log buffer became full. However, due to the rapid commit during this benchmark, the redo log buffer was always flushed by a commit before it became full. Also, because many transactions were committing in a short period of time, a

single flush of the redo log buffer resulted in many transactions' redo log data being written to disk. This is called group commit.

6.6.1 Checkpoint

During an Oracle8 Enterprise Database Server v8.1.7.1 checkpoint, all modified blocks in the shared buffer cache which had not been written to disk since the last checkpoint are written to disk.

6.6.2 Checkpoint Conditions

Oracle8 Enterprise Database Server v8.1.7.1 performs a checkpoint for the following conditions:

1. A redo log switch occurs.
2. The amount of data written to a redo log reaches the log_checkpoint_interval
3. The amount of time since the last checkpoint reaches the log_checkpoint_timeout.

6.6.3 Checkpoint Implementation

During each benchmark measurement, a log switch was performed upon the end of ramp-up. After the initial checkpoint, a log switch was performed every 28 minutes.

6.6.4 Serializable Transactions

Oracle supports serializable transaction isolation in full compliance with the SQL92 and TPC-C requirements. This is implemented by extending the multiversity concurrency control mechanism long supported by Oracle.

Oracle queries take no read locks and see only data committed as of the beginning of the query's execution. This means that readers and writers coexist without blocking one another, providing a high degree of concurrency and consistency. While this mode does prevent reading dirty data, Oracle's default isolation level also permits a transaction that issues a query twice to see non-repeatable reads and phantoms, as defined in SQL92 and TPC-C.
Beginning with Oracle7 release 7.3, a transaction may request a high degree of isolation with the command SET TRANSACTION ISOLATION LEVEL SERIALIZABLE, as defined in SQL92. This transaction mode prevents read/write and write/write conflicts that would cause serializability failures. A session can establish this mode as its default mode, so the SET TRANSACTION command need not be issued in each transaction.

Oracle implements SERIALIZABLE mode by extending of the scope of read consistency from the individual query to the entire transaction. Instead of limiting a query to data committed at the time a query begins, in a serializable transaction all queries see data as of the beginning of the transaction. Thus, a serializable transaction sees a fixed snapshot of the database, established as of the beginning of the transaction.

All reads within a serializable transaction see only committed data as of the start of that transaction, plus new updates done by the transaction itself. All reads by a serializable transaction are therefore repeatable, as the transaction will access prior versions of data changed (or deleted) by other transactions after the start of the serializable transaction. This behavior also results in phantom protection since new rows created by other transactions will be invisible to the serializable transaction.

To ensure proper isolation, a serializable transaction cannot modify rows that were changed by other transactions after the beginning of the serializable transaction. If a serializable transaction attempts to update (or delete) a row previously changed by another transaction (serializable or not) since the beginning of the serializable transaction, the update (or delete) statement will fail with error ORA-08177: "Can't serialize access", and the statement will rollback.

SET TRANSACTION ISOLATION

LEVEL SERIALIZABLE;

SELECT …

SELECT…

UPDATE…

IF "Can't serialize access"

THEN ROLLBACK; LOOP and retry

ELSE COMMIT;

When a serializable transaction fails with this error, the application may either commit the work executed to that point, execute additional (but different) statements, or rollback the entire transaction. Repeated attempts to execute the same statement will always fail with the error "Can't serialize access", unless the other transaction has rolled back and released its lock. This error and these recovery options are similar to the treatment of deadlocks in systems that use read locks to ensure serializable execution. In both cases, conflicts between transactions cannot be resolved unless one of the transactions rolls back and restarts or commits without re-executing the statement receiving the error.

6.7 Reproducibility

A description of the method used to determine the reproducibility of the measurement results.

A second measurement achieved a qualified throughput of 195575.23 tpmC over a 112-minute, steady-state interval.

6.8 Measurement Period Duration

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

The measurement interval was 112 minutes.

6.9 Regulation of Transaction Mix

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

The weighted selection method of *Clause 5.2.4.1* was used. The weights were not adjusted during the run.

6.10 Transaction Mix

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

Table 6.5: Transaction Mix

Type	Percentage
New Order	44.80%
Payment	43.06%
Order Status	4.05%
Delivery	4.05%
Stock Level	4.05%

6.11 Transaction Statistics

The percentage of New-Order transactions rolled back as a result of invalid item number must be disclosed. The average number of order-lines entered per New-Order trasaction must be disclosed. The percentage of remote order-lines entered per New-Order transaction must be disclosed. The percentage of remote Payment transactions must be disclosed. The percentage of customer selections by customer last name in the Payment and Order-Status transactions must be disclosed. The percentage of Delivery transactions skipped due to there being fewer than necessary orders in the New-Order table must be disclosed.

See Table 3.1

6.12 Checkpoint Count and Location

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

The number of checkpoints in the interval was 4. The time of seconds from the start of the measurement interval to the first checkpoint was 946 seconds. The Checkpoint Interval is 28 minutes.

7 Clause 6 Related Items

7.1 RTE Description

If the RTE is commercially available, then its inputs must be specified. Otherwise, a description must be supplied of what inputs (e.g., scripts) to the RTE had been used. The RTE input parameters, code fragments, functions, et cetera used to generate each transaction input field must be disclosed. Comment: The intent is to demonstrate the RTE was configured to generate transaction input data as specified in Clause 2.

The RTE (Remote Terminal Emulator) on the driver system was developed at Hewlett-Packard and is not commercially available. Appendix D lists RTE input parameters and code fragments used to generate each transaction input field.

For this instance of the TPC-C benchmark, 20 drivers and 40 clients were used. The drivers emulated users logged in to the clients. An overview of the benchmark software on the drivers, clients and server is shown in Figure 7.1.

The benchmark is started with the **run** command on the driver system. **Run** controls the overall execution of the benchmark. After reading a configuration file, **run** starts TUXEDO on the client, collects pre-benchmark audit information and inserts a timestamp into a database audit table. When all the initial steps are completed, **run** invokes another program, **driver,** to start the benchmark. As the benchmark completes, **run** shuts down TUXEDO and collects the benchmark results into a single location.

Driver is the heart of the benchmark software. It simulates users as they log in, execute transactions and view results. **Driver** collects response times for each transaction and saves them in a file for future analysis.

Qualify is the post-processing analysis program. It produces the numerical summaries and histograms needed for the disclosure report.

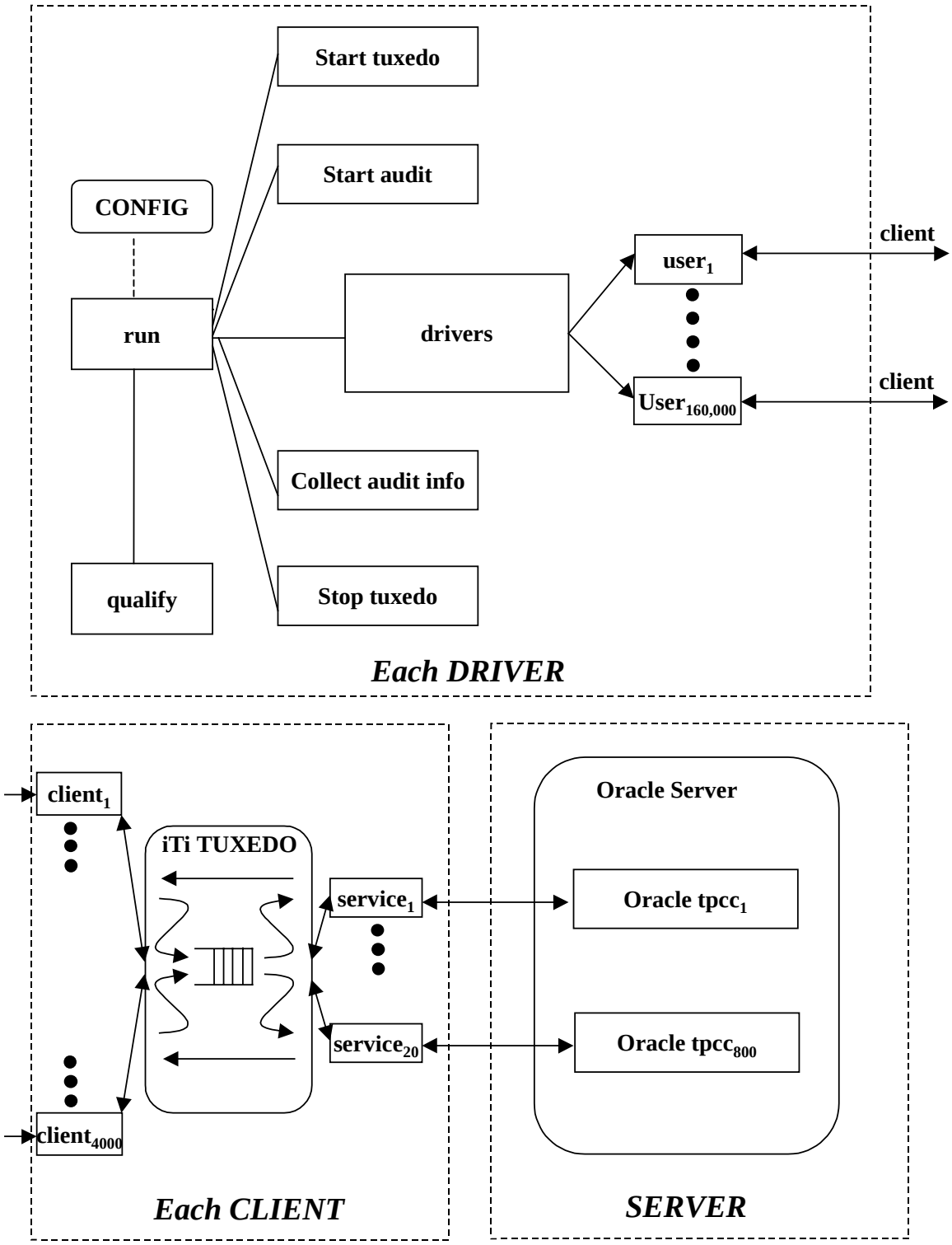


Figure 7.1: Benchmark Software

7.2 Emulated Components

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

In the priced configuration, workstations are connected to the clients via LANs. On the tested system, 20 LAN segments carried all the traffic between the 160,000 simulated users in the RTE system and the 40 client systems. In the priced configuration, this traffic has been divided among 4 separate LAN segments for each of the 40 clients, for a total of 160 LAN segments.

7.3 Functional Diagrams

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

Figures 1.1 and 1.2 (in Chapter 1) show functional diagrams of the benchmark and configured systems. A description of the RTE and benchmark software is provided above.

7.4 Networks

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

Figures 1.1 and 1.2 (in Chapter 1) diagram the network configurations of the benchmark and configured systems, and represent the Driver connected via LAN replacing the workstations and HUBs connected via LANs. The clients are connected via 100 Base-T to an 100BT/1000BT-Ethernet switch which in turn is connected via 1000BT-Ethernet to the SUT.

The bandwidth of the networks used in the tested/priced configurations must be disclosed.

Ethernet and 100 Base-T local area networks (LAN) with a bandwidth of 100 megabits per second are used in the tested/priced configurations. The 1000BT used has a bandwidth of 1000 megabits per second.

8 Clause 7 Related Items

8.1 System Pricing

A detailed list of 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 data. If package-pricing is used contents of the package must be disclosed. Pricing source(s) and effective date(s) of price(s) must also be reported.

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.

Each priced configuration consists of an integrated system package, additional options, and components. Prices for all Hewlett-Packard products that are not provided by a third party quote are HP's US list prices. A one (1) year warranty is standard with all Hewlett-Packard products.

8.2 Support Pricing

The three year support pricing for Hewlett-Packard products is based on twenty-four (24) months of monthly support costs; thirty-six (36) months minus the twelve month warranty period. The Oracle Corporation support pricing is based on thirty-six (36) months of monthly support costs. The following support products were priced in the benchmark:

- HP four-hour on-site repair hardware support,
- HP telephone support for software and updates
- Oracle Corporation Standard Technical Support and,
- BEA TUXEDO Standard Technical Support

8.2.1 HP Hardware Support

HP's on-site support for hardware provides service 24 hour, seven day support.

8.2.2 HP Software Support

HP Software Support provides the following:

- Access to the HP Response Centers for fault isolation and problem solving assistance,
- Guaranteed two (2) hour call return, immediate response for critical calls,
- Electronic access to product and support information,
- Electronic access to software patches,
- Right-to-use and copy software updates.

8.3 Oracle Corporation Standard Technical Support

Oracle Corporation Standard Technical Support includes:

Product updates,

- A regular technical publication,
- Unlimited, toll-free telephone service to assist in product installation, syntax, and usage that is available 24 hours, seven days a week.

8.4 Availability

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

see below

8.5 Priced System Configuration

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

8.6 Throughput, Price/Performance, and Availability Date

A statement of the measured tpmC® *as well as the respective calculations for the 5-year pricing, price/performance (price/tpmC®).*

For Throughput and Price/Performance, please see page iv and v. The Price/Performance calculation spreadsheet appears on page v.

All hardware components in this test of the HP 9000 Superdome Enterprise Server system are currently available. HP-UX 11.i 64-bit incorporating will be available now. Oracle8 Enterprise Database Server v8.1.7.1 will be available on May 1, 2001.

9 Clause 9 Related Items

9.1 Auditor's Report

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.

If audited, the auditor's attestation letter must be made readily available to the public as part of the Full Disclosure Report, but a detailed report from the auditor is not required.

This implementation of the TPC Benchmark® C on the HP 9000 Superdome Enterprise Server was audited by Lorna Livingtree for Performance Metrics, Inc..

Lorna Livingtree
Performance Metrics, Inc.
137 Yankton Street, Suite 101
Folsom, CA 95630
U.S.A.
Phone: 916 985-1131
Fax: 916 985-1185

The attestation letter is shown on the following pages.

March 19, 2001

Andreas Hotea
Hewlett-Packard Server Division
11000 Wolf Rd.
Cupertino, CA 95014

In my opinion, the data provided for the HP9000 Superdome result of March 5, 2001 complies with the TPC-C Version 5 upgrade requirements.

The following attributes of the benchmark were given special attention:

- **The data for the 60 day space calculation was verified**
- **Maintenance was verified to be 3-year, 7 X 24 with 4 hour response time.**
- **The system pricing was checked for major components and maintenance.**

Auditor Notes:

none

Sincerely,

Lorna Livingtree
Auditor

10 Report Availability

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

Transaction Processing
Performance Council
c/o Shanley Public Relations
650 N. Winchester Blvd.
Suite 1
San Jose, CA 95128

or your local Hewlett-Packard sales office.

Appendix A Client/Server Source

This appendix contains the source and makefiles for all client and server programs.

A.1 Client Front-End

client/client.c

```
/*****************************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 10:53:26 $

 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
*****************************************************************************/
/*****************************************************************
History
941101 JVM Fixed login screen to detect broken connection (used to loop)
941013 JVM Added audit strings to the login form
941013 VM modified the getfield procedure to add digit and char check
       according to the field type.
941014 VM added the status_msg routine to display transaction results.
941015 VM added zip routine to format zip codes and phone routine
       to format phone numbers.
*****************************************************************/


#include "iobuf.h"
#include "tpcc.h"
#include <signal.h>

#define until(c)  while(!(c))


/* a generic transaction variable. */
generic_trans generic_transaction;
generic_trans *trans=&generic_transaction;

/* global variables set up during initialization */
int user;
ID warehouse;
ID district;

main(argc, argv)
    int argc;
    char **argv;
    {
    int key;

    /* setup the transactions */
    key = setup(argc, argv);

    /* repeat until done */
    while (key != '9' && key != EOF)
        {

        /* get the menu choice */
        key = menu_read();

        /* process according to the choice */
        switch(key)
            {
            case '1': key = neworder(&trans->neworder); break;
            case '2': key = payment(&trans->payment); break;
            case '3': key = ordstat(&trans->ordstat); break;
            case '4': key = delivery(&trans->delivery); break;
            case '5': key = stocklev(&trans->stocklev); break;
            case EOF: break;
            case '9': break;
            default:    msgline("Please enter a valid menu choice");
            }
        }

    /* done */
    cleanup();
    }


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

Neworder form processing

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

define_iobuf(neworder_form, 900);

int neworder(trans)
    neworder_trans *trans;
    {
    int key;
    display(neworder_form);
    key = neworder_read(trans);
    if (key != ENTER) return key;
    neworder_transaction(trans);
    neworder_write(trans);
    return key;
    }


int neworder_read(trans)
    neworder_trans *trans;
    {
    int i;
    int field;
    int key;
    int ol;

    /* Our warehouse number is fixed */
    trans->W_ID = warehouse;
    trans->D_ID = EMPTY_NUM;

    /* assume nothing set yet */
    trans->C_ID = EMPTY_NUM;
    for (i=0; i<15; i++)
        {
        trans->item[i].OL_I_ID = EMPTY_NUM;
        trans->item[i].OL_QUANTITY = EMPTY_NUM;
        trans->item[i].OL_SUPPLY_W_ID = EMPTY_NUM;
        }

    /* Process fields until done */
    for (field = 1; field > 0; field = next_field(field, key, 47))
        retry: switch (field)
            {
```

```
        case 1: key = read_number(4, 29, &trans->D_ID, 2);
                break;

        case 2: key = read_number(5, 12, &trans->C_ID, 4);
                break;

        case 3: case 6: case 9: case 12: case 15:
        case 18: case 21: case 24: case 27: case 30:
        case 33: case 36: case 39: case 42: case 45:
           ol = (field - 3) / 3;
           key = read_number(9+ol, 2, &trans->item[ol].OL_SUPPLY_W_ID,6);
           break;

        case 4: case 7: case 10: case 13: case 16:
        case 19: case 22: case 25: case 28: case 31:
        case 34: case 37: case 40: case 43: case 46:
           ol = (field - 3) / 3;
           key = read_number(9+ol,10, &trans->item[ol].OL_I_ID, 6);
           break;

        case 5: case 8: case 11: case 14: case 17:
        case 20: case 23: case 26: case 29: case 32:
        case 35: case 38: case 41: case 44: case 47:
           ol = (field - 3) / 3;
           key = read_number(9+ol, 45, &trans->item[ol].OL_QUANTITY, 2);
           break;
        }

/* abort the screen if requested */
if (key != ENTER)
   return key;

/* calculate how many items were entered */
for (i=15; i>0; i--)
   if ((trans->item[i-1].OL_I_ID != EMPTY_NUM) ||
               (trans->item[i-1].OL_SUPPLY_W_ID != EMPTY_NUM) ||
               (trans->item[i-1].OL_QUANTITY != EMPTY_NUM)) break;
trans->O_OL_CNT = i;

/* make sure all necessary fields are filled in */
if (trans->D_ID == EMPTY_NUM)
   {field=1; msgline("Please specify district"); goto retry;}
if (trans->C_ID == EMPTY_NUM)
   {field=2; msgline("Please specify customer id"); goto retry;}
if (trans->O_OL_CNT == 0)
   {field=3; msgline("Please enter at least one orderline"); goto retry;}
for (i=0; i<trans->O_OL_CNT; i++)
   {
   if (trans->item[i].OL_SUPPLY_W_ID == EMPTY_NUM)
      {field=i*3+3; msgline("Please enter supply warehouse"); goto retry;}
   if (trans->item[i].OL_I_ID == EMPTY_NUM)
      {field=i*3+4; msgline("Please enter Item id"); goto retry;}
   if (trans->item[i].OL_QUANTITY == EMPTY_NUM
    || trans->item[i].OL_QUANTITY <= 0)
      {field=i*3+5; msgline("Please enter quantity > 0"); goto retry;}
   }

/* decide if they were all local */
for (i=0; i<trans->O_OL_CNT; i++)
   if (trans->item[i].OL_SUPPLY_W_ID != trans->W_ID) break;
trans->all_local = (i == trans->O_OL_CNT);

/* display number of order lines */
number(6, 42, trans->O_OL_CNT, 2);

msgline("");
flush();
return key;
}
```

```
neworder_write(t)
   neworder_trans *t;
   {
   int i;
   MONEY amount, total_amount, cost;

   /* Rev. 3.3 error checking: both of the following branches are
    * skipped.  We'll go to status and print an error message.
    */

   /* CASE: invalid item, display only these values */
   if (t->status == E_INVALID_ITEM)
      {
      text(5, 25, t->C_LAST);
      text(5,52,  t->C_CREDIT);
      number(6, 15, t->O_ID, 8);
      }

   /* CASE: everything OK, display everything */
   else if (t->status == OK)
      {
      text(5, 25, t->C_LAST);
      text(5,52,  t->C_CREDIT);
      number(6, 15, t->O_ID, 8);
      date(4, 61, t->O_ENTRY_D);
      real(5, 64, t->C_DISCOUNT * 100, 5, 2);
      real(6, 59, t->W_TAX*100, 5, 2);
      real(6, 74, t->D_TAX*100, 5, 2);

      total_amount = 0;
      for (i=0; i < t->O_OL_CNT; i++)
         {

         /* keep track of amount of each line and total */
         amount = t->item[i].I_PRICE * t->item[i].OL_QUANTITY;
         total_amount += amount;

         /* display the item line */
         text(9+i, 19, t->item[i].I_NAME);
         number(9+i, 51, t->item[i].S_QUANTITY, 3);
         position(9+i, 58);   pushc(t->item[i].brand_generic);
         money(9+i, 62, t->item[i].I_PRICE, 7);
         money(9+i, 71, amount, 8);
         }

      /* Clear the screen of any empty input fields */
      clear_screen();

      /* display the total cost */
      text(24, 63, "Total:");
      cost = total_amount * (1 - t->C_DISCOUNT) * (1 + t->W_TAX + t->D_TAX);
      money(24, 71, cost, 9);
      }

   /* display the status message */
   status(24, 1, t->status);
   }


neworder_setup()
   {
   int item;
   iobuf *old;

   /* start with an empty form */
   reset(neworder_form);

   /* redirect the data to a special menu buffer */
```

```
    old = out_buf;  out_buf = neworder_form;

    /* clear the iobuf below the menu */
    position(3,1);
    clear_screen();

    /* set up all the field labels */
    text(3, 36, "New Order");
    text(4, 1, "Warehouse:");
    number(4, 12, warehouse, 6);
    text(4, 19, "District:");
    empty(4, 29, 2);
    text(4, 55, "Date:");
    text(5, 1, "Customer:");
    empty(5, 12, 4);
    text(5, 19, "Name:");
    text(5, 44, "Credit:");
    text(5, 57, "Disc.:");
    text(6, 1, "Order Number:");
    text(6, 25, "Number of Lines:");
    text(6, 52, "W_Tax:");
    text(6, 67, "D_Tax:");
    text(8, 2, "Supp_W Item_Num   Item_Name");
    text(8, 45, "Qty Stock   B/G     Price  Amount");

    /* display blank fields for each item */
    for (item = 1; item <= 15; item++)
        {
        empty(8+item, 2, 6);
        empty(8+item, 10, 6);
        empty(8+item, 45, 2);
        }

    trigger();

    /* restore to the previous I/O buffer */
    out_buf = old;
    }



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

Payment form processing

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

define_iobuf(payment_form, 400);


int payment(trans)
    payment_trans *trans;
    {
    int key;
    display(payment_form);
    key = payment_read(trans);
    if (key != ENTER)  return key;
    payment_transaction(trans);
    payment_write(trans);
    return key;
    }


payment_setup()
    {
    int item;
    iobuf *old;

    /* start with an empty form */
    reset(payment_form);

    /* redirect the data to a special menu buffer */
    old = out_buf;  out_buf = payment_form;

    /* clear the iobuf below the menu */
    position(3,1);
    clear_screen();

    /* set up all the field labels */
    text(3, 38, "Payment");
    text(4, 1, "Date:");
    text(6, 1, "Warehouse:");
    number(6, 12, warehouse, 6);
    text(6, 42, "District:");
    empty(6, 52, 2);
    text(11, 1, "Customer:");
    empty(11, 11, 4);
    text(11, 17, "Cust-Warehouse:");
    empty(11, 33, 6);
    text(11, 40, "Cust-District:");
    empty(11, 54, 2);
    text(12, 1, "Name:");
    empty(12, 29, 16);
    text(12, 50, "Since:");
    text(13, 50, "Credit:");
    text(14, 50, "%Disc:");
    text(15, 50, "Phone:");
    text(17, 1, "Amount Paid:");
    empty(17, 23, 8);
    text(17, 37, "New Cust-Balance:");
    text(18, 1, "Credit Limit:");
    text(20, 1, "Cust-Data:");
    trigger();

    out_buf = old;
    }



int payment_read(t)
    payment_trans *t;
    {
    int i;
    int field;
    int key;

    /* Our warehouse number is fixed */
    t->W_ID = warehouse;
    t->C_ID = EMPTY_NUM;
    t->D_ID = EMPTY_NUM;
    t->C_W_ID = EMPTY_NUM;
    t->C_D_ID = EMPTY_NUM;
    t->H_AMOUNT = EMPTY_FLT;
    t->C_LAST[0] = '\0';

    /* Process fields until done */
    for (field = 1; field > 0; field = next_field(field, key, 6))
        retry: switch (field)
            {

            case 1: key = read_number(6, 52, &t->D_ID, 2);
                    break;

            case 2:
                /* if last name specified, skip this field */
                if (t->C_LAST[0] != '\0')
```

```
            break;

        /* read in the customer id */
        key = read_number(11, 11, &t->C_ID, 4);

        /* if specified, don't allow last name to be entered */
        if (t->C_ID != EMPTY_NUM)
            {
            blanks(12, 29, 16);
            t->C_LAST[0] = '\0';
            }

        /* refresh the C_LAST underlines, if possibly needed */
        else if (t->C_LAST[0] == '\0')
            empty(12, 29, 16);
        break;

    case 3: key = read_number(11, 33,  &t->C_W_ID, 6);
            break;

    case 4: key = read_number(11, 55, &t->C_D_ID, 2);
            break;

    case 5:
        /* skip this field if C_ID was already specified */
        if (t->C_ID != EMPTY_NUM)
            break;

        /* read in the customer last name */
        key = read_text(12, 29, t->C_LAST, 16);

        /* if specified, don't allow c_id to be entered */
        if (t->C_LAST[0] != '\0')
            {
            blanks(11, 11, 4);
            t->C_ID = EMPTY_NUM;
            }

        /* refresh the C_ID underlines, if possibly needed */
        else if (t->C_ID == EMPTY_NUM)
            empty(11, 11, 4);
        break;

    case 6: key = read_money(17, 23, &t->H_AMOUNT, 8);
            break;
    }

/* if Aborted, then done */
if (key != ENTER)
    return key;


/* Make sure all the fields were entered */
if (t->D_ID == EMPTY_NUM)
    {field=1; msgline("Please enter district id"); goto retry;}
if (t->C_ID == EMPTY_NUM && t->C_LAST[0] == '\0')
    {field=2; msgline("C_ID or C_LAST must be entered"); goto retry;}
if (t->C_W_ID == EMPTY_NUM)
    {field=3; msgline("Please enter customer's warehouse"); goto retry;}
if (t->C_D_ID == EMPTY_NUM)
    {field=4; msgline("please enter customer's district"); goto retry;}
if (t->H_AMOUNT == EMPTY_FLT)
    {field=6; msgline("Please enter payment amount"); goto retry;}
if (t->H_AMOUNT <= 0)
            {field=6; msgline("Please enter a positive payment"); goto retry;}


t->byname = (t->C_ID == EMPTY_NUM);
msgline("");
flush();
    return key;
    }


payment_write(t)
    payment_trans *t;
    {

    /* if errors, display a message and quit */
    if (t->status != OK)
        {
        status(24, 1, t->status);
        return;
        }

    /* display the screen */
    date(4, 7, t->H_DATE);
    text(7, 1, t->W_STREET_1);
    text(7, 42, t->D_STREET_1);
    text(8, 1, t->W_STREET_2);
    text(8, 42, t->D_STREET_2);
    text(9, 1, t->W_CITY);
    text(9, 22, t->W_STATE);
    zip(9, 25, t->W_ZIP);
    text(9, 42, t->D_CITY);
    text(9, 63, t->D_STATE);
    zip(9, 66, t->D_ZIP);
    number(11, 11, t->C_ID, 4);
    text(12, 9, t->C_FIRST);
    text(12, 26, t->C_MIDDLE);
    text(12, 29, t->C_LAST);
    date_only(12, 58, t->C_SINCE);
    text(13, 9, t->C_STREET_1);
    text(13, 58, t->C_CREDIT);
    text(14, 9, t->C_STREET_2);
    real(14, 58, t->C_DISCOUNT*100, 5, 2);  /* percentage or fraction? */
    text(15, 9, t->C_CITY);
    text(15, 30, t->C_STATE);
    zip(15, 33, t->C_ZIP);
    phone(15, 58, t->C_PHONE);
    money(17, 17, t->H_AMOUNT,14);
    money(17, 55, t->C_BALANCE, 15);
    money(18, 17, t->C_CREDIT_LIM, 14);

    /* Display cust data if bad credit. */
    if (t->C_CREDIT[0] == 'B' && t->C_CREDIT[1] == 'C')
        long_text(20, 12, t->C_DATA, 50);
    }



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

ORDSTAT form processing

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

define_iobuf(ordstat_form, 300);



int ordstat(t)
    ordstat_trans *t;
    {
    int key;
    display(ordstat_form);
```

```
    key = ordstat_read(trans);
    if (key != ENTER)  return key;
    ordstat_transaction(trans);
    ordstat_write(trans);
    return key;
    }


ordstat_setup()
    {
    int item;
    iobuf *old;

    /* start with an empty form */
    reset(ordstat_form);

    /* redirect the data to a special menu buffer */
    old = out_buf;  out_buf = ordstat_form;

    /* clear the iobuf below the menu */
    position(3,1);
    clear_screen();

    /* set up all the field labels */
    text(3, 35, "Order-Status");
    text(4, 1, "Warehouse:");
    number(4, 12, warehouse, 6);
    text(4, 19, "District:");
    empty(4, 29, 2);
    text(5, 1, "Customer:");
    empty(5, 11, 4);
    text(5, 18, "Name:");
    empty(5, 44, 16);
    text(6, 1, "Cust-Balance:");
    text(8, 1, "Order-Number");
    text(8, 26, "Entry-Date:");
    text(8, 60, "Carrier-Number:");
    text(9, 1, "Supply-W");
    text(9, 14, "Item-Num");
    text(9, 25, "Qty");
    text(9, 33,"Amount");
    text(9, 45, "Delivery-Date");

    trigger();

    /* done */
    out_buf = old;
    }



int ordstat_read(t)
    ordstat_trans *t;
    {
    int i;
    int field;
    int key;

    /* Our warehouse number is fixed */
    t->W_ID = warehouse;
    t->C_ID = EMPTY_NUM;
    t->D_ID = EMPTY_NUM;
    t->C_LAST[0] = '\0';

    /* Process fields until done */
    for (field = 1; field > 0; field = next_field(field, key, 3))
        retry: switch (field)
            {
            case 1: key = read_number(4, 29, &t->D_ID, 2);
                break;

            case 2:
                /* if last name specified, skip this field */
                if (t->C_LAST[0] != '\0')
                    break;

                /* read in the customer id */
                key = read_number(5, 11, &t->C_ID, 4);

                /* if specified, don't allow last name to be entered */
                if (t->C_ID != EMPTY_NUM)
                    {
                    blanks(5, 44, 16);
                    t->C_LAST[0] = '\0';
                    }

                /* refresh the C_LAST underlines, if possibly needed */
                else if (t->C_LAST[0] == '\0')
                    empty(5, 44, 16);
                break;

            case 3:
                /* skip this field if C_ID was already specified */
                if (t->C_ID != EMPTY_NUM)
                    break;

                /* read in the customer last name */
                key = read_text(5, 44, t->C_LAST, 16);

                /* if specified, don't allow c_id to be entered */
                if (t->C_LAST[0] != '\0')
                    {
                    blanks(5, 11, 4);
                    t->C_ID = EMPTY_NUM;
                    }

                /* refresh the C_ID underlines, if possibly needed */
                else if (t->C_ID == EMPTY_NUM)
                    empty(5, 11, 4);
                break;
            }

    /* if Aborted, then done */
    if (key != ENTER)
        return key;


    /* ensure all the necessary fields were entered */
    if (t->D_ID == EMPTY_NUM)
        {field=1; msgline("Please enter district id"); goto retry;}
    if (t->C_ID == EMPTY_NUM && t->C_LAST[0] == '\0')
        {field=2;  msgline("C_ID or C_LAST must be entered"); goto retry;}


    t->byname = (t->C_ID == EMPTY_NUM);
    msgline("");
    flush();
    return key;
    }


ordstat_write(t)
    ordstat_trans *t;
    {
    int i;

    /* if errors, display a status message and quit */
    if (t->status != OK)
```

```
        {
        status(24, 1, t->status);
        return;
        }

    /* display the results */
    number(5, 11, t->C_ID, 4);
    text(5, 24, t->C_FIRST);
    text(5, 41, t->C_MIDDLE);
    text(5, 44, t->C_LAST);
    money(6, 15, t->C_BALANCE, 10);
    number(8, 15, t->O_ID, 8);
    date(8, 38, t->O_ENTRY_DATE);
    if (t->O_CARRIER_ID > 0)
        number(8, 76, t->O_CARRIER_ID, 2);

    for (i=0; i< t->ol_cnt; i++)
        {
        number(i+10, 3, t->item[i].OL_SUPPLY_W_ID, 6);
        number(i+10, 14, t->item[i].OL_I_ID, 6);
        number(i+10, 25, t->item[i].OL_QUANTITY, 2);
        money(i+10, 32, t->item[i].OL_AMOUNT, 9);
        date_only(i+10, 47, t->item[i].OL_DELIVERY_DATE);
        }
    }




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

delivery form processing

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

define_iobuf(delivery_form, 300);



int delivery(t)
    delivery_trans *t;
    {
    int key;
    display(delivery_form);
    key = delivery_read(trans);
    if (key != ENTER)  return key;
    delivery_enque(trans);
    delivery_write(trans);
    return key;
    }


delivery_setup()
    {
    int item;
    iobuf *old;

    /* start with an empty form */
    reset(delivery_form);

    /* redirect the data to a special menu buffer */
    old = out_buf;  out_buf = delivery_form;

    /* clear the iobuf below the menu */
    position(3,1);
    clear_screen();

    /* set up all the field labels */
    text(3, 38, "Delivery");
    text(4, 1, "Warehouse:");
    number(4, 12, warehouse, 6);
    text(6, 1, "Carrier Number:");
    empty(6, 17, 2);

    trigger();

    /* done */
    out_buf = old;
    }



int delivery_read(t)
    delivery_trans *t;
    {
    int i;
    int field;
    int key;

    /* Our warehouse number is fixed */
    t->W_ID = warehouse;
    t->O_CARRIER_ID = EMPTY_NUM;

    /* Process fields until done */
    for (field = 1; field > 0; field = next_field(field, key, 1))
        retry: switch (field)
            {
            case 1: key = read_number(6, 17, &t->O_CARRIER_ID, 2);
                    break;
            }

    /* if Aborted, then done */
    if (key != ENTER)
        return key;

    /* Must enter the carrier id */
    if ((t->O_CARRIER_ID == EMPTY_NUM) ||
                    (t->O_CARRIER_ID < 1) ||
                    (t->O_CARRIER_ID > 10))
        {field=1; msgline("Please enter a Carrier Number within 1 and 10"); goto retry; }

    /* clear the message line */
    msgline("");
    flush();
    return key;
    }


delivery_write(t)
    delivery_trans *t;
    {
    if (t->status == OK)
        text(8, 1, "Execution Status: Delivery has been queued");
    else
        status(8, 1, t->status);
    }



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

stocklev form processing
```

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

define_iobuf(stocklev_form, 300);


int stocklev(t)
    stocklev_trans *t;
    {
    int key;
    display(stocklev_form);
    key = stocklev_read(trans);
    if (key != ENTER)  return key;
    stocklev_transaction(trans);
    stocklev_write(trans);
    return key;
    }


stocklev_setup()
    {
    int item;
    iobuf *old;

    /* start with an empty form */
    reset(stocklev_form);

    /* redirect the data to a special menu buffer */
    old = out_buf;  out_buf = stocklev_form;

    /* clear the iobuf below the menu */
    position(3,1);
    clear_screen();

    /* set up all the field labels */
    text(3, 35, "Stock-Level");
    text(4, 1, "Warehouse:");
    number(4, 12, warehouse, 6);
    text(4, 19, "District:");
    number(4, 29, district, 2);
    text(6, 1, "Stock Level Threshold:");
    empty(6, 24, 2);
    text(8, 1, "low stock");

    trigger();

    /* done */
    out_buf = old;
    }



int stocklev_read(t)
    stocklev_trans *t;
    {
    int field;
    int key;

    t->W_ID = warehouse;
    t->D_ID = district;
    t->threshold = EMPTY_NUM;

    /* Process fields until done */
    for (field = 1; field > 0; field = next_field(field, key, 1))
        retry: switch (field)
            {
            case 1: key = read_number(6, 24, &t->threshold, 2);
                    break;
            }

    /* if Aborted, then done */
    if (key != ENTER)
        return key;


    /* make sure the necessary fields were entered */
    if ((t->threshold == EMPTY_NUM) ||
        (t->threshold < 10) ||
                    (t->threshold > 20))

        {field=1; msgline("Please enter a threshold within 10 and 20"); goto retry; }

    /* clear the message line */
    msgline("");
    flush();
    return key;
    }


stocklev_write(t)
    stocklev_trans *t;
    {
    if (t->status == OK)
        number(8, 12, t->low_stock, 3);
    else
      status(10, 1, t->status);
    }



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

login form processing

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

int login()
    {
    int field;
    int key;
    char auditstr[21];
    int w_id, d_id;

    /* assume the default values */
    w_id = warehouse;
    d_id = district;
    auditstr[0] = '\0';

    /* display the login menu */
    position(1,1);  clear_screen();
    text(3, 30, "Please login.");
    text(5,5,"Warehouse:");
    number(5, 16, w_id, 6);
    text(5, 24, "District:");
    number(5, 34, d_id, 2);
    text(15, 5, "Audit String:");
    text(15, 19, CLIENT_AUDIT_STRING);
    empty(16, 19, 20);
    trigger();

    /* Get values until done */
    for (field = 1; field > 0;  field = next_field(field, key, 3))
        retry: switch (field)
            {
            case 1:
                key = read_number(5, 16, &w_id, 6, Num);
```

```
            break;

        case 2:
            key = read_number(5, 34, &d_id, 2, Num);
            break;

        case 3:
            key = read_text(16, 19, auditstr, 20);
            break;
        }

    if (key != ENTER)
        return EOF;

    if (w_id == EMPTY_NUM && warehouse == EMPTY_NUM)
        {
        msgline("You must enter a warehouse id");
        field =1;
        goto retry;
        }

    if (d_id == EMPTY_NUM && district == EMPTY_NUM)
        {
        msgline("You must enter a district id");
        field = 2;
        goto retry;
        }

    if (w_id != EMPTY_NUM)
        warehouse = w_id;
    if (d_id != EMPTY_NUM)
        district = d_id;

    /* done */
    flush();
    return key;
    }




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

menu form processing

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

menu_setup()
    {

    /* display the menu on the iobuf -- never erased */
    position(1, 1);
    clear_screen();
    string("(1)New-Order (2)Payment (3)Order-Status ");
    string("(4)Delivery (5)StockLevel (9)Exit");
    }

int menu_read()
    {
    position(1, 1);
    trigger();
    return getkey();
    }
```

```
int next_field(current, key, max)
    int current;
    int key;
    int max;
    {

    if (key == BACKTAB)
        if (current == 1)    return max;
        else                 return current-1;
    else if (key == TAB)
        if (current == max)  return 1;
        else                 return current+1;
    else
        return 0;
    }




msgline(str)
    char *str;
    {
    position(24, 1);
    clear_screen();
    string(str);
    flush();  /* Needed? */
    }




int setup(argc, argv)
    int argc;
    char **argv;
    {
    int key;

    /* Ignore SIGPIPE, since they occur normally */
    signal(SIGPIPE, SIG_IGN);

    /* get the user, warehouse and district numbers */
    warehouse = EMPTY_NUM;
    district = EMPTY_NUM;
    key = login();
    user = warehouse*DIST_PER_WARE + district + 1;

    /* set up the forms */
    menu_setup();
    neworder_setup();
    payment_setup();
    ordstat_setup();
    delivery_setup();
    stocklev_setup();

    /* connect to the delivery queue */
    delivery_init(user);

    /* connect to the transaction processor */
    transaction_begin(user);

    return key;
    }


cleanup()
    {
```

```
    /* detach from transaction engine */
    transaction_done();

    /* detach from the delivery queue */
    delivery_done();

    /* clear the screen */
    position(1, 1);
    clear_screen();
    flush();
    }


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

Screen Output Routines

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


number(row, col, n, width)
    int row;
    int col;
    int n;
    int width;
    {
    char str[81];
    fmt_num(str, n, width);
    text(row, col, str);
    }



real(row, col, x, width, dec)
    int row;
    int col;
    double x;
    int width;
    int dec;
    {
    char str[81];
    fmt_flt(str, x, width, dec);
    text(row, col, str);
    }

date(row, col, date_str)
    int row;
    int col;
    char *date_str;
    {
    text(row, col, date_str);
    }


date_only(row, col, date_str)
    int row;
    int col;
    char *date_str;
    {
    date_str[10] = '\0';
    text(row, col, date_str);
    }

money(row, col, x, width)
    int row;
    int col;
    double x;
    int width;
    {
    char str[81];
    fmt_money(str, x, width);
    text(row, col, str);
    }


long_text(row, col, str, width)
    int row, col, width;
    char *str;
    {
    int pos;

    /* repeat until the entire string is written out */
    for (pos = width; *str != '\0';  str++, pos++)
        {

        /* if at end of line, position the cursor to next line */
        if (pos >= width)
            {
            position(row, col);
            pos = 0;
            row++;
            }

        /* output the next character */
        pushc(*str);
        }
    }


text(row, col, str)
    int row;
    int col;
    char str[];
    {
    position(row, col);
    string(str);
    }


phone(row, col,str)
      int row;
      int col;
      char *str;
      {

       char temp[30];

       fmt_phone(temp,str);
       text(row,col,temp);

       }


zip(row, col, str)
    int row;
    int col;
    char *str;
    {
    char temp[30];

    fmt_zip(temp,str);
    text(row,col,temp);
    }

empty(row, col, len)
    int row;
    int col;
```

```
    int len;
    {
    position(row, col);
    while (len-- > 0)
        pushc('_');
    }


blanks(row, col, len)
    int row, col, len;
    {
    position(row, col);
    while (len-- > 0)
        pushc(' ');
    }


status(row, col, status)
/*************************************************************************
status displays the transaction status
  Note: must correspond to 'get_status' in driver/keystroke.c
*************************************************************************/
    int row, col;
    int status;
    {
    text(row, col, "Execution Status: ");

    if (status == OK)
        string("Transaction Committed");
    else if (status == E_INVALID_ITEM)
        string("Item number is not valid");
    /* Do the rev. 3.3 error checking here.       */
    else if (status == E_INVALID_INPUT)
        string("Invalid input, transaction not executed");
    else
        {
        string("Rollback -- ");
        number(row, col+30, status, 5);
        }
    }

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

ASCII terminal control

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


trigger()
/*************************************************************************
trigger sends a turnaround sequence to let the driver know to send input
*************************************************************************/
    {
    pushc(TRIGGER);
    }


position(row, col)
/*************************************************************************
position positions the cursor at the given row and column
*************************************************************************/
    int row;
    int col;
    {
    pushc(ESCAPE);
    pushc('[');
    if (row >= 10)
        pushc('0' + row/10);
    pushc('0'+ row%10);
    pushc(';');
    if (col >= 10)
        pushc('0' + col/10);
    pushc('0' + col%10);
    pushc('H');
    }

clear_screen()
/*************************************************************************
clear_screen clears the iobuf from cursor position to end of iobuf
*************************************************************************/
    {
    pushc(ESCAPE);
    pushc('[');
    pushc('J');
    }




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

Screen Input Routines

*************************************************************
*************************************************************/
#define funny(key)  (key != ENTER && key !=TAB && key != BACKTAB)


read_number(row, col, n, width)
/*************************************************************************
read_number reads an integer field
*************************************************************************/
    int row;
    int col;
    int *n;
    int width;
    {
    char temp[81];
    int key;
    int err;
    debug("read_number: row=%d  col=%d  width=%d n=%d \n",row, col,width,*n);

    /* generate the current characters */
    fmt_num(temp, *n, width);
    err = NO;

    /* repeat until a valid number or a funny key is pressed */
    for (;;)
        {
        /* Let the user edit the field */
        key = getfield(row, col, temp, width, Num);
                if (funny(key)) return key;

        /* convert the field to a number */
        *n = cvt_num(temp);
        if (*n != INVALID_NUM) break;

        msgline("Invalid digit entered");
                pushc(BELL);
        err = YES;
        }

    /* display the new number */
    number(row, col, *n, width);
    if (err) msgline("");
    debug("read_number: n=%d  key=%d\n", *n, key);
```

```
    return key;
    }


int read_money(row, col, m, width)
    int row;
    int col;
    double *m;
    int width;
    {
    char temp[81];
    int key;
    int err;

    err = NO;
    fmt_money(temp, *m, width);

    /* repeat until a valid number or a funny key is pressed */
    for (;;)
        {
        key = getfield(row, col, temp, width, Money);
                if (funny(key)) return key;

        *m = cvt_money(temp);
        if (*m != INVALID_FLT)  break;

        msgline("Please enter amount $99999.99");
        pushc(BELL);
        err = YES;
                }

    money(row, col, *m, width);
    if (err) msgline("");
    return key;
    }



int read_real(row, col, x, width, dec)
    int row, col, width;
    double *x;
    {
    char temp[81];
    int key;
    int err;

    /* generate the current characters */
    fmt_flt(temp, *x, width, dec);
    err = NO;

    /* repeat until a valid number or a funny key is pressed */
    for (;;)
                {
        key = getfield(row, col, temp, width);
                if (funny(key)) return key;

        /* convert the field to a number */
        *x = cvt_flt(temp);
                if (*x != INVALID_FLT) break;

        msgline("Please enter a valid floating pt number");
        pushc(BELL);
        err = YES;
        }

    /* display the new number */
    real(row, col, *x, width, dec);
    if (err) msgline("");

    return key;
    }


int read_text(row, col, s, width)
    int row, col, width;
    char *s;
    {
    char temp[81];
    int key;
    int i;

    /* generate the current characters */
    fmt_text(temp, s, width);

    /* let the user edit the field */
    key = getfield(row, col, temp, width, Text);
    if (funny(key)) return key;

    /* Strip off leading and trailing space characters */
    cvt_text(temp, s);

    /* redisplay the current text */
    fmt_text(temp, s, width);
    text(row, col, temp);

    return key;
    }



int getfield(row, col, buf, width,ftype)
    int row, col, width;
    char buf[];
    FIELD_TYPE ftype;

    {
    int pos, key;

    debug("getfield: width=%d  buf=%*s\n", width, width, buf);

    /* go to the beginning of the field */
    position(row, col);
    pos = 0;

    /* repeat until a special control character is pressed */
    for (;;)
        {

        /* get the next character */
        key = getkey();

        /* CASE: Add to buf if it fits and Is it a valid character ? */
        if (pos < width  && valid_char(key, ftype))
            {
            buf[pos] = key;
            pos++;
            pushc(key);
            }

        /* CASE: char is BACKSPACE.  Erase last character. */
        else if (key == BACKSPACE && pos > 0)
            {
            pos--;
            buf[pos] = '_';
            pushc(BACKSPACE);
            pushc('_');
            pushc(BACKSPACE);
            }
```

```
    /* CASE: enter, tab, backtab, ^c.  Exit loop */
    else if (key==ENTER || key==TAB || key==BACKTAB || key==CNTRLC
            || key == EOF)
        break;

    else if (key=='\031')   /* for debugging, let ^X == ENTER */
        {key=ENTER; break;}

    /* Otherwise, ignore the character and beep */
    else
        pushc(BELL);
    }

  debug("getfield: final key: %d  buf=%*s\n", key, width, buf);
  return key;
  }




int valid_char(key, ftype)
/*************************************************************************
valid_char is true if the key is valid for this type of field
*************************************************************************/
  int key;
  FIELD_TYPE ftype;
  {
  int valid;
  switch(ftype)
                {
                case Num : valid = (isdigit(key) || key == '-' || key == ' ');
                                break;

      case Text : valid = (isprint(key) || key == ' ');
                                break;

      case Money : valid = (isdigit(key) || key == '-' || key == '.'
                                                || key == '$' || key == ' ');
                        break;

      default     : valid = NO;
                                break;
      }

   return valid;
   }
```

client/tux_transaction.c

```
/****************************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 10:53:27 $

 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
****************************************************************************/

#include <varargs.h>
#include <errno.h>


#include "atmi.h"
#include "Uunix.h"
#include "tpcc.h"
int user;

neworder_trans *neworder_ptr;
payment_trans  *payment_ptr;
ordstat_trans *ordstat_ptr;
stocklev_trans *stocklev_ptr;
delivery_trans *delivery_ptr;

int result;



transaction_begin(u)
  int u;
  {

  /* keep track of which user we are (for error messages only) */
  user = u;

  /* attach to Tuxedo */
  if (tpinit( (TPINIT *)NULL) == -1)
      tux_error("Failed to attach to Tuxedo\n");

  /* allocate structures for each transaction */
  neworder_ptr = tpalloc("CARRAY", NULL, sizeof(neworder_trans));
  payment_ptr = tpalloc("CARRAY", NULL, sizeof(payment_trans));
  ordstat_ptr = tpalloc("CARRAY", NULL, sizeof(ordstat_trans));
  stocklev_ptr = tpalloc("CARRAY", NULL, sizeof(stocklev_trans));
  delivery_ptr = tpalloc("CARRAY", NULL, sizeof(delivery_trans));
  if (neworder_ptr == NULL || payment_ptr == NULL || ordstat_ptr == NULL
      || stocklev_ptr == NULL || delivery_ptr == NULL)
      tux_error("Unable to allocate Tuxedo memory\n");
  }



transaction_done()
  {
  if (tpterm() == -1)
      tux_error("Unable to detach from Tuxedo\n");
  }



void neworder_transaction(t)
  neworder_trans *t;
  {
  *neworder_ptr = *t;
  while (tpcall("NEWO_SVC", neworder_ptr, sizeof(neworder_trans),
          &neworder_ptr, &result, TPSIGRSTRT|TPNOTIME) == -1) {
      tux_error("Tuxedo failed for neworder transaction\n");
                  *neworder_ptr = *t;
                  }
  *t = *neworder_ptr;
  }



void payment_transaction(t)
  payment_trans *t;
  {
  *payment_ptr = *t;
  while (tpcall("PMT_SVC", payment_ptr, sizeof(payment_trans),
                  &payment_ptr, &result, TPSIGRSTRT|TPNOTIME) == -1) {
      tux_error("Tuxedo failed for payment transaction\n");
                  *payment_ptr = *t;
                  }
  *t = *payment_ptr;
  }


void ordstat_transaction(t)
```

```
    ordstat_trans *t;
    {
    *ordstat_ptr = *t;
    while (tpcall("ORDS_SVC", ordstat_ptr, sizeof(ordstat_trans),
                    &ordstat_ptr, &result, TPSIGRSTRT|TPNOTIME) == -1) {
                tux_error("Tuxedo failed for ordstat transaction\n");
                *ordstat_ptr = *t;
                }
    *t = *ordstat_ptr;
    }



stocklev_transaction(t)
    stocklev_trans *t;
    {
    *stocklev_ptr = *t;
    while (tpcall("STKL_SVC", stocklev_ptr, sizeof(stocklev_trans),
                    &stocklev_ptr, &result, TPSIGRSTRT|TPNOTIME) == -1) {
        tux_error("Tuxedo failed for stocklev transaction\n");
                *stocklev_ptr = *t;
                }
    *t = *stocklev_ptr;
    }


delivery_init(u)
    int u;
    {
    }


delivery_enque(t)
    delivery_trans *t;
    {
    gettimeofday(&t->enque, NULL);
    t->status = OK;

    *delivery_ptr = *t;
    while (tpacall("DVRY_SVC", delivery_ptr, sizeof(delivery_trans),
              TPNOREPLY) == -1) {
        tux_error("Tuxedo failed enqueing delivery transaction\n");
                *delivery_ptr = *t;
                }
    }


delivery_done()
    {
    }



static tux_error(format, va_alist)
    char *format;
    va_dcl
    {
    va_list argptr;

    va_start(argptr);
    vmessage(format, argptr);

    message("Tuxedo error %d\n", tperrno);

    errno = Uunixerr;
    if (tperrno == TPEOS)
        syserror("Tuxedo encountered O/S error\n");

    if (tperrno != TPESVCERR)
                error("EXITING !!!\n");
    else
                message("Retrying transation\n");

    }
```

client/Makefile

```
#*****************************************************************************
#@(#) Version: A.10.10 $Date: 98/02/03 08:13:40 $
#
#(c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
#*****************************************************************************

include ../buildenv.mk

#
# Makefile for compiling the client, batch-tpcc, and service code
#

OH      = ${ORACLE_HOME}
TOB             = ${TUXDIR}/udataobj
P       = ${WORK_DIR}/src
I       = $(P)/lib
L       = $(P)/lib
D       = $(P)/driver
Q       = $(P)/que
S       = $(P)/client

include $(ORACLE_HOME)/rdbms/lib/env_rdbms.mk

SH_OPT      = -Wl,-a,shared
OPT         =  -Wl,-a,archive_shared
LDOPTS      = -ldld -a archive_shared

#TUXEDO     = -D_HPUX_SOURCE ${ROOTDIR}/include ${OPT}

# Check tkvcinin.sql to set ORA_NO_NULL_DATE
# Check tpccload     to set ORA_LOAD_NULL_DATE
ORA_CFLAGS = -DORA_BLOCK_PATH=\"/project/tpcc/blocks/\" \
                    -DORA_NULL_DATE=\"01-01-1811\" \
                    -D_HPUX_SOURCE -DSS_64BIT_SERVER -DHPPA64 -DSLS8NATIVE \
                    -DSLU8NATIVE -DSLTS_ENABLE -DHPUX_KTHREAD -DSLXMX_ENABLE \
                    -DSLMXMX_ENABLE

ORA_INCLUDE=-I. -I${S}/oracle \
   -I$(ORACLE_HOME)/rdbms/demo \
   -I$(ORACLE_HOME)/rdbms/public -I$(ORACLE_HOME)/rdbms/include \
   -I$(ORACLE_HOME)/plsql/public \
   -I$(ORACLE_HOME)/network/public
SYB_INCLUDE= -I${SYBASE}/include
VIS_INCLUDE= -I ${VISIGENIC}/include
TUX_INCLUDE= -I${ROOTDIR}/include
INCLUDE    = -I. -I$L

SH_CFLAGS  = $(BUILDFLAGS) ${SH_OPT} ${INCLUDE} ${TUX_INCLUDE}
CFLAGS          = $(BUILDFLAGS) ${OPT} ${INCLUDE} ${TUX_INCLUDE}
CFLAGS_SYB = $(BUILDFLAGS) ${OPT} ${INCLUDE} ${TUX_INCLUDE} ${SYB_INCLUDE}
CFLAGS_ORA = $(BUILDFLAGS) ${ORA_CFLAGS} ${OPT} ${INCLUDE} ${ORA_INCLUDE} \
                    ${TUX_INCLUDE}
CFLAGS_SQL = -Dunix -D_HPUX_SOURCE -DVG_UNIX ${OPT} ${INCLUDE} \
                    ${TUX_INCLUDE} ${SQL_INCLUDE} ${VIS_INCLUDE}


#‘cat ${OL}/sysliblist‘\
#
```

```
LDFLAGS_ORA= ${OPT} $(CFLAGS_ORA) ${L}/tpc_lib.a
LDFLAGS_SYB= ${OPT} ${L}/tpc_lib.a -L${SYBASE}/lib -lsybdb -lm
LDFLAGS_SQL= ${OPT} ${L}/tpc_lib.a -L/opt/odbc/lib -lodbc -lm

PROGRAMS     = client service startup client_batch msg_server raw

all: ${PROGRAMS}

all_ora: others_oracle service_oracle tpcc_client

tpcc_client: client
                $(MV) client ${WORK_DIR}/bin/
others_sybase: raw startup client_batch_syb msg_server_syb
                $(MV) raw startup client_batch msg_server ${WORK_DIR}/bin
others_oracle: raw startup client_batch_ora
                $(MV) raw startup ${WORK_DIR}/bin
                $(MV) client_batch_ora ${WORK_DIR}/bin/client_batch
others_sqlserver: raw startup client_batch_sql msg_server_sql
                $(MV) raw startup client_batch msg_server ${WORK_DIR}/bin
service_oracle: service_ora
                $(MV) service_ora ${WORK_DIR}/bin/service
service_sybase: service_syb
                $(MV) service ${WORK_DIR}/bin/
service_sqlserver: service_sql
                $(MV) service ${WORK_DIR}/bin/

${S}/oracle/transaction.o: ${S}/oracle/transaction.c
                $(CC) ${CFLAGS_ORA} $(L)/tpc_lib.a -c ${S}/oracle/transaction.c;
${S}/sybase/transaction.o: ${S}/sybase/transaction.c
                $(CC) ${CFLAGS_SYB} $(L)/tpc_lib.a -c ${S}/sybase/transaction.c;
${S}/sqlserver/transactionb.o: ${S}/sqlserver/transactionb.c
                $(CC) ${CFLAGS_SQL} $(L)/tpc_lib.a -c ${S}/sqlserver/transactionb.c;

ORA_OBJS=plnew.o plord.o plpay.o pldel.o plsto.o tpccpl.o
plnew.o: ${S}/oracle/plnew.c
                $(CC) ${CFLAGS_ORA} $(L)/tpc_lib.a -c ${S}/oracle/plnew.c;
plord.o: ${S}/oracle/plord.c
                $(CC) ${CFLAGS_ORA} $(L)/tpc_lib.a -c ${S}/oracle/plord.c;
plpay.o: ${S}/oracle/plpay.c
                $(CC) ${CFLAGS_ORA} $(L)/tpc_lib.a -c ${S}/oracle/plpay.c;
pldel.o: ${S}/oracle/pldel.c
                $(CC) ${CFLAGS_ORA} $(L)/tpc_lib.a -c ${S}/oracle/pldel.c;
plsto.o: ${S}/oracle/plsto.c
                $(CC) ${CFLAGS_ORA} $(L)/tpc_lib.a -c ${S}/oracle/plsto.c;
tpccpl.o: ${S}/oracle/tpccpl.c
                $(CC) ${CFLAGS_ORA} $(L)/tpc_lib.a -c ${S}/oracle/tpccpl.c;

raw: raw.o
                cc ${CFLAGS} raw.o $(L)/tpc_lib.a -o raw

startup: startup.o $(L)/tpc_lib.a
                cc ${SH_CFLAGS} startup.o $(L)/tpc_lib.a -o startup
                chmod a+rw startup

# Warning: can't use +pd because kernel will use this size to extend
# DATA pregion when break/sbreak is called.
# Force shared libc to avoid to both libc data from the archived and shared version.
client: client.o  tux_transaction.o $(L)/tpc_lib.a
                cp ${TOB}/lic.sdk ${TOB}/lic.txt
                ${ROOTDIR}/bin/buildclient -v -o client \
        -f "$(BUILDFLAGS) $(OPT) -Wl,+pi 256K -Wl,-R 0x100000 \
           client.o tux_transaction.o $(L)/tpc_lib.a" \
                -l "-lnsl  -lm -Wl,-ashared -lc"
                cp ${TOB}/lic.rtk ${TOB}/lic.txt

service_ora: service.o ${S}/oracle/transaction.o $(ORA_OBJS) $(L)/tpc_lib.a
                cp ${TOB}/lic.sdk ${TOB}/lic.txt
                if [ -f /project/iti/lib/libgp.a ] ; then \
           mv /project/iti/lib/libgp.a /project/iti/lib/libgp.a.cc_service ; \
        fi
                ${ROOTDIR}/bin/buildserver -v -b shm \
                -s NEWO_SVC -s PMT_SVC -s ORDS_SVC -s STKL_SVC -s DVRY_SVC \
                -o service_ora \
                -f "$(BUILDFLAGS) $(OPT) \
                   -Wl,+pi 4M -Wl,+pd 256K \
                   -Wl,-R 0x400000 -Wl,-D 0x40100000 \
                                service.o transaction.o $(ORA_OBJS) $L/tpc_lib.a \
                        ${LDFLAGS_ORA} $(LDFLAGS) $(SSABED) $(DEF_OPT) $(TTLIBS)" \
                -l "-lnsl "
                   if [ -f /project/iti/lib/libgp.a.cc_service ] ; then \
                      cp /project/iti/lib/libgp.a.cc_service /project/iti/lib/libgp.a ; \
                   fi
                   cp ${TOB}/lic.rtk ${TOB}/lic.txt

service_syb: service.o ${S}/sybase/transaction.o $(L)/tpc_lib.a
                cp ${TOB}/lic.sdk ${TOB}/lic.txt
                ${ROOTDIR}/bin/buildserver -v -b shm \
                -s NEWO_SVC -s PMT_SVC -s ORDS_SVC -s STKL_SVC -s DVRY_SVC \
                -o service \
                -f "service.o transaction.o $L/tpc_lib.a \
                   ${SYBASE}/lib/libsybdb.a -lm";
                cp ${TOB}/lic.rtk ${TOB}/lic.txt

service_sql: service.o ${S}/sqlserver/transactionb.o $(L)/tpc_lib.a
                cp ${TOB}/lic.sdk ${TOB}/lic.txt
                ${ROOTDIR}/bin/buildserver -v -b shm \
                -s NEWO_SVC -s PMT_SVC -s ORDS_SVC -s STKL_SVC -s DVRY_SVC \
                -o service \
                -f "service.o transactionb.o $L/tpc_lib.a \
                  /vsbuild/v1.10/build/com/obj/inst/libodbc.sl"
                cp ${TOB}/lic.rtk ${TOB}/lic.txt

client_batch_ora: $(D)/driver.o $(D)/generate.o ${S}/oracle/transaction.o \
                        $(ORA_OBJS) $(Q)/dummy_que.o $(L)/tpc_lib.a  \
                        $(L)/server_default.o
                $(CC) $(BUILDFLAGS) $(OPT) \
        $(D)/driver.o $(D)/generate.o transaction.o $(ORA_OBJS) \
                 $(Q)/dummy_que.o $(L)/server_default.o $(L)/tpc_lib.a ${LDFLAGS_ORA} \
                 $(LDFLAGS) $(SSABED) $(DEF_OPT) $(TTLIBS) -o client_batch_ora;

client_batch_syb: $(D)/driver.o $(D)/generate.o ${S}/sybase/transaction.o \
                        $(Q)/dummy_que.o $(L)/tpc_lib.a $(L)/server_default.o
                $(CC) $(D)/driver.o $(D)/generate.o transaction.o \
                  $(Q)/dummy_que.o $(L)/server_default.o $(L)/tpc_lib.a \
                  ${LDFLAGS_SYB} -o client_batch;

client_batch_sql: $(D)/driver.o $(D)/generate.o ${S}/sqlserver/transactionb.o \
                        $(Q)/dummy_que.o $(L)/tpc_lib.a $(L)/server_default.o
                                $(CC) $(D)/driver.o $(D)/generate.o transactionb.o \
                        $(Q)/dummy_que.o $(L)/server_default.o $(L)/tpc_lib.a \
                        ${LDFLAGS_SQL} -o client_batch;

msg_server_ora: $(Q)/msg_server.o ${S}/oracle/transaction.o $(ORA_OBJS) \
                       $(L)/tpc_lib.a
                $(CC) $(Q)/msg_server.o transaction.o $(ORA_OBJS) ${LDFLAGS_ORA} \
                  $(LDFLAGS) $(SSABED) $(DEF_OPT) $(TTLIBS) -o msg_server;
msg_server_syb: $(Q)/msg_server.o  ${S}/sybase/transaction.o $(L)/tpc_lib.a
                $(CC) $(Q)/msg_server.o transaction.o ${LDFLAGS_SYB} -o msg_server;

msg_server_sql: $(Q)/msg_server.o  ${S}/sqlserver/transactionb.o $(L)/tpc_lib.a
                $(CC) $(Q)/msg_server.o transactionb.o ${LDFLAGS_SQL} -o msg_server;

clean:
                rm -f *.o

clobber: clean
                rm -f ${PROGRAMS}

install: ${PROGRAMS}
                cp ${PROGRAMS} ${WORK_DIR}/bin
```

client/make_no_pbo

```
#!/usr/bin/csh -x

setenv CCOPTS "-Ae +DA2.0 +DS2.0 +pgm client"
make -f Makefile tpcc_client

if (${DATABASE} == "sybase") then
    setenv CCOPTS "-Ae +DA2.0 +DS2.0 +pgm service"
    make -f Makefile service_sybase
    setenv CCOPTS "-Ae +DA2.0 +DS2.0 -DHPUX -D_REENTRANT"
    make -f Makefile others_sybase
else if (${DATABASE} == "oracle") then
    setenv CCOPTS "-Ae +DA2.0 +DS2.0 +pgm service"
    make -f Makefile service_oracle
    setenv CCOPTS "-Ae +DA2.0 +DS2.0 -DHPUX -D_REENTRANT"
    make -f Makefile others_oracle
else if (${DATABASE} == "sqlserver") then
    setenv CCOPTS "-Ae +DA2.0 +DS2.0 +pgm service"
    make -f Makefile service_sqlserver
    setenv CCOPTS "-Ae +DA2.0 +DS2.0 -DHPUX -D_REENTRANT"
    make -f Makefile others_sqlserver
endif
```

client/raw.c

```
/*****************************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 10:53:26 $

 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
*****************************************************************************/

#include <termio.h>
#include <sys/ioctl.h>

main(argc, argv)
    int argc;
    char **argv;
    {

    /* put the port into raw mode */
    terminal_setup();

    /* invoke the program */
    if (fork() == 0)
        execvp(argv[1], argv+1);

    /* wait for the program to terminate */
    wait(0);

    /* restore the port characteristics */
    terminal_cleanup();
    }



struct termio old_in;
struct termio old_out;


terminal_setup()
    {
    struct termio new;

    ioctl(0, TCGETA, &old_in);
    new = old_in;
    new.c_iflag = 0;
    new.c_oflag = 0;
    new.c_lflag = 0;
    new.c_cc[VMIN] = 1;
    new.c_cc[VTIME] = 0;
    ioctl(0, TCSETAW, &new);

    ioctl(1, TCGETA, &old_out);
    new = old_out;
    new.c_iflag = 0;
    new.c_oflag = 0;
    new.c_lflag = 0;
    new.c_cc[VMIN] = 1;
    new.c_cc[VTIME] = 0;
    ioctl(1, TCSETAW, &new);
    }

terminal_cleanup()
    {
    ioctl(1, TCSETAW, &old_out);
    ioctl(0, TCSETAW, &old_in);
    }
```

client/service.c

```
/*****************************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 10:53:26 $

 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
*****************************************************************************/

#include <unistd.h>
#include <sys/types.h>
#include "tpcc.h"
#include "atmi.h"

extern int userid;
char *cmd          = NULL;

int tpsvrinit(argc, argv)
int    argc;
char **argv;
{
    char c;
    int ret;

    /*
     * search for the options
     *    "-n" server number
     *    "-S" server program
     * purpose: to get svr_id & progname for DVRY_LOG files
     *
     */
    while ((c = getopt(argc, argv, "n:S:h:")) != EOF) {
        switch(c) {
        case 'n':
            userid = atoi(optarg);
            break;
        case 'S':
            cmd  = optarg;
            break;
        }
    }

    ret = transaction_begin(userid);
    results_open(userid);
```

```
    return 0;
}


void NEWO_SVC(svcinfo)
TPSVCINFO *svcinfo;
{
    neworder_transaction((neworder_trans *)svcinfo->data);
    tpreturn(TPSUCCESS, 0, svcinfo->data, svcinfo->len, 0);
}


void PMT_SVC(svcinfo)
TPSVCINFO *svcinfo;
{

    payment_transaction((payment_trans *)svcinfo->data);
    tpreturn(TPSUCCESS, 0, svcinfo->data, svcinfo->len, 0);
}

void ORDS_SVC(svcinfo)
TPSVCINFO *svcinfo;
{
    ordstat_transaction((ordstat_trans *)svcinfo->data);
    tpreturn(TPSUCCESS, 0, svcinfo->data, svcinfo->len, 0);
}

void STKL_SVC(svcinfo)
TPSVCINFO *svcinfo;
{
    stocklev_transaction((stocklev_trans *)svcinfo->data);
    tpreturn(TPSUCCESS, 0, svcinfo->data, svcinfo->len, 0);
}

void DVRY_SVC(svcinfo)
TPSVCINFO *svcinfo;
{
    delivery_trans *t = (delivery_trans *)svcinfo->data;
    gettimeofday(t->deque, NULL);
    delivery_transaction(t);
    gettimeofday(t->complete, NULL);
    results(t);

    /* Why do we return things ? */
    tpreturn(TPSUCCESS, 0, svcinfo->data, svcinfo->len, 0);
}

/*****************************************************************
tpsrvdone cleans up after the TPC transaction service
*****************************************************************/
void tpsvrdone()
{
    transaction_done();
    results_close();

    /* Log a message saying we are done */
    userlog("TUXEDO service %s has shutdown\n", cmd);
}
```

client/startup.c

```
/*****************************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 10:53:27 $
 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
*****************************************************************************/

#include <signal.h>
#include <sys/types.h>
#include <sys/socket.h>
#include <netinet/in.h>
#include <netdb.h>
#include <fcntl.h>
#include <errno.h>

#undef NULL
#define NULL ((void *)0)

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

    server <port> <a.out> <arg list>

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

void spawn_user();


int main(argc, argv)
    int argc;
    char **argv;
    {
    int server_fd;
    int client_fd;

    /* We don't want zombie children */
    signal(SIGCHLD, SIG_IGN);

    if (rtprio(0, 80) < 0)
        perror("Server can't run real-time");

    /* create a socket to accept new requests */
    server_fd = server_socket(argv[1]);
    if (server_fd < 0)
        syserror("Can't create a listening socket\n");


    /* repeat forever */
    for (;;)
        {
        client_fd = connect_client(server_fd);

                spawn_user(server_fd, client_fd, argc-2, argv+2);

                close(client_fd);
        }

    return 0;
    }



void spawn_user(s_fd, c_fd, argc, argv)
    int s_fd;
    int c_fd;
    int argc;
    char **argv;
    {
    int pid;

    pid = fork();
    if (pid < 0)
        syserror("Can't fork off child process\n");

    if (pid > 0)  return;
```

```
    /* close the accept fd */
    close(s_fd);

    /* adjust the file descriptors so socket is stdin and stdout */
    close(0); close(1);
    if (dup(c_fd) != 0)
        syserror("Couldn't dup to fd 0\n");
    if (dup(c_fd) != 1)
        syserror("Couldn't dup to fd 1\n");
    close(c_fd);

    /* execute the child process */
    execvp(argv[0], argv);

    syserror("Unable to exec %s\n", argv[0]);
    }



int connect_client(server_fd)
/*********************************************************************
connect_client connects the clients who are waiting
*********************************************************************/
    int server_fd;
    {
    int fd, vfd;
    struct sockaddr dummy_addr;
    int dummy_size = sizeof(dummy_addr);

    /* accept a connection to a new client.  Exit if no more */
    fd = accept(server_fd, &dummy_addr, &dummy_size);
    if (fd < 0)
        syserror("Can't accept new client\n");

    /* set the socket parameters */
    if (prepare_socket(fd) < 0)
                syserror("Can't set socket parameters\n");

    return fd;
    }



int server_socket(service)
/*********************************************************************
server_socket creates a socket for a server with the given name
*********************************************************************/
    char service[];
    {
    int fd;
    struct sockaddr_in address;
    struct servent *server;
    int port;
    char *s;

    /* if the service is all digits, then use that as tcp port number */
    for (s=service; isdigit(*s); s++)
                ;
    if (*s == '\0')
                port = atoi(service);

    /* otherwise, get the named service port number */
    else
                {
        server = getservbyname(service, "tcp");
        if (server == NULL)
                    error("Service %s is unknown\n", service);
        port = server->s_port;
                }

    /* create a socket */
    fd = socket(AF_INET, SOCK_STREAM, 0);
    if (fd < 0)
                syserror("Can't create a socket\n");
    if (prepare_socket(fd) < 0)
                syserror("Can't configure the socket\n");

    /* build up an internet style address */
    address.sin_family = AF_INET;
    address.sin_port = port;
    address.sin_addr.s_addr = INADDR_ANY;

    /* set up the socket to listen at the given address */
    if (bind(fd, &address, sizeof(address)) < 0)
        syserror("Can't bind the socket to address\n");
    if (listen(fd, SOMAXCONN) < 0)
        syserror("Can't listen\n");

    return fd;
    }
```

A.2 Tpc_lib Source

lib/tpcc.h

```
/*****************************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 14:01:49 $

 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
*****************************************************************************/
#ifndef TPCC_INCLUDED
#define TPCC_INCLUDED
#include <values.h>


/* The auditor can define these 20 char strings to be anything */
#define DRIVER_AUDIT_STRING  "driver audit string"
#define CLIENT_AUDIT_STRING  "client audit string"

#ifdef DEBUG
#define debug printf
#else
#define debug (void)
#endif

#include <stdio.h>

typedef int ID;          /* All id's */
typedef double MONEY;    /* Large integer number of cents */
typedef char TEXT;       /* Add an extra byte for null terminator */
typedef double TIME;     /* Elapsed seconds from start of run (float?) */
typedef int COUNT;       /* integer numbers of things */
typedef double REAL;     /* real numbers */
typedef int LOGICAL;     /* YES or NO */
typedef struct {         /* days and seconds since Jan 1, 1900 */
    int day;             /* NULL represented by negative day */
    int sec;
    } DATE;

/* Macro to convert time of day to TIME */
#include <time.h>
```

```
extern struct timeval start_time;
#define elapsed_time(t) ( ((t)->tv_sec - start_time.tv_sec) + \
                          ((t)->tv_usec - start_time.tv_usec) / 1000000.0 )

typedef enum {Num,Money,Text,Time,Real,Date} FIELD_TYPE;   /* screen field types */


/* Various TPCC constants */
#define W_ID_LEN        4
#define D_ID_LEN        2
#define C_ID_LEN        4
#define I_ID_LEN        6
#define OL_QTY_LEN      2
#define PMT_LEN         7
#define C_ID_LEN        4
#define C_LAST_LEN      16
#define CARRIER_LEN     2
#define THRESHOLD_LEN   2
#define DIST_PER_WARE   10
#define CUST_PER_DIST   3000
#define ORD_PER_DIST    3000
#define MAXITEMS        100000
#define MAX_DIGITS      3       /* # of digits of the NURand number selected
                                   to generate the customer last name */
#define MAXWAREHOUSE    2000    /* maximum # of warehouses - scaling factor */
#define LOADSEED        42 /* # of digits of the NURand number selected

/*************************************************************************/
/* database identifiers and populations                                  */
/*************************************************************************/

  int no_warehouse;                     /*  scaling factor    */
  int no_item;                        /*  100000            */
  int no_dist_pw;                       /*      10            */
  int no_cust_pd;                       /*    3000            */
  int no_ord_pd;                        /*    3000            */
  int no_new_pd;                        /*     900            */
  int tpcc_load_seed;                   /*     900            */

/* fields to add to each transaction for acid testing */
#define ACID_STUFF     \
   char acid_txn[2]; \
   int  acid_timing; \
   int  acid_action; \
   FILE *acid_res

typedef struct {
   ID OL_SUPPLY_W_ID;
   ID OL_I_ID;
   TEXT I_NAME[24+1];
   COUNT OL_QUANTITY;
   COUNT S_QUANTITY;
   MONEY I_PRICE;
   char brand_generic;
   } neworder_item;

typedef struct {
   int status;
   LOGICAL all_local;
   ID W_ID;
   ID D_ID;
   ID C_ID;
   TEXT C_LAST[C_LAST_LEN+1];
   TEXT C_CREDIT[2+1];
   REAL C_DISCOUNT;
   COUNT O_OL_CNT;
   ID O_ID;
   TEXT O_ENTRY_D[20];  /* dates as text fields */
   REAL W_TAX;
   REAL D_TAX;
   neworder_item item[15];
   ACID_STUFF;
   } neworder_trans;


typedef struct {
   int status;
   LOGICAL byname;
   ID W_ID;
   ID D_ID;
   ID C_ID;
   ID C_D_ID;
   ID C_W_ID;
   MONEY H_AMOUNT;
   TEXT H_DATE[20];  /* date as text field */
   TEXT W_STREET_1[20+1];
   TEXT W_STREET_2[20+1];
   TEXT W_CITY[20+1];
   TEXT W_STATE[2+1];
   TEXT W_ZIP[9+1];
   TEXT D_STREET_1[20+1];
   TEXT D_STREET_2[20+1];
   TEXT D_CITY[20+1];
   TEXT D_STATE[2+1];
   TEXT D_ZIP[9+1];
   TEXT C_FIRST[16+1];
   TEXT C_MIDDLE[2+1];
   TEXT C_LAST[16+1];
   TEXT C_STREET_1[20+1];
   TEXT C_STREET_2[20+1];
   TEXT C_CITY[20+1];
   TEXT C_STATE[2+1];
   TEXT C_ZIP[9+1];
   TEXT C_PHONE[16+1];
   TEXT C_SINCE[20]; /* date as text field */
   TEXT C_CREDIT[2+1];
   MONEY C_CREDIT_LIM;
   REAL C_DISCOUNT;
   REAL C_BALANCE;
   TEXT  C_DATA[200+1];
   ACID_STUFF;
   } payment_trans;


typedef struct {
   int status;
   LOGICAL byname;
   ID W_ID;
   ID D_ID;
   ID C_ID;
   TEXT C_FIRST[16+1];
   TEXT C_MIDDLE[2+1];
   TEXT C_LAST[16+1];
   MONEY C_BALANCE;
   ID O_ID;
   TEXT O_ENTRY_DATE[20];   /* date as text field */
   ID O_CARRIER_ID;
   COUNT ol_cnt;
   struct {
      ID OL_SUPPLY_W_ID;
      ID OL_I_ID;
      COUNT OL_QUANTITY;
      MONEY OL_AMOUNT;
      TEXT OL_DELIVERY_DATE[20]; /* date as text field */
      } item[15];
   ACID_STUFF;
   } ordstat_trans;
```

```
typedef struct {
    int status;
    ID W_ID;
    ID D_ID;
    COUNT threshold;
    COUNT low_stock;
    ACID_STUFF;
    } stocklev_trans;

typedef struct {
    int status;
    ID W_ID;
    ID O_CARRIER_ID;
    struct {
        ID O_ID;
                int status;
        } order[10];
    struct timeval enque[1];
    struct timeval deque[1];
    struct timeval complete[1];
    ACID_STUFF;
    } delivery_trans;


typedef union {
    neworder_trans neworder;
    payment_trans payment;
    ordstat_trans ordstat;
    delivery_trans delivery;
    stocklev_trans stocklev;
    int status;
    } generic_trans;


/*********************************************************
Record formats for results
*********************************************************/

#ifdef NOTYET
typedef struct
    {
    float t1, t2, t3, t4, t5;
    int status          :8;
    unsigned int type    :3;
    unsigned int ol_cnt  :4;
    unsigned int remote_ol_cnt :4;
    unsigned int byname :1;
    unsigned int remote  :1;
    unsigned int skipped  :4;
    } success_t;
#endif

typedef struct
    {
    TIME t1, t2, t3, t4, t5;
    int status;
    unsigned int type    :3;
    unsigned int ol_cnt  :4;
    unsigned int remote_ol_cnt :4;
    unsigned int byname :1;
    unsigned int remote  :1;
    unsigned int skipped  :4;
    } success_t;

typedef struct
    {
    struct timeval start_time;
    } success_header_t;
```

```
/*********************************************************************
Record formats for loading routines.  (DB's have own internal formats
*********************************************************************/
typedef struct
    {
    ID W_ID;
    TEXT W_NAME[10+1];
    TEXT W_STREET_1[20+1];
    TEXT W_STREET_2[20+1];
    TEXT W_CITY[20+1];
    TEXT W_STATE[2+1];
    TEXT W_ZIP[9+1];
    REAL W_TAX;
    MONEY W_YTD;
    } warehouse_row;

typedef struct
    {
    ID D_ID;
    ID D_W_ID;
    TEXT D_NAME[10+1];
    TEXT D_STREET_1[20+1];
    TEXT D_STREET_2[20+1];
    TEXT D_CITY[20+1];
    TEXT D_STATE[2+1];
    TEXT D_ZIP[9+1];
    REAL D_TAX;
    MONEY D_YTD;
    ID D_NEXT_O_ID;
    } district_row;


typedef struct
    {
    ID C_ID;
    ID C_D_ID;
    ID C_W_ID;
    TEXT C_FIRST[16+1];
    TEXT C_MIDDLE[2+1];
    TEXT C_LAST[16+1];
    TEXT C_STREET_1[20+1];
    TEXT C_STREET_2[20+1];
    TEXT C_CITY[20+1];
    TEXT C_STATE[2+1];
    TEXT C_ZIP[9+1];
    TEXT C_PHONE[16+1];
    DATE C_SINCE;
    TEXT C_CREDIT[2+1];
    MONEY C_CREDIT_LIM;
    REAL C_DISCOUNT;
    MONEY C_BALANCE;
    MONEY C_YTD_PAYMENT;
    COUNT C_PAYMENT_CNT;
    COUNT C_DELIVERY_CNT;
    TEXT  C_DATA[500+1];
    } customer_row;

typedef struct
    {
    ID H_C_ID;
    ID H_C_D_ID;
    ID H_C_W_ID;
    ID H_D_ID;
    ID H_W_ID;
    DATE H_DATE;
    MONEY H_AMOUNT;
    TEXT H_DATA[24+1];
    } history_row;

typedef struct
```

```
    {
    ID NO_O_ID;
    ID NO_D_ID;
    ID NO_W_ID;
    } neworder_row;

typedef struct
    {
    ID O_ID;
    ID O_D_ID;
    ID O_W_ID;
    ID O_C_ID;
    DATE O_ENTRY_D;
    ID O_CARRIER_ID;
    COUNT O_OL_CNT;
    LOGICAL O_ALL_LOCAL;
    } order_row;

typedef struct
    {
    ID OL_O_ID;
    ID OL_D_ID;
    ID OL_W_ID;
    ID OL_NUMBER;
    ID OL_I_ID;
    ID OL_SUPPLY_W_ID;
    DATE OL_DELIVERY_D;
    COUNT OL_QUANTITY;
    MONEY OL_AMOUNT;
    TEXT OL_DIST_INFO[24+1];
    } orderline_row;

typedef struct
    {
    ID I_ID;
    ID I_IM_ID;
    TEXT I_NAME[24+1];
    MONEY I_PRICE;
    TEXT I_DATA[50+1];
    } item_row;

typedef struct
    {
    ID S_I_ID;
    ID S_W_ID;
    COUNT S_QUANTITY;
    TEXT S_DIST_01[24+1];
    TEXT S_DIST_02[24+1];
    TEXT S_DIST_03[24+1];
    TEXT S_DIST_04[24+1];
    TEXT S_DIST_05[24+1];
    TEXT S_DIST_06[24+1];
    TEXT S_DIST_07[24+1];
    TEXT S_DIST_08[24+1];
    TEXT S_DIST_09[24+1];
    TEXT S_DIST_10[24+1];
    COUNT S_YTD;
    COUNT S_ORDER_CNT;
    COUNT S_REMOTE_CNT;
    TEXT S_DATA[50+1];
    } stock_row;


/* Empty field values */
#define EMPTY_NUM (MAXINT-1)
#define INVALID_NUM (MAXINT)
#define EMPTY_FLT   (MAXDOUBLE)
#define INVALID_FLT (MINDOUBLE)

/* Status conditions */
#define OK 0
#define E 1
#define E_INVALID_ITEM 2
#define E_NOT_ENOUGH_ORDERS 3
#define E_DB_ERROR 4
#define E_INVALID_INPUT 5

/* Error message strings */
static char *e_mesg[]={"Transaction complete.","Error","Invalid item number.",
                       "Not enough orders.", "Database ERROR !!!!"};



#define YES 1
#define NO 0



double cvt_flt();
double cvt_money();
TIME getclock();
TIME getlocalclock();

#define TPC_MSG_QUE  150


/*****************************************
Transaction specific stuff
*****************************************/

/* types of transactions */
#define NEWORDER 1
#define PAYMENT  2
#define ORDSTAT  3
#define DELIVERY 4
#define STOCKLEV 5
#define DEFERRED 6   /* deferred portion of delivery */

/* the name of each transaction */
static char *transaction_name[] =
    {"", "New_Order", "Payment", "Order-Status",
                       "Delivery", "Stock-Level", "Deferred-Delivery"};

/* size of each transaction record */
static int transaction_size[] = {0,
     sizeof(neworder_trans),
     sizeof(payment_trans),
     sizeof(ordstat_trans),
     sizeof(delivery_trans),
     sizeof(stocklev_trans),
     sizeof(delivery_trans),
     0};

/* valid response time for each transaction */
static TIME valid_response[] = {0, 5, 5, 5, 5, 20};


#endif /* TPCC_INCLUDED */
```

lib/date.c

```
/*****************************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 10:56:52 $

 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
*****************************************************************************/
```

```
#include "tpcc.h"
#include <time.h>

/* macro to get starting day of a particular year (1901 thru 2100) */
#define YEAR(yr)  ( (yr-1900)*365 + (yr-1900-1)/4 )

CurrentDate(date)
/*********************************************************************
CurrentDate fetches the current date and time
*********************************************************************/
    DATE *date;
    {
    struct timeval time;
    struct timezone tz;

    /* get the current time of day */
    if (gettimeofday(&time, &tz) < 0)
                syserror("Can't get time of day\n");

    /* adjust the time of day by the timezone */
    time.tv_sec -= tz.tz_minuteswest * 60;

    /* convert seconds and days since EPOCH (Jan 1, 1970) */
    date->day = time.tv_sec / (24*60*60);
    date->sec = time.tv_sec - date->day * (24*60*60);

    /* convert to days since Jan 1, 1900 */
    date->day += YEAR(1970);
    }


EmptyDate(date)
/*****************************************************
Get a NULL date and time
*****************************************************/
    DATE *date;
    {
    date->day = 0;   /* Use EMPTYNUM instead */
    date->sec = 0;
    }

int IsEmptyDate(date)
    DATE *date;
    {
    return (date->day == 0 & date->sec == 0);
    }


#define Feb29 (31+29-1)

fmt_date(str, date)
/*********************************************************************
fmt_date formats the DATE into a string  MM-DD-YY HH-MM-SS
*********************************************************************/
    char str[20];
    DATE *date;
    {
    /* Note: should probably do date and time separately */

    int quad, year, month, day;
    int hour, minute, sec;

    static int dur[] = {31, 28, 31, 30, 31, 30, 31, 31, 30, 31, 30, 31};
    static int first = YES;

    day = date->day;
    sec = date->sec;

    /* if NULL date, then return empty string */
    if (day == EMPTY_NUM || sec == EMPTY_NUM)
                {str[0] = '\0'; return;}

    /* 2100, 1900 are NOT leap years.  If we are Feb 29 or later, add a day */
    if (day >= Feb29 + YEAR(2100))  day++;
    if (day >= Feb29)               day++;

    /* figure out which quad and day within quad we are in */
    quad = day / (4*365+1);
    day = day - quad * (4*365+1);

    /* get our year within quad and day within the year */
    if      (day < 1*365+1)    {year = 0;}
    else if (day < 2*365+1)    {year = 1; day -= 1*365+1;}
    else if (day < 3*365+1)    {year = 2; day -= 2*365+1;}
    else                       {year = 3; day -= 3*365+1;}

    /* if this is a leap year, february has 29 days */
    if (year == 0)          dur[1] = 29;
    else                    dur[1] = 28;

    /* decide which day and month we are */
    for (month = 0; day >= dur[month]; month++)
        day -= dur[month];

    /* decide what time of day it is */
    minute = sec / 60;
    sec = sec - minute * 60;
    hour = minute / 60;
    minute = minute - hour * 60;

    /* format the date and time */
    fmtint(str+0,  day+1, 2, ' ');
    str[2]='-';
    fmtint(str+3, month+1, 2, '0');
    str[5]='-';
    fmtint(str+6, 1900+quad*4+year, 4, '0');
    str[10] = ' ';
    fmtint(str+11, hour, 2, ' ');
    str[13] = ':';
    fmtint(str+14, minute, 2, '0');
    str[16] = ':';
    fmtint(str+17, sec, 2, '0');
    str[19] = '\0';
    }
```

lib/errlog.c

```
/*****************************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 10:56:52 $

 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
*****************************************************************************/
#include <stdio.h>
#include <varargs.h>
#include <unistd.h>
#include <errno.h>
#include <stdlib.h>
#include <fcntl.h>

int userid;

static msg_buf();

error(format, va_alist)
/*********************************************************************
error formats a message and outputs it to a standard location (stderr for now)
*********************************************************************/
```

```
    char *format;
                va_dcl
    {
    va_list argptr;

    msg_buf("error \n", strlen("error \n"));

    /* point to the list of arguments */
    va_start(argptr);

    /* format and print to stderr */
    vmessage(format, argptr);

    /* done */
    va_end(argptr);

    /* take an error exit */
    exit(1);
    }


syserror( format, va_alist )
/*************************************************************************
syserror logs a message with the system error code
*************************************************************************/
    char *format;
                va_dcl
    {
    va_list argptr;
    int save_errno = errno;

    msg_buf("syserror \n", strlen("syserror \n"));
    /* point to the list of arguments */
    va_start(argptr);

    /* format and print to stderr */
    vmessage(format, argptr);

    /* done */
    va_end(argptr);

    /* display the system error message */
    message("    System error message: %d %s\n", save_errno, strerror(save_errno));

    /* take an error exit */
    exit(1);
    }



message(format, va_alist)
/*************************************************************************
message formats a message and outputs it to a standard location (stderr for now)
*************************************************************************/
    char *format;
                va_dcl
{
    va_list argptr;

    msg_buf("message \n", strlen("message \n"));
    /* point to the list of arguments */
    va_start(argptr);

    /* format and print to stderr */
    vmessage(format, argptr);

    /* done */
    va_end(argptr);
    }
```

```
vmessage(format, argptr)
/*****************************************************

*****************************************************/
    char *format;
    va_list argptr;
{
  char buf[3*1024];

  /* format a message id */
  sprintf(buf, "Host %-8s User %-6d Pid %-6d ", getenv("HOST_NAME"), userid, getpid());

  /* format the string and print it */
  vsprintf(buf+strlen(buf), format, argptr);
  if (getenv("NO_ERROR_LOG") == NULL)
      msg_buf(buf, strlen(buf));
  if (getenv("NO_STDERR") == NULL)
      write(2, buf, strlen(buf));
}



static msg_buf(buf, size)
  char *buf;
  int size;
  {
  int                fd;
  char  *fname;
  time_t tepoch = time(NULL);
  char timestamp[16];
  int ltimestamp;

  ltimestamp = strftime(timestamp, sizeof(timestamp), "%m/%d %T ", localtime(&tepoch));

  /* get the file name to use */
  fname = getenv("ERROR_LOG");
  if (fname == NULL)
    fname = "/tmp/ERROR_LOG";

  /* get exclusive access to the error log file */
  fd= open(fname, O_WRONLY | O_CREAT, 0666);
  if (fd < 0)
    console_error("Can't open tpc error log file 'ERROR_LOG'\n");
  lockf(fd, F_LOCK, 0);

  /* write the new text at the end of the file */
  lseek(fd, 0, SEEK_END);
  write(fd, timestamp, ltimestamp);
  write(fd, buf, size);

  /* release the file */
  /* fsync(fd); */
  lockf(fd, F_ULOCK, 0);
  close(fd);
  }



console_error(str)
   char *str;
   {
   int fd = open("/dev/tty", O_WRONLY);
   write(fd, str, strlen(str));
   close(fd);
```

```
    exit(1);
    }
```

lib/fmt.c

```
/*****************************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 10:56:52 $

 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
*****************************************************************************/
#include "tpcc.h"
#include "iobuf.h"
#include <math.h>    /* needed for ceil (VM) */
#include <strings.h>

/* formatting routines.  */

/* Note: Currently use integer routines to format and convert.  Need to
   modify the code for cases when integers don't work.  */

fmt_money(str, m, width)
    char *str;
    MONEY m;
    int width;
    {

    if (m == EMPTY_FLT)
        {
        memset(str, '_', width);
        str[width] = '\0';
        return;
        }

    /* format it as a number with a leading blank */
    *str = ' ';
    fmt_flt(str+1, m/100, width-1, 2);

    /* fill in a leading dollar */
    while (*(str+1) == ' ')
        str++;
    *str = '$';
    }


double cvt_money(str)
    char *str;
    {
    char temp[81], *t, *s;
    double cvt_flt(), f;

    /* skip leading and trailing blanks */
    cvt_text(str, temp);

    /* remove leading $ */
    if (*temp == '$')   t = temp + 1;
    else                t = temp;

    /* start scan at current character */
    s = t;

    /* allow leading minus sign */
    if (*s == '-')
                s++;

    /* allow leading digits */
    while (isdigit(*s))
                s++;

    /* allow decimal pt and two decimal digits */
    if (*s == '.')    s++;
    if (isdigit(*s))  s++;
    if (isdigit(*s))  s++;

    /* There should be no more characters */
    if (*s != '\0') return INVALID_FLT;

    /* convert the floating pt number */
    f = cvt_flt(t);
    if (f == EMPTY_FLT)        return EMPTY_FLT;
    else if (f == INVALID_FLT) return INVALID_FLT;
    else                       return rint(f*100);
    }


fmt_num(str, n, width)
    char str[];
    int n;
    int width;
    {
    /* mark the end of the string */
    str[width] = '\0';

    /* if empty number, return the empty field */
    if (n == EMPTY_NUM)
        memset(str, '_', width);

    /* otherwise, convert the integer */
    else
        fmtint(str, n, width, ' ');

    debug("fmt_num:  n=%d  str=%s\n", n, str);
    }



cvt_num(str)
    char str[];
    {
    char text[81];
    cvt_text(str, text);
    if (*text == '\0')
        return EMPTY_NUM;
    else
        return cvtint(text);
    }



fmt_flt(str, x, width, dec)
/*****************************************************************************
fmt_flt converts a floating pt number to a string    "999999.9999"
*****************************************************************************/
    char *str;
    double x;
    int width;
    int dec;
    {
    int negative;
    int integer, fract;
    double absolute;

    static double pow10[] =
    {1., 10., 100., 1000., 10000., 100000., 1000000., 10000000., 100000000.};

    /* mark the end of string */
    str[width] = '\0';
```

```
    /* if empty value, make it be an empty field */
    if (x == EMPTY_FLT)
        {
        memset(str, '_', width);
        return;
        }

    absolute = (x < 0)? -x: x;

    /* separate into integer and fractional parts */
    integer = (int) absolute;
    fract   = (absolute - integer) * pow10[dec] + .5;

    /* let the integer portion contain the sign */
    if (x < 0) integer = -integer;

    /* Format integer and fraction separately */
    fmtint(str, integer, width-dec-1, ' ');
    str[width-dec-1] = '.';
    fmtint(str+width-dec, fract, dec, '0');
    }



double cvt_flt(str)
    char str[];
    {
    char text[81];
    char *t;
    double value;
    int div;
    int fract;
    int negative;
    int i;

    /* normalize the text */
    cvt_text(str, text);
    if (*text == '\0')
        return EMPTY_FLT;

    negative = NO;
    fract = NO;
    value = 0;
    div = 1.0;

    negative = (text[0] == '-');
    if (negative)    t = text+1;
    else             t = text;

    for (;  *t !=  '\0' ; t++)
        {

        if (*t == '.')
                        if (fract)  return INVALID_FLT;
            else        fract = YES;

        else if (isdigit(*t))
            {
            value = value*10 + (int)*t - (int)'0';
            if (fract) div *= 10;
            }

        else
            return INVALID_FLT;
        }

    if (fract)
        value /= div;

    if (negative)
        value = -value;

    return value;
    }



fmt_text(s, text, width)
    char *s, *text;
    int width;
    {

    /* if an empty string, then all underscores */
    if (*text == '\0')
        for (; width > 0; width--)
            *s++  = '_';

    /* otherwise, blank fill it */
    else
        {

        /* copy the text into the new buffer */
        for ( ; *text != '\0';  width--)
            *s++ = *text++;

        /* fill in the rest with blanks */
        for (;  width > 0;  width--)
            *s++ = ' ';
        }

    /* and finally, terminate the string */
    *s = '\0';
    }



cvt_text(s, text)
    char *s;
    char *text;
    {
    char *lastnb;

    /* skip leading blanks and underscores */
    for (; *s == ' ' || *s == '_'; s++)
        ;

    /* copy the characters, keeping track of last blank or underscore */
    lastnb = text-1;
    for (; *s != '\0'; *text++ = *s++)
        if (*s != ' ' && *s != '_')
            lastnb = text;

    /* truncate the text string to last nonblank character */
    *(lastnb+1) = '\0';
    }



fmtint(field, value, size, fill)
/*********************************************************************
fmtint formats an integer value into a character field to make the integer
right-justified within the character field, padded with leading fill
characters (e.g. leading blanks if a blank is passed in for the fill argument
*********************************************************************************/
    int value;
    char *field;
    int size;
    char fill;
```

```
    {
    int negative;
    int dividend;
    int remainder;
    char *p;

    /* create characters from right to left */
    p = field + size - 1;

    /* make note if this is a negative number */
    negative = value < 0;
    if (negative)
        value = -value;

    /* Case: Null field.  Can't do anything */
    if (p < field)
        ;

    /* Case: value is zero.  Print a leading '0' */
    else if (value == 0)
        *p-- = '0';

    /* Otherwise, convert each digit in turn */
    else do
        {

        dividend = value / 10;
        remainder = value - dividend * 10;
        value = dividend;

        *p-- = (char) (  (int)'0' +  remainder  );

        } while (p >= field && value > 0);

    /* insert a minus sign if appropriate */
    if (negative && p >= field)
        *p-- = '-';

    /* fill in leading characters */
    while (p >= field)
        *p-- = fill;
    }


int cvtint(str)
/*****************************************************************
getint extracts an integer value from the given character field
(ex: turns the string "123" into the integer 123)
*****************************************************************/
    char *str;
    {
    int value;
    char c;
    int negative;
    debug("cvtint: str=%s\n", str);

    negative = (*str == '-');
    if (negative)  str++;

    /* convert the integer */
    for (value = 0; isdigit(*str); str++)
        value = value*10 + (int)(*str) - (int)'0';

    /* if any non-digit characters, error */
    if (*str != '\0')
                return INVALID_NUM;

    /* make negative if there was a minus sign */
    if (negative)
        value = -value;

    debug("cvtint: value=%d\n", value);
    return value;
    }


fmt_phone(str, phone)
    char str[20];
    char *phone;

    {
    /* copy phone number and insert dashes  999999-999-999-9999 */
    str[0] = phone[0];  str[1] = phone[1]; str[2] = phone[2];
    str[3] = phone[3];  str[4] = phone[4]; str[5] = phone[5];
    str[6] = '-';
    str[7] = phone[6];  str[8] = phone[7]; str[9] = phone[8];
    str[10] = '-';
    str[11] = phone[9]; str[12] = phone[10]; str[13] = phone[11];
    str[14] = '-';
    str[15] = phone[12]; str[16] = phone[13]; str[17] = phone[14];
    str[18] = phone[15];
    str[19] = '\0';
    }


fmt_zip(str,zip)
    char str[20];
    char *zip;
    {
    /* copy zip code and insert dashes 99999-9999 */
    str[0] = zip[0];  str[1] = zip[1];  str[2] = zip[2];
    str[3] = zip[3];  str[4] = zip[4];
    str[5] = '-';
    str[6] = zip[5]; str[7] = zip[6]; str[8] = zip[7];  str[9] = zip[8];
    str[10] = '\0';
    }
```

lib/iobuf.h

```
/*****************************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 10:56:52 $

 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
*****************************************************************************/

/*********************************************************************
History
941220 LAN Added definition and initialization of the line_col[] array.
       This was needed for modifications made of client program to do
       block I/O using a WYSE terminal.
*********************************************************************/

/* structure for screen emulation */
typedef struct
    {
    int row;
    int col;
    char buf[25][81];
    } screen_t;


typedef struct {
    char *beg;
    char *end;   /* for output buffers */
    char *max;
    char *cur;   /* for input buffers */
```

```
    } iobuf;

/* Macro do define an I/O buffer of x characters, initialized to empty */
#define define_iobuf(name, size)                    \
char name##_data[size];                             \
iobuf name[1] = {{name##_data, name##_data,       \
                 name##_data+size, name##_data}}

#define reset(buf)  if (1) { \
    (buf)->cur = (buf)->end = (buf)->beg;               \
    *(buf)->beg = '\0';                                 \
    } else (void)0

#define flush()  if(1) { \
        display(out_buf);    \
        reset(out_buf);     \
     } else (void)0


/* Standard I/O to and from in_buf and out_buf */
#ifdef DECLARE_IO_BUFFERS
define_iobuf(output_stuff, 4*1024);
define_iobuf(input_stuff, 1024);
iobuf *in_buf = input_stuff;
iobuf *out_buf = output_stuff;
#else
iobuf *in_buf;
iobuf *out_buf;
#endif

#define pushc(c) if (1) { \
    if (out_buf->end >= out_buf->max)   \
        error("out_buf overflow:  beg=0x%x end=%d  max=%d\n",  \
         out_buf->beg, out_buf->end-out_buf->beg,out_buf->max-out_buf->beg); \
    *(out_buf->end++) = (c);  \
    *(out_buf->end) = '\0';  /* debug */ \
    } else (void)0

#define popc()  \
    (*in_buf->cur++)


/* Standard characters used for screen control */
#define ENTER '\015'
#define TAB   '\t'
#define BACKTAB '\02' /*  ^B  */
#define CNTRLC '\03'
#define BACKSPACE '\010'
#define BELL '\07'
#define BLANK ' '
#define UNDERLINE '_'
#define ESCAPE '\033'
/*#define EOF    ((char)-1) */
#define TRIGGER '\021' /* dc1 */
```

lib/iobuf.c

```
/*****************************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 10:56:52 $

 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.

*****************************************************************************/
#define DECLARE_IO_BUFFERS
#include "iobuf.h"
#undef DECLARE_IO_BUFFERS
#include "tpcc.h"
#include <errno.h>



string(str)
    char str[];
    {
    for (; *str != '\0'; str++)
        pushc(*str);
    }


push(str, len)
    char *str;
    int len;
    {
    for (; len > 0; len --)
        pushc(*str++);
    }


display(scr)
    iobuf *scr;
    {
/* Note: if problems doing output, let the input routine detect it */
    char *p;
    int len;
    for (p = scr->beg; p < scr->end; p+=len)
        {
        len = write(1, p, scr->end - p);
        if (len <= 0) break;
        }
    }


input(scr)
    iobuf *scr;
    {
    int len;

    /* read in as many characters as are available */
    len = read(0, scr->end, scr->max - scr->end);

    /* if end of input, then pretend we read an END character */
    if (len == 0 || (len == -1 && errno == ECONNRESET))
        {
        *scr->end = EOF;
        len = 1;
        }

    /* Check for errors */
    else if (len == -1)
        syserror("input(scr): unable to read stdin\n");

    /* update the pointers to reflect the new data */
    scr->end += len;
    *scr->end='\0';  /* for debugging */
    }


getkey()
    {
    if (in_buf->cur == in_buf->end)
        {
```

```
        flush();
        reset(in_buf);
        input(in_buf);
        }

    return popc();
    }
```

lib/random.c

```
/*********************************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 14:01:59 $

 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
*********************************************************************************/
#include "tpcc.h"
#include "string.h"
#include "random.h"

double drand48();

char lastNames[1000][16];
char customerData1[10][301];
char customerData2[10][201];
char stockData1[10][27];
char stockData2[10][25];
char historyData1[10][13];
char historyData2[10][13];
char citystreetData1[10][11];
char citystreetData2[10][11];
char firstNameData1[10][9];
char firstNameData2[10][9];
char StockDistrict[10][25];
char phoneData[10][17];

static long RandySeedIter = 7;

void GenerateLastNames()
{
    int      i;
    char *name;
    static char *n[] = {"BAR", "OUGHT", "ABLE", "PRI", "PRES",
                        "ESE", "ANTI", "CALLY", "ATION", "EING"};

    for(i = 0; i < 1000; i++) {
        name = lastNames[i];
        strcpy(name, n[(i/100)%10]);
        strcat(name, n[(i/10) %10]);
        strcat(name, n[(i/1)  %10]);
    }
}

int MakeNumberString(min, max, num)
    int min;
    int max;
    TEXT num[];
    {
    static char digit[]="0123456789";
    int length;
    int i;

    length = RandomNumber(min, max);

    for (i=0;  i<length;  i++)
        num[i] = digit[RandomNumber(0,9)];
    num[length] = '\0';

    return length;
    }

ID RandomWarehouse(local, scale, percent)
    ID local;
    ID scale;
    int percent;   /* percent of remote transactions */
    {
    ID w_id;

    /* For the given percent of the time, pick the local warehouse */
    if (RandomNumber(1, 100) > percent || scale == 1)
        w_id = local;

    /* Otherwise, pick a non-local warehouse */
    else
        {
        w_id = RandomNumber(2, scale);
        if (w_id == local)
            w_id = 1;
        }
    return w_id;
    }


/* Initialize a table of Random strings for the stock-district
   field in the stock table.  We can use a table of 10 elements
   and select randomly from this table via rule 4.3.2.2 in
   the TPC-C spec */
void InitRandomStrings()
{
    int i;

    for (i=0; i < 10; i++) {
                        MakeAlphaString(24,24,&StockDistrict[i]);

                        MakeAlphaString(300,300,&customerData1[i]);
                        MakeAlphaString(0,200,&customerData2[i]);

                        MakeAlphaString(26,26,&stockData1[i]);
                        MakeAlphaString(0,24,&stockData2[i]);

                        MakeAlphaString(12,12,&historyData1[i]);
                        MakeAlphaString(0,12, &historyData2[i]);

                        MakeAlphaString(10,10,&citystreetData1[i]);
                        MakeAlphaString(0 ,10,&citystreetData2[i]);

                        MakeAlphaString(8,8,&firstNameData1[i]);
                        MakeAlphaString(0,8,&firstNameData2[i]);

                        MakeNumberString(16,16,&phoneData[i]);
                    }
                    GenerateLastNames();
}

int MakeAlphaString(min, max, str)
    int min;
    int max;
    TEXT str[];
    {
    static char character[] = "abcdefghijklmnopqrstuvwxyz";
    int length;
    int i;

    length = RandomNumber(min, max);

    for (i=0;  i<length;  i++) {
```

```
        /* NOTE:  we use sizeof(character)-2 because of the following:
           subtract 1 because we are numbering from 0 instead of 1 and
           subtract 1 because the sizeof(character) is 1 greater than
           the data in character because of the inivisible C string
           terminator at the end. */
        str[i] = character[RandomNumber(0, sizeof(character)-2)];
    }
    str[length] = '\0';

    return length;
    }

void RandomPermutation(perm, n)
    int perm[];
    int n;
    {
    int i, r, t;

    /* generate the identity permutation to start with */
    for (i=1; i<=n; i++)
        perm[i] = i;

    /* randomly shuffle the permutation */
    for (i=1; i<=n; i++)
        {
        r = RandomNumber(i, n);
        t = perm[i]; perm[i] = perm[r]; perm[r] = t;
        }
    }


void RandomDelay(mean, adjust)
/*********************************************************************
random_sleep sleeps according to the TPC specification
*********************************************************************/
    double mean;
    double adjust;
    {
    double secs;
    double exponential();

    secs = exponential(mean);

    delay(secs+adjust);
    }

double exponential(mean)
/*********************************************************************
exponential generates a reverse exponential distribution
*********************************************************************/
    double mean;
    {
    double x;
    double log();

#ifdef USE_DRAND48
    x = -log(1.0-drand48()) * mean;
#else
    x = -log(1.0-randy()) * mean;
#endif

    return x;
    }

void SetRandomSeed(val)
long val;
    {
#ifdef USE_DRAND48
    srand48(val);
#else
    RandySeedIter = val;
#endif
    }

void Randomize()
    {
    SetRandomSeed(time(0)+getpid());
    }

/* Random number generator from Proceeding of the ACM */
#define RANDY_A_VAL 16807
/* 2^31 - 1 */
#define RANDY_M_VAL 2147483647
/* m / a */
#define RANDY_Q_VAL 127773
/* m % a */
#define RANDY_R_VAL 2836

double randy()
{
  long    hi, lo, test;

  hi = RandySeedIter / RANDY_Q_VAL;
  lo = RandySeedIter % RANDY_Q_VAL;

  test = (RANDY_A_VAL * lo) - (RANDY_R_VAL * hi);
  RandySeedIter = (test > 0) ? test : test + RANDY_M_VAL;

  return( (double)RandySeedIter / (double)RANDY_M_VAL );
}  /* end of fn randy  */
```

lib/Makefile

```
#*****************************************************************************
#@(#) Version: A.10.10 $Date: 97/12/15 14:02:02 $
#
#(c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
#*****************************************************************************

include ../buildenv.mk

CFLAGS= $(BUILDFLAGS) -Wl,-a,archive_shared

utils=iobuf.o delay.o errlog.o fmt.o random.o tas.o null_key.o null_select.o results_file.o  date.o prepare_socket.o shm.o spinlock.o

all: tpc_lib.a  server_default.o

tpc_lib.a: ${utils}
                rm -f tpc_lib.a
                ar -r tpc_lib.a ${utils}

clean:
                rm -f *.o
                rm -f *.a

clobber: clean

.s.o:
                cc -c $*.s
```

delay.c

```
/*****************************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 10:56:52 $

 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
*****************************************************************************/
#include <sys/time.h>
#include <errno.h>
#ifndef HPUX9
#include <time.h>
#endif
#include "tpcc.h"
#include "shm.h"

delay(sec)
/*****************************************************************************
delay sleeps for the specified number of seconds.  (to closest 1/100th second)
*****************************************************************************/
    double sec;
    {
#ifdef HPUX9
    struct timeval delay;
#else
    struct timespec delay;
#endif

    /* if no delay,  done */
    if (sec <= 0.0) return;

    /* add a portion of a clock tick to keep averages correct */
    sec += 1.0 / CLK_TCK;

    /* convert the delay to seconds and nanoseconds */
    delay.tv_sec = sec;
#ifdef HPUX9
    delay.tv_usec = (sec - delay.tv_sec) * 1000000;
#else
    delay.tv_nsec = (sec - delay.tv_sec) * 1000000000;
#endif

    /* sleep on a select call */
#ifdef HPUX9
    if (select(0, NULL, NULL, NULL, &delay) < 0) {
        syserror("delay:  select() call failed\n");
    }
#else
    if (nanosleep(&delay,NULL) == -1) {
                if (errno != EINTR) {
            syserror("delay:  nanosleep() call failed, errno = %d\n",errno);
                }
    }
#endif
}



struct timeval start_time;

initclock()
    {
    gettimeofday(&start_time, NULL);
    }

TIME getclock()
/*****************************************************************************
getclock returns the current time, expressed in seconds from start of run
*****************************************************************************/
    {
    struct timeval current;
    gettimeofday(&current, NULL);

    return elapsed_time(&current);
    }
```

master.h

```
/*****************************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 10:56:52 $

 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
*****************************************************************************/

#ifndef _MASTER_INCLUDED
#define _MASTER_INCLUDED

#include "shm.h"

#define SHMKEY_MASTER 99999
#define MAX_DRIVERS 100
#define CMD "slave"


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

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

shm_t *shm_master;    /* master shared memory pointer */
int sd[MAX_DRIVERS];  /* socket descriptors */

#define m_state shm_master->s_state
#define m_desired shm_master->s_desired
#define m_attached shm_master->s_attached
#define m_transactions shm_master->s_transactions
#define m_max_transactions shm_master->s_max_transactions
#define m_max_duration shm_master->s_max_duration

typedef struct
{
    struct
    {
        int t_desired;
        int t_state;
        struct timeval t_start_time;
    } out_data;

    struct
    {
        int t_attached;
                    int t_transactions;
                    int t_max_transactions;
                    int t_max_duration;
        stat_t t_stat[1];
    } in_data;

} xfer_data_t;

xfer_data_t xfer_data;


typedef struct
```

```
{
    int     s_attached;
    int     s_transactions;
    int     s_max_transactions;
    int     s_max_duration;
    stat_t  s_stat[1];
} store_data_t;

store_data_t str_data;

#define d_desired xfer_data.out_data.t_desired
#define d_state xfer_data.out_data.t_state
#define d_start_time xfer_data.out_data.t_start_time
#define d_attached xfer_data.in_data.t_attached
#define d_max_transactions xfer_data.in_data.t_max_transactions
#define d_max_duration xfer_data.in_data.t_max_duration
#define d_transactions xfer_data.in_data.t_transactions
#define d_stat xfer_data.in_data.t_stat[0]


#endif /* _MASTER_INCLUDED */
```

null_key.c

```
/*****************************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 10:56:53 $

 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
*****************************************************************************/
/* dummy keystroke routines */
neworder_key(){}
payment_key(){}
ordstat_key(){}
delivery_key(){}
stocklev_key(){}
```

null_select.c

```
/*****************************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 10:56:53 $

 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
*****************************************************************************/
/* dummy menu selection routines */
neworder_select(){}
payment_select(){}
ordstat_select(){}
delivery_select(){}
stocklev_select(){}
```

odbc.h

```
/* ODBC.H */

#include <sql.h>
#include <sqlext.h>

#define DEL_FIFO "/dev/delivery"

#ifndef TRUE
#define TRUE 1
#endif

#ifndef FALSE
#define FALSE 0
#endif

#define DEADLOCK -2

#ifndef MaxTries
#define MaxTries 25
#endif

#define LinesPerCall 15

#define dsn (unsigned char *) "MSSqlServer"
#define user (unsigned char *) "sa"
#define server (unsigned char *) "HPDPC338"
#define database (unsigned char *) "tpcc"
#define passwd (unsigned char *) ""

HDBC hdbc;
HENV henv;
HSTMT hstmt;

/* For error checking */
extern char errorname[32];

int prev_xact_type;
short o_ol_cnt, o_ol_done, o_ol_now;
short o_all_local;
short lines_per_call;

#define XACT_NEWO 0
#define XACT_PAYM 1
#define XACT_ORDS 2
#define XACT_DEL 3
#define XACT_STOCK 4
#define XACT_BKEND 5

/*
** Define the TPC-C functions
*/

int ODBCError();

int new_order_rpc();
int payment_rpc();
int order_status_rpc();
int stock_level_rpc();
int delivery_rpc();
int connect_odbc_user();

void display_xction();
void sleep_before_retry ();
void pick_xact_type();
```

prepare_socket.c

```
/*****************************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 10:56:53 $

 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
*****************************************************************************/
#include <sys/socket.h>
#include <netinet/in.h>
#include <netinet/tcp.h>
#include <netdb.h>
```

```
int prepare_socket(fd)
    int fd;
    {
    int yes = 1;

    if (setsockopt(fd, SOL_SOCKET, SO_KEEPALIVE, &yes, sizeof(yes)) < 0)
        return -1;
    if (setsockopt(fd, SOL_SOCKET, SO_REUSEADDR, &yes, sizeof(yes)) < 0)
        return -1;
    if (setsockopt(fd, SOL_SOCKET, TCP_NODELAY, &yes, sizeof(yes)) < 0)
                return -1;
    /* SO_SNDBUF, SO_RCVBUF, TPC_MAXSEG  should be set ?? */
    return 0;
    }
```

random.c

```
/*****************************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 14:01:59 $

 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
*****************************************************************************/
#include "tpcc.h"
#include "string.h"
#include "random.h"

double drand48();

char lastNames[1000][16];
char customerData1[10][301];
char customerData2[10][201];
char stockData1[10][27];
char stockData2[10][25];
char historyData1[10][13];
char historyData2[10][13];
char citystreetData1[10][11];
char citystreetData2[10][11];
char firstNameData1[10][9];
char firstNameData2[10][9];
char StockDistrict[10][25];
char phoneData[10][17];

static long RandySeedIter = 7;

void GenerateLastNames()
{
    int      i;
    char *name;
    static char *n[] = {"BAR", "OUGHT", "ABLE", "PRI", "PRES",
                        "ESE", "ANTI", "CALLY", "ATION", "EING"};

    for(i = 0; i < 1000; i++) {
        name = lastNames[i];
        strcpy(name, n[(i/100)%10]);
        strcat(name, n[(i/10) %10]);
        strcat(name, n[(i/1)  %10]);
    }
}

int MakeNumberString(min, max, num)
    int min;
    int max;
    TEXT num[];
    {
    static char digit[]="0123456789";
    int length;
    int i;

    length = RandomNumber(min, max);

    for (i=0;  i<length;  i++)
        num[i] = digit[RandomNumber(0,9)];
    num[length] = '\0';

    return length;
    }

ID RandomWarehouse(local, scale, percent)
    ID local;
    ID scale;
    int percent;   /* percent of remote transactions */
    {
    ID w_id;

    /* For the given percent of the time, pick the local warehouse */
    if (RandomNumber(1, 100) > percent || scale == 1)
        w_id = local;

    /* Otherwise, pick a non-local warehouse */
    else
        {
        w_id = RandomNumber(2, scale);
        if (w_id == local)
            w_id = 1;
        }
    return w_id;
    }


/* Initialize a table of Random strings for the stock-district
   field in the stock table.  We can use a table of 10 elements
   and select randomly from this table via rule 4.3.2.2 in
   the TPC-C spec */
void InitRandomStrings()
{
    int i;

    for (i=0; i < 10; i++) {
                        MakeAlphaString(24,24,&StockDistrict[i]);

                        MakeAlphaString(300,300,&customerData1[i]);
                        MakeAlphaString(0,200,&customerData2[i]);

                        MakeAlphaString(26,26,&stockData1[i]);
                        MakeAlphaString(0,24,&stockData2[i]);

                        MakeAlphaString(12,12,&historyData1[i]);
                        MakeAlphaString(0,12, &historyData2[i]);

                        MakeAlphaString(10,10,&citystreetData1[i]);
                        MakeAlphaString(0 ,10,&citystreetData2[i]);

                        MakeAlphaString(8,8,&firstNameData1[i]);
                        MakeAlphaString(0,8,&firstNameData2[i]);

                        MakeNumberString(16,16,&phoneData[i]);
                    }
                    GenerateLastNames();
}

int MakeAlphaString(min, max, str)
    int min;
    int max;
    TEXT str[];
    {
    static char character[] = "abcdefghijklmnopqrstuvwxyz";
```

```
    int length;
    int i;

    length = RandomNumber(min, max);

    for (i=0;  i<length;  i++) {
        /* NOTE:  we use sizeof(character)-2 because of the following:
           subtract 1 because we are numbering from 0 instead of 1 and
           subtract 1 because the sizeof(character) is 1 greater than
           the data in character because of the inivisible C string
           terminator at the end. */
        str[i] = character[RandomNumber(0, sizeof(character)-2)];
    }
    str[length] = '\0';

    return length;
    }

void RandomPermutation(perm, n)
    int perm[];
    int n;
    {
    int i, r, t;

    /* generate the identity permutation to start with */
    for (i=1; i<=n; i++)
        perm[i] = i;

    /* randomly shuffle the permutation */
    for (i=1; i<=n; i++)
        {
        r = RandomNumber(i, n);
        t = perm[i]; perm[i] = perm[r]; perm[r] = t;
        }
    }


void RandomDelay(mean, adjust)
/*********************************************************************
random_sleep sleeps according to the TPC specification
*********************************************************************/
    double mean;
    double adjust;
    {
    double secs;
    double exponential();

    secs = exponential(mean);

    delay(secs+adjust);
    }

double exponential(mean)
/*********************************************************************
exponential generates a reverse exponential distribution
*********************************************************************/
    double mean;
    {
    double x;
    double log();

#ifdef USE_DRAND48
    x = -log(1.0-drand48()) * mean;
#else
    x = -log(1.0-randy()) * mean;
#endif

    return x;
    }
```

```
void SetRandomSeed(val)
long val;
    {
#ifdef USE_DRAND48
    srand48(val);
#else
    RandySeedIter = val;
#endif
    }

void Randomize()
    {
    SetRandomSeed(time(0)+getpid());
    }

/* Random number generator from Proceeding of the ACM */
#define RANDY_A_VAL 16807
/* 2^31 - 1 */
#define RANDY_M_VAL 2147483647
/* m / a */
#define RANDY_Q_VAL 127773
/* m % a */
#define RANDY_R_VAL 2836

double randy()
{
  long    hi, lo, test;

  hi = RandySeedIter / RANDY_Q_VAL;
  lo = RandySeedIter % RANDY_Q_VAL;

  test = (RANDY_A_VAL * lo) - (RANDY_R_VAL * hi);
  RandySeedIter = (test > 0) ? test : test + RANDY_M_VAL;

  return( (double)RandySeedIter / (double)RANDY_M_VAL );
}  /* end of fn randy  */
```

results_file.c

```
/*****************************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 14:02:01 $

 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
*****************************************************************************/
#include <unistd.h>
#include <stdio.h>
#include <stdlib.h>
#include "tpcc.h"



static FILE *rfile;

results_open(id)
    int id;
    {
    char fullname[128];
    char *basename;

    /* get the base file name for the deferred results */
    /*
     * Make it a directory under /tmp so at least we can set it to a
     * symbolic link in case /tmp doesn't have enough room.
     */
    basename = getenv("TPCC_RESULTS_FILE");
    if (basename == NULL)
```

```
    basename = "/tmp/TPCC_RESULTS_FILE";

  /* create the full file name */
  sprintf(fullname, "%s.%d", basename, id);

  /* open the file */
  unlink(fullname);
  rfile = fopen(fullname, "wb");
  if (rfile == NULL)
    syserror("Delivery server %d can't open file %s\n", id, fullname);

  /* allocate a larger buffer */
  }


results(t)
  delivery_trans *t;
  {
  if (fwrite(t, sizeof(*t), 1, rfile) != 1)
    syserror("Delivery server: Can't post results\n");
  }


results_close()
  {
  if (fclose(rfile) < 0)
    syserror("Delivery server can't close file\n");
  }
```

server_default.c

```
/*****************************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 10:56:54 $

 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
*****************************************************************************/
int server_default = 1;
```

shm.c

```
#include <stdio.h>
#include <values.h>
#include <unistd.h>
#include <sys/types.h>
#include <sys/shm.h>
#include "shm.h"

void *
attach_shm(key, size, create)
/*********************************************************************
attach_shm attaches to the shared memory
*********************************************************************/
key_t   key;
size_t size;
int     create;
  {
  void *ptr;
  int shmid;
  int flag;

  /* create the shm if it doesn't already exist */
  flag = (create) ? 0777|IPC_CREAT|IPC_SHARE32 : 0777;

  shmid = shmget(key, size, flag);
  if (shmid < 0) {
        if (create) {
                perror("attach_shm");
    syserror("Can't create shared memory.\n");
        } else {
    return NULL;
        }
  }

  /* attach to the shared memory */
  ptr = shmat(shmid, NULL, 0);
  if (ptr == (void *)-1)
    syserror("Can't attach shared memory\n");

  return ptr;
}

void
detach_shm(ptr)
/*********************************************************************
cleanup_shm detaches from the shared memory region
*********************************************************************/
void *ptr;
  {
  shmdt((void *)ptr);
  }
```

shm.h

```
/*****************************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 10:56:54 $

 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
*****************************************************************************/
#ifndef SHM_INCLUDED
#define SHM_INCLUDED

#include <time.h>
#include "tpcc.h"
#include "shm_lookup.h"

#define SHMKEY_DRIVER 55555
shm_t *shm;  /* pointer to shared memory for each driver */

int ndrivers;
int drivernum;
int nclients;
int clientnum;

extern void *attach_shm();
extern void detach_shm();

#endif /* SHM_INCLUDED */
```

shm2.h

```
/*****************************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 10:56:54 $

 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
*****************************************************************************/
#ifndef SHM_INCLUDED
```

```
#define SHM_INCLUDED

#include <time.h>
#include "tpcc.h"
#include "shm_lookup2.h"

#define SHMKEY_DRIVER 55555
shm_t *shm;  /* pointer to shared memory for each driver */

int ndrivers;
int drivernum;
int nclients;
int clientnum;

extern void *attach_shm();
extern void detach_shm();

#endif /* SHM_INCLUDED */
```

shm_lookup.h

```
/*******************************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 14:01:58 $

 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
*******************************************************************************/
#ifndef SHM_LOOKUP_INCLUDED
#define SHM_LOOKUP_INCLUDED

#include <time.h>
#include "tpcc.h"
#include "spinlock.h"

typedef struct
    {
    char *old;
    char *next;
    char buffer[5000000];   /* big enough for two+ seconds of data */
    } success_buf;

#define S_FIRST  (shm->success.buffer)
#define S_LAST   (shm->success.buffer + sizeof(shm->success.buffer))
#define S_NEXT   shm->success.next       /* points to next slot to fill */
#define S_OLD    shm->success.old        /* points to last unfilled slot */

/* states to sync with multiple drivers */
/*
 * WAIT -- driver is waiting for all users to login
 * RUN  -- all users logged in, running transactions
 * STOP -- test is over, stop
 * CONFIGURE -- driver is in process of configuring shared memory
 */

#define WAIT      0
#define RUN       1
#define STOP      2
#define CONFIGURE 3

typedef struct {
    double total_response[6];
    int count[6];
    int bad[6];
    } stat_t;


/* Now, the entire shared memory declaration */

typedef struct
    {

    /* control information */
    lock_t          s_shm_lock; /* spin lock for accessing shared memory */
    volatile int    s_state;    /* state of the machine */
    volatile int    s_stopflag;
    volatile int    s_desired;  /* # users we want attached */
    volatile int    s_attached; /* # users we know are attached */
    volatile int    s_spawned;  /* # processes active that could attach */
    volatile int    s_transactions; /* # transactions so far */
/*  volatile int   s_sync; *//* synchronize the log output after every trans */
    volatile int    s_first_user;

    /* configuration parameters */
    volatile int    s_scale;
    volatile int    s_max_transactions;
    volatile int    s_max_duration;
    volatile double s_fudge;
    volatile int    s_server;        /* tpca or tpcb */
    volatile int    s_dbg;           /* single user debugging */
    volatile double s_think_factor;
    volatile int    s_post_transactions;

    /* run time statistics */
    stat_t s_stat[1];
    struct timeval start_time;

    /* success buffer */
    success_buf success;

    } shm_t;

#define first_user shm->s_first_user
#define shm_lock shm->s_shm_lock
#define state shm->s_state
#define file_lock shm->s_log.l_file_lock
#define attached shm->s_attached
#define spawned shm->s_spawned
#define desired shm->s_desired
#define stopflag shm->s_stopflag
#define scale shm->s_scale
#define max_transactions shm->s_max_transactions
#define max_duration shm->s_max_duration
#define fudge  shm->s_fudge
#define transactions shm->s_transactions
#define sync shm->s_sync
#define server shm->s_server
#define stat   shm->s_stat
#define dbg    shm->s_dbg
#define think_factor shm->s_think_factor
#define post_transactions shm->s_post_transactions

extern shm_t *shm;
extern int shmid;

extern int ndrivers;
extern int drivernum;
extern int nclients;
extern int clientnum;

#endif /* SHM_INCLUDED */
```

shm_lookup2.h

```
/*******************************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 14:01:58 $
```

```
 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
*****************************************************************************/
#ifndef SHM_LOOKUP_INCLUDED
#define SHM_LOOKUP_INCLUDED

#include <time.h>
#include "tpcc.h"
#include "spinlock.h"

typedef struct
    {
    char *old;
    char *next;
    char buffer[2000000];   /* big enough for two+ seconds of data */
    } success_buf;

#define S_FIRST  (shm->success.buffer)
#define S_LAST   (shm->success.buffer + sizeof(shm->success.buffer))
#define S_NEXT   shm->success.next       /* points to next slot to fill */
#define S_OLD    shm->success.old        /* points to last unfilled slot */

/* states to sync with multiple drivers */
/*
 * WAIT -- driver is waiting for all users to login
 * RUN  -- all users logged in, running transactions
 * STOP -- test is over, stop
 * CONFIGURE -- driver is in process of configuring shared memory
 */

#define WAIT      0
#define RUN       1
#define STOP      2
#define CONFIGURE 3

typedef struct {
    double total_response[6];
    int count[6];
    int bad[6];
    } stat_t;


/* Now, the entire shared memory declaration */
typedef struct
    {

    /* control information */
    lock_t          s_shm_lock; /* spin lock for accessing shared memory */
    volatile int    s_state;    /* state of the machine */
    volatile int    s_stopflag;
    volatile int    s_desired;  /* # users we want attached */
    volatile int    s_attached; /* # users we know are attached */
    volatile int    s_spawned;  /* # processes active that could attach */
    volatile int    s_transactions; /* # transactions so far */
/*  volatile int   s_sync; *//* synchronize the log output after every trans */
    volatile int    s_first_user;

    /* configuration parameters */
    volatile int    s_scale;
    volatile int    s_max_transactions;
    volatile int    s_max_duration;
    volatile double  s_fudge;
    volatile int    s_server;        /* tpca or tpcb */
    volatile int    s_dbg;           /* single user debugging */
    volatile double  s_think_factor;
    volatile int    s_post_transactions;

    /* run time statistics */
    stat_t s_stat[1];
    struct timeval start_time;

    /* success buffer */
    success_buf success;

    } shm_t;

#define first_user shm->s_first_user
#define shm_lock shm->s_shm_lock
#define state shm->s_state
#define file_lock shm->s_log.l_file_lock
#define attached shm->s_attached
#define spawned shm->s_spawned
#define desired shm->s_desired
#define stopflag shm->s_stopflag
#define scale shm->s_scale
#define max_transactions shm->s_max_transactions
#define max_duration shm->s_max_duration
#define fudge  shm->s_fudge
#define transactions shm->s_transactions
#define sync shm->s_sync
#define stat   shm->s_stat
#define dbg    shm->s_dbg
#define think_factor shm->s_think_factor
#define post_transactions shm->s_post_transactions

extern shm_t *shm;
extern int shmid;

extern int ndrivers;
extern int drivernum;
extern int nclients;
extern int clientnum;

#endif /* SHM_INCLUDED */
```

spinlock.c

```
/*****************************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 10:56:54 $

 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
*****************************************************************************/
#include "spinlock.h"


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

Locking routines to give exclusive access to shared memory

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

void
lock(latch)
/*****************************************************************
lock gets exclusive access to the shared memory data structures
*****************************************************************/
    lock_t latch;
    {
    while (!tas(addr64(latch)))
        delay(.01);
    }


void
unlock(latch)
```

```
/*************************************************************
unlock releases exclusive access to shmem
*************************************************************/
    lock_t latch;
    {
    *addr64(latch) = 1;
    }


void
init_lock(latch)
/*****************************************************************
init_lock initializes the lock structure
*****************************************************************/
    lock_t latch;
    {
    unlock(latch);
    }
```

spinlock.h

```
/*****************************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 10:56:54 $

 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
*****************************************************************************/
#ifndef SPINLOCK_HEADER_INCLUDED
#define SPINLOCK_HEADER_INCLUDED

typedef struct
    {
    int wx[32];
    int count;
    int conflict;
    int sleep;
    } lock_t[1];

/* macro to point to the relevant lock word */
#define addr64(latch)     ((int *)(((unsigned long)latch + 63UL) & ~63UL))

extern void lock();
extern void unlock();
extern void init_lock();
extern int * tas(int *);

#endif
```

A.3 Transaction Source

client/service.c

```
/*****************************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 10:53:26 $

 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
*****************************************************************************/

#include <unistd.h>
#include <sys/types.h>
#include "tpcc.h"
#include "atmi.h"

extern int userid;
char *cmd          = NULL;

int tpsvrinit(argc, argv)
int    argc;
char **argv;
{
    char c;
    int ret;

    /*
     * search for the options
     *    "-n" server number
     *    "-S" server program
     * purpose: to get svr_id & progname for DVRY_LOG files
     *
     */
    while ((c = getopt(argc, argv, "n:S:h:")) != EOF) {
        switch(c) {
        case 'n':
            userid = atoi(optarg);
            break;
        case 'S':
            cmd  = optarg;
            break;
        }
    }

    ret = transaction_begin(userid);
    results_open(userid);

    return 0;
}


void NEWO_SVC(svcinfo)
TPSVCINFO *svcinfo;
{
    neworder_transaction((neworder_trans *)svcinfo->data);
    tpreturn(TPSUCCESS, 0, svcinfo->data, svcinfo->len, 0);
}


void PMT_SVC(svcinfo)
TPSVCINFO *svcinfo;
{

    payment_transaction((payment_trans *)svcinfo->data);
    tpreturn(TPSUCCESS, 0, svcinfo->data, svcinfo->len, 0);
}

void ORDS_SVC(svcinfo)
TPSVCINFO *svcinfo;
{
    ordstat_transaction((ordstat_trans *)svcinfo->data);
    tpreturn(TPSUCCESS, 0, svcinfo->data, svcinfo->len, 0);
}

void STKL_SVC(svcinfo)
TPSVCINFO *svcinfo;
{
    stocklev_transaction((stocklev_trans *)svcinfo->data);
    tpreturn(TPSUCCESS, 0, svcinfo->data, svcinfo->len, 0);
}

void DVRY_SVC(svcinfo)
TPSVCINFO *svcinfo;
{
```

```
    delivery_trans *t = (delivery_trans *)svcinfo->data;
    gettimeofday(t->deque, NULL);
    delivery_transaction(t);
    gettimeofday(t->complete, NULL);
    results(t);

    /* Why do we return things ? */
    tpreturn(TPSUCCESS, 0, svcinfo->data, svcinfo->len, 0);
}

/*****************************************************************
tpsrvdone cleans up after the TPC transaction service
*****************************************************************/
void tpsvrdone()
{
    transaction_done();
    results_close();

    /* Log a message saying we are done */
    userlog("TUXEDO service %s has shutdown\n", cmd);
}
```

client/oracle/transaction.c

```
#include "ora_tpcc.h"
#include <time.h>
#include "tpcc.h"

#ifdef __STDC__
#include "ociapr.h"
#else
#include "ocikpr.h"
#endif

extern TPCinit(int, char*, char*);

int     numtrans = 0;

transaction_done ()
{
   fprintf(stderr, "About to call TPCexit\n");fflush(stderr);
   TPCexit();
   fprintf(stderr, "TPCexit after %d transcations \n", numtrans);fflush(stderr);
}

/* void  */
transaction_begin(id)
int id;
{
   int ret;

   if ((ret=TPCinit(id, "tpcc", "tpcc")) == -1)
   {
                fprintf(stderr, "TPCinit failure!\n");fflush(stderr);
      /* Error */
   }
   numtrans = 0;
   return ret;
}

void neworder_transaction(str)
neworder_trans *str;
{
   int i;
   struct newstruct ora_str;

   ora_str.newin.w_id = str->W_ID;
   ora_str.newin.d_id = str->D_ID;
   ora_str.newin.c_id = str->C_ID;
   for (i = 0; i < str->O_OL_CNT; i++) {
      ora_str.newin.ol_i_id[i] = str->item[i].OL_I_ID;
      ora_str.newin.ol_supply_w_id[i] = str->item[i].OL_SUPPLY_W_ID;
      ora_str.newin.ol_quantity[i] = str->item[i].OL_QUANTITY;
   }
   for (i = str->O_OL_CNT; i < 15; i++) {
      ora_str.newin.ol_i_id[i] = 0;
      ora_str.newin.ol_supply_w_id[i] = 0;
      ora_str.newin.ol_quantity[i] = 0;
   }

   numtrans++;
   if (TPCnew(&ora_str) == -1) {
      str->status = E_DB_ERROR;
      return;
   } else {
      str->status = OK;
   }

   str->O_ID = ora_str.newout.o_id;
   str->O_OL_CNT = ora_str.newout.o_ol_cnt;
   strncpy (str->C_LAST, ora_str.newout.c_last, 17);
   strncpy (str->C_CREDIT, ora_str.newout.c_credit, 3);
   str->C_DISCOUNT = (REAL) ora_str.newout.c_discount;
   str->W_TAX = (REAL) ora_str.newout.w_tax;
   str->D_TAX = (REAL) ora_str.newout.d_tax;
   strncpy (str->O_ENTRY_D, ora_str.newout.o_entry_d, 20);
   for (i = 0; i < ora_str.newout.o_ol_cnt; i++) {
      strncpy (str->item[i].I_NAME, ora_str.newout.i_name[i], 25);
      str->item[i].S_QUANTITY = ora_str.newout.s_quantity[i];
      str->item[i].brand_generic = ora_str.newout.brand_generic[i];
      str->item[i].I_PRICE = ora_str.newout.i_price[i]*100.0;  /* needs to be in cents */
   }
   str->status = ((ora_str.newout.status[0] != '\0') ? E_INVALID_ITEM : OK);
}

/*****************************************************************************
 * Payment Query
 *****************************************************************************/

void
payment_transaction(str)
payment_trans *str;
{
   int i;

   struct paystruct ora_str;

   ora_str.payin.w_id = str->W_ID;
   ora_str.payin.d_id = str->D_ID;
   ora_str.payin.c_w_id = str->C_W_ID;
   ora_str.payin.c_d_id = str->C_D_ID;
   ora_str.payin.h_amount = str->H_AMOUNT; /* Amount in cents */
   ora_str.payin.bylastname = str->byname;
   if (ora_str.payin.bylastname) {
      ora_str.payin.c_id = 0;
      strncpy (ora_str.payin.c_last, str->C_LAST, 17);
      ora_str.payin.c_last[16] = '\0';
      for (i = 15; ((i >= 0) && (ora_str.payin.c_last[i] == ' ')); i--)
         ora_str.payin.c_last[i] = '\0';
   }
   else {
      ora_str.payin.c_id = str->C_ID;
      strcpy (ora_str.payin.c_last, " ");
   }
   retries = 0;
```

```
  numtrans++;
  if (TPCpay (&ora_str)) {
    str->status = E_DB_ERROR;
    return;
  } else {
    str->status = OK;
  }

  strncpy (str->W_STREET_1, ora_str.payout.w_street_1, 21);
  strncpy (str->W_STREET_2, ora_str.payout.w_street_2, 21);
  strncpy (str->W_CITY, ora_str.payout.w_city, 21);
  strncpy (str->W_STATE, ora_str.payout.w_state, 3);
  strncpy (str->W_ZIP, ora_str.payout.w_zip, 10);
  strncpy (str->D_STREET_1, ora_str.payout.d_street_1, 21);
  strncpy (str->D_STREET_2, ora_str.payout.d_street_2, 21);
  strncpy (str->D_CITY, ora_str.payout.d_city, 21);
  strncpy (str->D_STATE, ora_str.payout.d_state, 3);
  strncpy (str->D_ZIP, ora_str.payout.d_zip, 10);
  str->C_ID = ora_str.payout.c_id;
  strncpy (str->C_FIRST, ora_str.payout.c_first, 17);
  strncpy (str->C_MIDDLE, ora_str.payout.c_middle, 3);
  strncpy (str->C_LAST, ora_str.payout.c_last, 17);
  strncpy (str->C_STREET_1, ora_str.payout.c_street_1, 21);
  strncpy (str->C_STREET_2, ora_str.payout.c_street_2, 21);
  strncpy (str->C_CITY, ora_str.payout.c_city, 21);
  strncpy (str->C_STATE, ora_str.payout.c_state, 3);
  strncpy (str->C_ZIP, ora_str.payout.c_zip, 10);
  strncpy (str->C_PHONE, ora_str.payout.c_phone, 17);
  strncpy (str->C_SINCE, ora_str.payout.c_since, 11);

  strncpy (str->C_CREDIT, ora_str.payout.c_credit, 3);
  str->C_CREDIT_LIM = (MONEY) ora_str.payout.c_credit_lim*100.0; /* needs to be in cents */
  str->C_DISCOUNT = (REAL) ora_str.payout.c_discount;
  str->C_BALANCE = (REAL) ora_str.payout.c_balance*100.0;  /* needs to be in cents */
  /* Oracle passes 201 characters, we copy 200 and terminate on 201.        */
  strncpy (str->C_DATA, ora_str.payout.c_data, 200);
  str->C_DATA[200] = '\0';
  strncpy (str->H_DATE, ora_str.payout.h_date, 20);
}

void
ordstat_transaction(str)
ordstat_trans *str;
{
  int i;

  struct ordstruct ora_str;

  ora_str.ordin.w_id = str->W_ID;
  ora_str.ordin.d_id = str->D_ID;
  ora_str.ordin.bylastname = str->byname;
  if (ora_str.ordin.bylastname) {
    ora_str.ordin.c_id = 0;
    strncpy (ora_str.ordin.c_last, str->C_LAST, 17);
    ora_str.ordin.c_last[16] = '\0';
    for (i = 15; ((i >= 0) && (ora_str.ordin.c_last[i] == ' ')); i--)
      ora_str.ordin.c_last[i] = '\0';
  }
  else {
    ora_str.ordin.c_id = str->C_ID;
    strcpy (ora_str.ordin.c_last, " ");
  }
  retries = 0;

  numtrans++;
  if (TPCord (&ora_str)) {
    str->status = E_DB_ERROR;
    return;
  } else {
    str->status = OK;
  }

  str->C_ID = ora_str.ordout.c_id;
  strncpy (str->C_LAST, ora_str.ordout.c_last, 17);
  strncpy (str->C_FIRST, ora_str.ordout.c_first, 17);
  strncpy (str->C_MIDDLE, ora_str.ordout.c_middle, 3);
  str->C_BALANCE = (MONEY) ora_str.ordout.c_balance*100.0; /* needs to be in cents */
  str->O_ID = ora_str.ordout.o_id;
  strncpy (str->O_ENTRY_DATE, ora_str.ordout.o_entry_d, 20);
  str->O_CARRIER_ID = ora_str.ordout.o_carrier_id;
  str->ol_cnt = ora_str.ordout.o_ol_cnt;
  for (i = 0; i < ora_str.ordout.o_ol_cnt; i++) {
    str->item[i].OL_SUPPLY_W_ID = ora_str.ordout.ol_supply_w_id[i];
    str->item[i].OL_I_ID = ora_str.ordout.ol_i_id[i];
    str->item[i].OL_QUANTITY = ora_str.ordout.ol_quantity[i];
    str->item[i].OL_AMOUNT = (MONEY) ora_str.ordout.ol_amount[i]*100.0;  /* needs to be in cents */
    strncpy (str->item[i].OL_DELIVERY_DATE, ora_str.ordout.ol_delivery_d[i], 11);
  }
}

/*****************************************************************************
 * Delivery Query
 *****************************************************************************/

void delivery_transaction(str)
delivery_trans *str;
{
  double tr_end;
  int i;

  struct delstruct ora_str;

  ora_str.delin.w_id         = str->W_ID;
  ora_str.delin.o_carrier_id = str->O_CARRIER_ID;
  retries      = 0;

  numtrans++;
  if (TPCdel (&ora_str)) {
    str->status = E_DB_ERROR;
    return;
  } else {
    str->status = OK;
  }

  for (i = 0; i < 10; i++) {
    if (del_o_id[i] <= 0) {
                str->order[i].status = E_NOT_ENOUGH_ORDERS;
    } else {
                str->order[i].status = OK;
                str->order[i].O_ID = del_o_id[i];
    }
  }
}

/*****************************************************************************
 * Stock Level Query
 *****************************************************************************/

void stocklev_transaction(str)
stocklev_trans *str;
{

  struct stostruct ora_str;
  ora_str.stoin.w_id = str->W_ID;
  ora_str.stoin.d_id = str->D_ID;
  ora_str.stoin.threshold = str->threshold;
  retries = 0;

  numtrans++;
```

```
  if (TPCsto (&ora_str)) {
    str->status = E_DB_ERROR;
    return;
  } else {
    str->status = OK;
  }
  str->low_stock = ora_str.stoout.low_stock;
}
```

client/oracle/tpccpl.c

```
#ifdef RCSID
static char *RCSid =
  "$Header: tpccpl.c 7030100.2 96/04/02 17:51:34 plai Generic<base> $ Copyr (c) 1994 Oracle";
#endif /* RCSID */


/*=========================================================================+
 |      Copyright (c) 1994  Oracle Corp, Redwood Shores, CA       |
 |                  OPEN SYSTEMS PERFORMANCE GROUP                 |
 |                       All Rights Reserved                       |
 +=========================================================================+
 | FILENAME
 |    tpccpl.c
 | DESCRIPTION
 |    TPC-C transactions in PL/SQL.
 |
 | Ordered rows of update of stock_item in new_order by item id to prevent
 | enqueue deadlocks - 11/18/99 - wbattist
 |
 | Fix bug in TPCnew for ordering rows of stock_item if number of items is
 | NITEMS - 03/9/00 - wbattist
 +=========================================================================*/

#include <stdio.h>
#include <time.h>
#include "ora_tpcc.h"
#ifdef TUX
#include <userlog.h>
#else
#include <stdarg.h>
#endif

#define SQLTXT "alter session set isolation_level = serializable"
#define SQLTXTTRC "alter session set sql_trace = true"
#define SQLTXTTIM "alter session set timed_statistics = true"

FILE *lfp;
FILE *fopen ();
#ifdef ORA_NT
#undef boolean
#include "dpbcore.h"
#define gettime dpbtimef
#else
extern double gettime ();
#endif
int proc_no = 0;
int logon = 0;
int new_init = 0;
int pay_init = 0;
int ord_init = 0;
int del_init = 0;
int sto_init = 0;
int res_init = 0;

int execstatus;
int errcode;

OCIEnv *tpcenv;
OCIServer *tpcsrv;
OCIError *errhp;
OCISvcCtx *tpcsvc;
OCISession *tpcusr;
OCIStmt *curi;


/* for stock-level transaction */

int w_id;
int d_id;
int c_id;
int threshold;
int low_stock;

/* for delivery transaction */

int del_o_id[10];
int retries;

/* for order-status transaction */

int bylastname;
char c_last[17];
char c_first[17];
char c_middle[3];
double c_balance;
int o_id;
text o_entry_d[20];
ub4  datelen;
int o_carrier_id;
int o_ol_cnt;
int ol_supply_w_id[15];
int ol_i_id[15];
int ol_quantity[15];
int ol_amount[15];
ub4  ol_del_len[15];
text ol_delivery_d[15][11];

/* for payment transaction */

int c_w_id;
int c_d_id;
int h_amount;
char w_street_1[21];
char w_street_2[21];
char w_city[21];
char w_state[3];
char w_zip[10];
char d_street_1[21];
char d_street_2[21];
char d_city[21];
char d_state[3];
char d_zip[10];
char c_street_1[21];
char c_street_2[21];
char c_city[21];
char c_state[3];
char c_zip[10];
char c_phone[17];
ub4  sincelen;
text c_since_d[11];
float c_discount;
char c_credit[3];
int c_credit_lim;
char c_data[201];
ub4 hlen;
text h_date[20];
```

```
/* for new order transaction */

int nol_i_id[15];
int nol_supply_w_id[15];
int nol_quantity[15];
int nol_quanti10[15];
int nol_quanti91[15];
int nol_ytdqty[15];
int nol_amount[15];
int o_all_local;
float w_tax;
float d_tax;
float total_amount;
char i_name[15][25];
int s_quantity[15];
char brand_gen[15];
int i_price[15];
char brand_generic[15][1];
int status;
int tracelevel = 0;

OCIDate cr_date;
OCIDate c_since;
OCIDate o_entry_d_base;
OCIDate ol_d_base[15];
dvoid *xmem;

#ifdef AVOID_DEADLOCK
int indx[15], ordl_cnt;
void swap(struct newstruct *str, int i, int j);
void q_sort(int *arr, struct newstruct *str, int left, int right);
/* void disitems(int *itm, int wid, int did, int cid, int cnt); */
#endif

/*
extern char oracle_home[256];
*/

/* NewOrder Binding stuff */



#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(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);
/* vmm313    TPCexit(1); */
/* vmm313    exit(1); */
  case OCI_INVALID_HANDLE:
    fprintf(stderr,"Module %s Line %d\n", fname, lineno);
    fprintf(stderr,"Error - OCI_INVALID_HANDLE\n");
    TPCexit(1);
    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);
}


FILE  *vopen(fnam,mode)
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 %d\n",fnam,fd);
        exit(-1);
    }
    return(fd);
}

int sqlfile(fnam,linebuf)
```

```
char   *fnam;
text   *linebuf;
{
FILE *fd;
int nulpt = 0;
char realfile[512];

#ifdef  DEBUG
  fprintf(stderr, "sqlfile() fnam: %s,  linebuf: %#x\n", fnam, linebuf);
#endif

/*
    sprintf(realfile,"%s/bench/tpc/tpcc/blocks/%s",oracle_home,fnam);
*/
    sprintf(realfile,"%s",fnam);
    fd = vopen(realfile,"r");
    while (fgets((char *)linebuf+nulpt, SQL_BUF_SIZE,fd))
    {
        nulpt = strlen((char *)linebuf);
    }
    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)

{
```

```
  if (new_init) {
    tkvcndone();
    new_init = 0;
  }
  if (pay_init) {
    tkvcpdone();
    pay_init = 0;
  }
  if (ord_init) {
    tkvcodone();
    ord_init = 0;
  }
  if (del_init) {
    tkvcddone();
    del_init = 0;
  }
  if (sto_init) {
    tkvcsdone();
    sto_init = 0;
  }


  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);

  if (lfp) {
    fclose (lfp);
    lfp = NULL;
  }

}



TPCinit (id, uid, pwd)

int id;
char *uid;
char *pwd;

{

  char filename[40];
  text stmbuf[100];

  proc_no = id;
  sprintf (filename, "tpcc_%d.del", proc_no);
  if ((lfp = fopen (filename, "w")) == NULL) {
#ifdef TUX
      userlog ("Error in TPC-C server %d: Failed to open %s\n",
            proc_no, filename);
#else
      fprintf (stderr, "Error in TPC-C server %d: Failed to open %s\n",
            proc_no, filename);
#endif
      return (-1);
  }

  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);

  /* run all transaction in serializable mode */

  OCIHandleAlloc(tpcenv, (dvoid **)&curi, OCI_HTYPE_STMT, 0, (dvoid**)0);
  sprintf ((char *) stmbuf, SQLTXT);
  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);


/*
This is done in cvdrv.c
  if (tracelevel == 2) {
    OCIHandleAlloc(tpcenv, (dvoid **)&curi, OCI_HTYPE_STMT, 0, (dvoid**)0);
    memset(stmbuf,0,100);
    sprintf ((char *) stmbuf, SQLTXTTRC);
    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((dvoid *)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, errhp, stmbuf, strlen((char *)stmbuf),
                                        OCI_NTV_SYNTAX, OCI_DEFAULT);
    OCIERROR(errhp, OCIStmtExecute(tpcsvc, curi, errhp,1,0,0,0,OCI_DEFAULT));
    OCIHandleFree((dvoid *)curi, OCI_HTYPE_STMT);
  }

  logon = 1;

  OCIERROR(errhp,OCIDateSysDate(errhp,&cr_date));

  if (tkvcninit ()) {  /* new order */
    TPCexit ();
    return (-1);
  }
  else
    new_init = 1;

  if (tkvcpinit ()) {   /* payment */
    TPCexit ();
    return (-1);
  }
  else
    pay_init = 1;

  if (tkvcoinit ()) {   /* order status */
    TPCexit ();
    return (-1);
  }
  else
    ord_init = 1;


  if (tkvcdinit ()) {   /* delivery */
    TPCexit ();
    return (-1);
  }
  else
    del_init = 1;
```

```
   if (tkvcsinit ()) {   /* stock level */
      TPCexit ();
      return (-1);
   }
   else
      sto_init = 1;

   return (0);

}



TPCnew (str)

struct newstruct *str;

{

   int i;

   w_id = str->newin.w_id;
   d_id = str->newin.d_id;
   c_id = str->newin.c_id;
   for (i = 0; i < 15; i++) {
      nol_i_id[i] = str->newin.ol_i_id[i];
      nol_supply_w_id[i] = str->newin.ol_supply_w_id[i];
      nol_quantity[i] = str->newin.ol_quantity[i];
   }
   retries = 0;

#ifdef AVOID_DEADLOCK

   ordl_cnt = NITEMS;

   for (i = 0; i < NITEMS; i++) {
      if (nol_i_id[i] == 0) {
         ordl_cnt = i;
         break;
      }
   }

   for(i=0;i<15;i++)
     indx[i] = i;

   q_sort(nol_i_id,str,0,ordl_cnt-1);

/*   disitems(nol_i_id, w_id, d_id, c_id, ordl_cnt); */
#endif

/*
   vgetdate(cr_date); */

   OCIERROR(errhp,OCIDateSysDate(errhp,&cr_date));

   if (str->newout.terror = tkvcn ()) {
      if (str->newout.terror != RECOVERR)
         str->newout.terror = IRRECERR;
      return (-1);
   }

   /* fill in date for o_entry_d from time in beginning of txn*/
/*
   cvtdmyhms(cr_date,o_entry_d);
*/
    datelen = sizeof(o_entry_d);
    OCIERROR(errhp,
       OCIDateToText(errhp,&cr_date,(text*)FULLDATE,SIZ(FULLDATE),(text*)0,0,
                  &datelen,o_entry_d));
   str->newout.terror = NOERR;
   str->newout.o_id = o_id;
   str->newout.o_ol_cnt = o_ol_cnt;
   strncpy (str->newout.c_last, c_last, 17);
   strncpy (str->newout.c_credit, c_credit, 3);
   str->newout.c_discount = c_discount;
   str->newout.w_tax = (float)(w_tax);
   str->newout.d_tax = (float)(d_tax);
   strncpy (str->newout.o_entry_d, (char*)o_entry_d, 20);
   str->newout.total_amount = total_amount;
   for (i = 0; i < o_ol_cnt; i++) {
      strncpy (str->newout.i_name[i], i_name[i], 25);
      str->newout.s_quantity[i] = s_quantity[i];
      str->newout.brand_generic[i] = brand_generic[i][0];
      str->newout.i_price[i] = (float)(i_price[i])/100;
      str->newout.ol_amount[i] = (float)(nol_amount[i])/100;
   }
#ifdef AVOID_DEADLOCK
    q_sort(indx,str,0,ordl_cnt-1);
#endif

   if (status)
      strcpy (str->newout.status, "Item number is not valid");
   else
      str->newout.status[0] = '\0';
   str->newout.retry = retries;
#if defined(TOP)  || defined(TUX)    /* changed mjb 17 feb for tuxedo */
   return(1);
#else
   return (0);
#endif

}



TPCpay (str)

struct paystruct *str;

{

   w_id = str->payin.w_id;
   d_id = str->payin.d_id;
   c_w_id = str->payin.c_w_id;
   c_d_id = str->payin.c_d_id;
   h_amount = str->payin.h_amount;
   bylastname = str->payin.bylastname;

/*
   vgetdate(cr_date);  */
   OCIERROR(errhp,OCIDateSysDate(errhp,&cr_date));

   if (bylastname) {
      c_id = 0;
      strncpy (c_last, str->payin.c_last, 17);
   }
   else {
      c_id = str->payin.c_id;
      strcpy (c_last, " ");
   }
   retries = 0;

   if (str->payout.terror = tkvcp ()) {
      if (str->payout.terror != RECOVERR)
         str->payout.terror = IRRECERR;
      return (-1);
   }

/*
```

```
   cvtdmyhms(cr_date,h_date);
*/
        hlen=SIZ(h_date);
        OCIERROR(errhp,OCIDateToText(errhp,&cr_date,
              (text*)FULLDATE,strlen(FULLDATE),(text*)0,0,&hlen,h_date));

/*
   cvtdmy(c_since,c_since_d);
*/
        sincelen=SIZ(c_since_d);
        OCIERROR(errhp,OCIDateToText(errhp,&c_since,
          (text*)SHORTDATE,strlen(SHORTDATE),(text*)0,0,&sincelen,c_since_d));



   str->payout.terror = NOERR;
   strncpy (str->payout.w_street_1, w_street_1, 21);
   strncpy (str->payout.w_street_2, w_street_2, 21);
   strncpy (str->payout.w_city, w_city, 21);
   strncpy (str->payout.w_state, w_state, 3);
   strncpy (str->payout.w_zip, w_zip, 10);
   strncpy (str->payout.d_street_1, d_street_1, 21);
   strncpy (str->payout.d_street_2, d_street_2, 21);
   strncpy (str->payout.d_city, d_city, 21);
   strncpy (str->payout.d_state, d_state, 3);
   strncpy (str->payout.d_zip, d_zip, 10);
   str->payout.c_id = c_id;
   strncpy (str->payout.c_first, c_first, 17);
   strncpy (str->payout.c_middle, c_middle, 3);
   strncpy (str->payout.c_last, c_last, 17);
   strncpy (str->payout.c_street_1, c_street_1, 21);
   strncpy (str->payout.c_street_2, c_street_2, 21);
   strncpy (str->payout.c_city, c_city, 21);
   strncpy (str->payout.c_state, c_state, 3);
   strncpy (str->payout.c_zip, c_zip, 10);
   strncpy (str->payout.c_phone, c_phone, 17);
   strncpy (str->payout.c_since, (char*)c_since_d, 11);
   strncpy (str->payout.c_credit, c_credit, 3);
   str->payout.c_credit_lim = (float)(c_credit_lim)/100;
   str->payout.c_discount = c_discount;
   str->payout.c_balance = (float)(c_balance)/100;
   strncpy (str->payout.c_data, c_data, 201);
   strncpy (str->payout.h_date, (char*)h_date, 20);
   str->payout.retry = retries;
#if defined(TOP)  || defined(TUX)   /* changed mjb 17 Feb */
   return(1);
#else
   return (0);
#endif

}



TPCord (str)

struct ordstruct *str;

{

   int i;
   w_id = str->ordin.w_id;
   d_id = str->ordin.d_id;
   bylastname = str->ordin.bylastname;
   if (bylastname) {
      c_id = 0;
      strncpy (c_last, str->ordin.c_last, 17);
   }
   else {
      c_id = str->ordin.c_id;
      strcpy (c_last, " ");
   }
   retries = 0;

   if (str->ordout.terror = tkvco ()) {
      if (str->ordout.terror != RECOVERR)
         str->ordout.terror = IRRECERR;
      return (-1);
   }

   datelen = sizeof(o_entry_d);
   OCIERROR(errhp,
       OCIDateToText(errhp,&o_entry_d_base,(text*)FULLDATE,SIZ(FULLDATE),(text*)0,0,
                &datelen,o_entry_d));

   str->ordout.terror = NOERR;
   str->ordout.c_id = c_id;
   strncpy (str->ordout.c_last, c_last, 17);
   strncpy (str->ordout.c_first, c_first, 17);
   strncpy (str->ordout.c_middle, c_middle, 3);
   str->ordout.c_balance = c_balance/100;
   str->ordout.o_id = o_id;
   strncpy (str->ordout.o_entry_d, (char*)o_entry_d, 20);
   if ( o_carrier_id == 11 )
      str->ordout.o_carrier_id = 0;
   else
      str->ordout.o_carrier_id = o_carrier_id;
   str->ordout.o_ol_cnt = o_ol_cnt;
   for (i = 0; i < o_ol_cnt; i++) {
      ol_delivery_d[i][10] = '\0';
      if ( !strcmp((char*)ol_delivery_d[i],"15-09-1911") )
                  strncpy((char*)ol_delivery_d[i],"NOT DELIVR",10);
      str->ordout.ol_supply_w_id[i] = ol_supply_w_id[i];
      str->ordout.ol_i_id[i] = ol_i_id[i];
      str->ordout.ol_quantity[i] = ol_quantity[i];
      str->ordout.ol_amount[i] = (float)(ol_amount[i])/100;
      strncpy (str->ordout.ol_delivery_d[i], (char*)ol_delivery_d[i], 11);
   }
   str->ordout.retry = retries;
#if defined(TOP)  || defined(TUX)
   return(1);
#else
   return (0);
#endif

}



TPCdel (str)

struct delstruct *str;

{

   double tr_end;
   int i;

   w_id = str->delin.w_id;
   o_carrier_id = str->delin.o_carrier_id;
   retries = 0;
/*
   vgetdate(cr_date);  */
   OCIERROR(errhp,OCIDateSysDate(errhp,&cr_date));

   if (str->delout.terror = tkvcd ()) {
     if(str->delout.terror == DEL_ERROR)
       return DEL_ERROR;
     if (str->delout.terror != RECOVERR)
       str->delout.terror = IRRECERR;
```

```
    return (-1);
  }

  /* Comment out for the HP kit.
  tr_end = gettime ();
  fprintf (lfp, "%d %d %f %f %d %d", str->delin.in_timing_int,
          (tr_end - str->delin.qtime) <= DELRT ? 1 : 0,
          str->delin.qtime, tr_end, w_id, o_carrier_id);
  for (i = 0; i < 10; i++) {
    fprintf (lfp, " %d %d", i + 1, del_o_id[i]);
    if (del_o_id[i] <= 0) {
#ifdef TUX
      userlog ("DELIVERY: no new order for w_id: %d, d_id %d\n",
               w_id, i + 1);
#else
      fprintf (stderr, "DELIVERY: no new order for w_id: %d, d_id %d\n",
               w_id, i + 1);
#endif
    }
  }
  fprintf (lfp, " %d\n", retries);
  */

  str->delout.terror = NOERR;
  str->delout.retry = retries;
#if defined(TOP) || defined(TUX)   /* changed mjb 17 feb */
  return(1);
#else
  return (0);
#endif

}



TPCsto (str)

struct stostruct *str;

{

  w_id = str->stoin.w_id;
  d_id = str->stoin.d_id;
  threshold = str->stoin.threshold;
  retries = 0;

  if (str->stoout.terror = tkvcs ()) {
    if (str->stoout.terror != RECOVERR)
      str->stoout.terror = IRRECERR;
    return (-1);
  }

  str->stoout.terror = NOERR;
  str->stoout.low_stock = low_stock;
  str->stoout.retry = retries;
#if defined(TOP) || defined(TUX) /* changed mjb 17 feb */
  return(1);
#else
  return (0);
#endif

}

#ifdef AVOID_DEADLOCK

void q_sort(int *arr,struct newstruct *str,int left, int right)
{
 int i, last;

 if(left >= right)
   return;
 swap(str,left,(left+right)/2);
 last = left;
 for(i=left+1;i<=right;i++)
   if(arr[i] < arr[left])
     swap(str,last,i);
 swap(str,left,last);
 q_sort(arr,str,left,last-1);
 q_sort(arr,str,last+1,right);
}

void swap(struct newstruct *str, int i, int j)
{
 int temp;
 float tempf;
 char tmpstr[25];
 char tmpch;

 temp = indx[i];
 indx[i] = indx[j];
 indx[j] = temp;

 temp = nol_i_id[i];
 nol_i_id[i] = nol_i_id[j];
 nol_i_id[j] = temp;

 temp = nol_supply_w_id[i];
 nol_supply_w_id[i] = nol_supply_w_id[j];
 nol_supply_w_id[j] = temp;

 temp = nol_quantity[i];
 nol_quantity[i] = nol_quantity[j];
 nol_quantity[j] = temp;

 strcpy(tmpstr,str->newout.i_name[i]);
 strcpy(str->newout.i_name[i],str->newout.i_name[j]);
 strcpy(str->newout.i_name[j],tmpstr);

 temp = str->newout.s_quantity[i];
 str->newout.s_quantity[i] = str->newout.s_quantity[j];
 str->newout.s_quantity[j] = temp;

 tmpch = str->newout.brand_generic[i];
 str->newout.brand_generic[i] = str->newout.brand_generic[j];
 str->newout.brand_generic[j] = tmpch;

 tempf = str->newout.i_price[i];
 str->newout.i_price[i] = str->newout.i_price[j];
 str->newout.i_price[j] = tempf;

 tempf = str->newout.ol_amount[i];
 str->newout.ol_amount[i] = str->newout.ol_amount[j];
 str->newout.ol_amount[j] = tempf;

}
/*
void disitems(itm, wid, did, cid, cnt)
int *itm;
int  wid;
int  did;
int  cid;
int  cnt;
{
 int i;
 int ordered = TRUE;

 for (i=1; i<15, itm[i]; i++)
   if (itm[i-1] > itm[i])
   {
     ordered = FALSE;
```

```
    break;
   }

  if (ordered)
    return;

  printf("w=%d, d=%d, c=%d, cnt=%d\n", wid, did, cid, cnt);
  for (i=0; i<15, itm[i] ; i++)
     printf("%d ", itm[i]);

  printf("\n");
}
*/
#endif
```

client/oracle/plnew.c

```
#ifdef RCSID
static char *RCSid =
   "$Header: tkvcnew.c 21-apr-98.18:32:59 rdecker Exp $ Copyr (c) 1994 Oracle";
#endif /* RCSID */

/*=================================================================+
 |       Copyright (c) 1996 , 1997, 1998 Oracle Corp, Redwood Shores, CA       |
 |                  OPEN SYSTEMS PERFORMANCE GROUP                 |
 |                       All Rights Reserved                       |
 +=================================================================+
 | FILENAME
 |    plnew.c
 | DESCRIPTION
 |    OCI version (using PL/SQL stored procedure) of
 |    NEW ORDER transaction in TPC-C benchmark.
 +=================================================================*/

#include "ora_tpcc.h"
#ifdef TUX
#include <userlog.h>
#endif
#include "tpccflags.h"

extern void userlog();

#ifdef PLSQLNO
#define SQLTXT2 "BEGIN initnew.new_init(:idx1arr); END;"
#else
#define SQLTXT2 "UPDATE stok SET s_order_cnt = s_order_cnt + 1, \
   s_ytd = s_ytd + :ol_quantity, s_remote_cnt = s_remote_cnt + :s_remote, \
   s_quantity = :s_quantity \
   WHERE rowid = :s_rowid"

#define SQLTXT3 "\
SELECT 0,stok.rowid,i_price,i_name,i_data,s_dist_%02d,s_data,s_quantity \
FROM item,stok WHERE i_id = :10 AND s_w_id = :30 AND s_i_id = i_id UNION ALL \
SELECT 1,stok.rowid,i_price,i_name,i_data,s_dist_%02d,s_data,s_quantity \
FROM item,stok WHERE i_id = :11 AND s_w_id = :31 AND s_i_id = i_id UNION ALL \
SELECT 2,stok.rowid,i_price,i_name,i_data,s_dist_%02d,s_data,s_quantity \
FROM item,stok WHERE i_id = :12 AND s_w_id = :32 AND s_i_id = i_id UNION ALL \
SELECT 3,stok.rowid,i_price,i_name,i_data,s_dist_%02d,s_data,s_quantity \
FROM item,stok WHERE i_id = :13 AND s_w_id = :33 AND s_i_id = i_id UNION ALL \
SELECT 4,stok.rowid,i_price,i_name,i_data,s_dist_%02d,s_data,s_quantity \
FROM item,stok WHERE i_id = :14 AND s_w_id = :34 AND s_i_id = i_id UNION ALL \
SELECT 5,stok.rowid,i_price,i_name,i_data,s_dist_%02d,s_data,s_quantity \
FROM item,stok WHERE i_id = :15 AND s_w_id = :35 AND s_i_id = i_id UNION ALL \
SELECT 6,stok.rowid,i_price,i_name,i_data,s_dist_%02d,s_data,s_quantity \
FROM item,stok WHERE i_id = :16 AND s_w_id = :36 AND s_i_id = i_id UNION ALL \
SELECT 7,stok.rowid,i_price,i_name,i_data,s_dist_%02d,s_data,s_quantity \
FROM item,stok WHERE i_id = :17 AND s_w_id = :37 AND s_i_id = i_id UNION ALL \
SELECT 8,stok.rowid,i_price,i_name,i_data,s_dist_%02d,s_data,s_quantity \
FROM item,stok WHERE i_id = :18 AND s_w_id = :38 AND s_i_id = i_id UNION ALL \
SELECT 9,stok.rowid,i_price,i_name,i_data,s_dist_%02d,s_data,s_quantity \
FROM item,stok WHERE i_id = :19 AND s_w_id = :39 AND s_i_id = i_id UNION ALL \
SELECT 10,stok.rowid,i_price,i_name,i_data,s_dist_%02d,s_data,s_quantity \
FROM item,stok WHERE i_id = :20 AND s_w_id = :40 AND s_i_id = i_id UNION ALL \
SELECT 11,stok.rowid,i_price,i_name,i_data,s_dist_%02d,s_data,s_quantity \
FROM item,stok WHERE i_id = :21 AND s_w_id = :41 AND s_i_id = i_id UNION ALL \
SELECT 12,stok.rowid,i_price,i_name,i_data,s_dist_%02d,s_data,s_quantity \
FROM item,stok WHERE i_id = :22 AND s_w_id = :42 AND s_i_id = i_id UNION ALL \
SELECT 13,stok.rowid,i_price,i_name,i_data,s_dist_%02d,s_data,s_quantity \
FROM item,stok WHERE i_id = :23 AND s_w_id = :43 AND s_i_id = i_id UNION ALL \
SELECT 14,stok.rowid,i_price,i_name,i_data,s_dist_%02d,s_data,s_quantity \
FROM item,stok WHERE i_id = :24 AND s_w_id = :44 AND s_i_id = i_id"


#define SQLTXT4 "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, :null_date, :ol_i_id, :ol_supply_w_id, :ol_quantity, \
   :ol_amount, :ol_dist_info)"
#endif  /* PLSQLNO */

#define NITEMS 15
#define ROWIDLEN 20
#define OCIROWLEN 20

sb4 no_data(dvoid *ctxp, OCIBind *bp, ub4 iter, ub4 index,
            dvoid **bufpp, ub4 *alenp, ub1 *piecep,
            dvoid **indpp)
{
  *bufpp = (dvoid*)0;
  *alenp =0;
  *indpp = (dvoid*)0;
  *piecep =OCI_ONE_PIECE;
  return (OCI_CONTINUE);
}
struct newctx {
  sb2 nol_i_id_ind[NITEMS];
  sb2 nol_supply_w_id_ind[NITEMS];
  sb2 nol_quantity_ind[NITEMS];
  sb2 nol_amount_ind[NITEMS];
  sb2 i_name_ind[NITEMS];
  sb2 s_quantity_ind[NITEMS];
  sb2 i_price_ind[NITEMS];
  sb2 ol_w_id_ind[NITEMS];
  sb2 ol_d_id_ind[NITEMS];
  sb2 ol_o_id_ind[NITEMS];
  sb2 ol_number_ind[NITEMS];
  sb2 cons_ind[NITEMS];
  sb2 s_rowid_ind[NITEMS];
  sb2 s_remote_ind[NITEMS];
  sb2 s_quant_ind[NITEMS];
  sb2 i_data_ind[NITEMS];
  sb2 s_data_ind[NITEMS];
  sb2 s_dist_info_ind[NITEMS];
  sb2 ol_dist_info_ind[NITEMS];
  sb2 null_date_ind[NITEMS];
#ifdef PLSQLNO
  sb2 s_bg_ind[NITEMS];
#endif

  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 i_data_len[NITEMS];
  ub2 s_dist_info_len[NITEMS];
  ub2 s_data_len[NITEMS];
  ub2 ol_w_id_len[NITEMS];
  ub2 ol_d_id_len[NITEMS];
  ub2 ol_o_id_len[NITEMS];
  ub2 ol_number_len[NITEMS];
  ub2 cons_len[NITEMS];
  ub2 s_rowid_len[NITEMS];
  ub2 s_remote_len[NITEMS];
  ub2 s_quant_len[NITEMS];
  ub2 ol_dist_info_len[NITEMS];
  ub2 null_date_len[NITEMS];
#ifdef PLSQLNO
  ub2 s_bg_len[NITEMS];
#endif

  ub2 nol_i_id_rcode[NITEMS];
  ub2 nol_supply_w_id_rcode[NITEMS];
  ub2 nol_quantity_rcode[NITEMS];
  ub2 nol_amount_rcode[NITEMS];
  ub2 i_name_rcode[NITEMS];
  ub2 s_quantity_rcode[NITEMS];
  ub2 i_price_rcode[NITEMS];
  ub2 ol_w_id_rcode[NITEMS];
  ub2 ol_d_id_rcode[NITEMS];
  ub2 ol_o_id_rcode[NITEMS];
  ub2 ol_number_rcode[NITEMS];
  ub2 cons_rcode[NITEMS];
  ub2 s_rowid_rcode[NITEMS];
  ub2 s_remote_rcode[NITEMS];
  ub2 s_quant_rcode[NITEMS];
  ub2 i_data_rcode[NITEMS];
  ub2 s_data_rcode[NITEMS];
  ub2 s_dist_info_rcode[NITEMS];
  ub2 ol_dist_info_rcode[NITEMS];
  ub2 null_date_rcode[NITEMS];
#ifdef PLSQLNO
  ub2 s_bg_rcode[NITEMS];
#endif

  int ol_w_id[NITEMS];
  int ol_d_id[NITEMS];
  int ol_o_id[NITEMS];
  int ol_number[NITEMS];
  int cons[NITEMS];

  OCIRowid  *s_rowid_ptr[NITEMS];

  int s_remote[NITEMS];
  char i_data[NITEMS][51];
  char s_data[NITEMS][51];
  char s_dist_info[NITEMS][25];
  OCIDate null_date[NITEMS]; /* base date for null date entry */
  OCIStmt *curn1;
#ifdef PLSQLNO
  OCIBind *ol_i_id_bp;
  OCIBind *ol_supply_w_id_bp;
  OCIBind *i_price_bp;
  OCIBind *i_name_bp;
  OCIBind *s_bg_bp;
  OCIBind *s_data_bp;
  OCIBind *i_data_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;
  ub4 s_data_count;
  ub4 i_data_count;
#endif
  OCIStmt *curn2;
  OCIStmt *curn3[10];
  OCIBind *ol_i_id_bp4;
  OCIBind *ol_supply_w_id_bp4;
  OCIBind *ol_quantity_bp;
  OCIBind *ol_quantity_bp4;
  OCIBind *s_remote_bp;
  OCIBind *s_quantity_bp;
  OCIStmt *curn4;
  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 *s_rowid_bp;
  OCIBind *id_bp[10][15];
  OCIBind *sd_bp[10][15];
  OCIDefine *Dcons[10];
  OCIDefine *Ds_rowid[10];
  OCIDefine *Di_price[10];
  OCIDefine *Di_data[10];
  OCIDefine *Ds_dist_info[10];
  OCIDefine *Ds_data[10];
  OCIDefine *Ds_quantity[10];
  OCIDefine *Di_name[10];
  OCIBind *ol_o_id_bp;
  OCIBind *ol_d_id_bp;
  OCIBind *ol_w_id_bp;
  OCIBind *ol_number_bp;
  OCIBind *ol_amount_bp;
  OCIBind *ol_dist_info_bp;
  OCIBind *null_date_bp;

  sb2 w_id_ind;
  ub2 w_id_len;
  ub2 w_id_rc;

  sb2 d_id_ind;
  ub2 d_id_len;
  ub2 d_id_rc;

  sb2 c_id_ind;
  ub2 c_id_len;
  ub2 c_id_rc;

  sb2 o_all_local_ind;
  ub2 o_all_local_len;
  ub2 o_all_local_rc;

  sb2 o_ol_cnt_ind;
  ub2 o_ol_cnt_len;
  ub2 o_ol_cnt_rc;

  sb2 w_tax_ind;
  ub2 w_tax_len;
  ub2 w_tax_rc;
```

```
  sb2 d_tax_ind;
  ub2 d_tax_len;
  ub2 d_tax_rc;

  sb2 o_id_ind;
  ub2 o_id_len;
  ub2 o_id_rc;

  sb2 c_discount_ind;
  ub2 c_discount_len;
  ub2 c_discount_rc;

  sb2 c_credit_ind;
  ub2 c_credit_len;
  ub2 c_credit_rc;

  sb2 c_last_ind;
  ub2 c_last_len;
  ub2 c_last_rc;

  sb2 retries_ind;
  ub2 retries_len;
  ub2 retries_rc;

  sb2 cr_date_ind;
  ub2 cr_date_len;
  ub2 cr_date_rc;

  int cs;
  int norow;

/* context holders */
  int i_name_ctx;
  int i_data_ctx;
  int i_price_ctx;
  int s_data_ctx;
  int s_dist_info_ctx;
  int s_quantity_ctx;
};

typedef struct newctx newctx;

newctx *nctx;

tkvcninit ()
{

  int i;
  text stmbuf[16*1024];
#ifndef PLSQLNO
  char sd[4];
  char id[4];
  int j;
# endif /* !PLSQLNO */

  nctx = (newctx *) malloc (sizeof(newctx));
  memset(nctx,(char)0,sizeof(newctx));
  nctx->cs = 1;
  nctx->norow=0;
  for(i=0;i<NITEMS;i++) {
    OCIERROR(errhp, OCIDescriptorAlloc(tpcenv,(dvoid**)&nctx->s_rowid_ptr[i],
       OCI_DTYPE_ROWID,0,(dvoid**)0));
  }
  nctx->w_id_ind = TRUE;
  nctx->w_id_len = sizeof(w_id);
  nctx->d_id_ind = TRUE;
  nctx->d_id_len = sizeof(d_id);
  nctx->c_id_ind = TRUE;
  nctx->c_id_len = sizeof(c_id);
  nctx->o_all_local_ind = TRUE;
  nctx->o_all_local_len = sizeof(o_all_local);
  nctx->o_ol_cnt_ind = TRUE;
  nctx->o_ol_cnt_len = sizeof(o_ol_cnt);
  nctx->w_tax_ind = TRUE;
  nctx->w_tax_len = 0;
  nctx->d_tax_ind = TRUE;
  nctx->d_tax_len = 0;
  nctx->o_id_ind = TRUE;
  nctx->o_id_len = sizeof(o_id);
  nctx->c_discount_ind = TRUE;
  nctx->c_discount_len = 0;
  nctx->c_credit_ind = TRUE;
  nctx->c_credit_len = 0;
  nctx->c_last_ind = TRUE;
  nctx->c_last_len = 0;
  nctx->retries_ind = TRUE;
  nctx->retries_len = sizeof(retries);
  nctx->cr_date_ind = TRUE;
  nctx->cr_date_len = sizeof(cr_date);

  /* open first cursor */
  OCIERROR(errhp,OCIHandleAlloc(tpcenv,(dvoid **)(&nctx->curn1),
        OCI_HTYPE_STMT, 0, (dvoid**)0));
#ifdef PLSQLNO
  sqlfile("/project/tpcc/blocks/tkvcpnew.sql",stmbuf);
#else
  sqlfile("/project/tpcc/blocks/tkvcbnew.sql",stmbuf);
#endif
  OCIERROR(errhp,OCIStmtPrepare(nctx->curn1, errhp, stmbuf, strlen((char *)stmbuf),
                                                        OCI_NTV_SYNTAX, OCI_DEFAULT));

  /* bind variables */

  OCIBNDR(nctx->curn1, nctx->w_id_bp, errhp, ":w_id",ADR(w_id),SIZ(w_id),
        SQLT_INT, &nctx->w_id_ind, &nctx->w_id_len, &nctx->w_id_rc);
  OCIBNDR(nctx->curn1, nctx->d_id_bp, errhp, ":d_id",ADR(d_id),SIZ(d_id),
        SQLT_INT, &nctx->d_id_ind, &nctx->d_id_len, &nctx->d_id_rc);
  OCIBNDR(nctx->curn1, nctx->c_id_bp, errhp, ":c_id",ADR(c_id),SIZ(c_id),
        SQLT_INT, &nctx->c_id_ind, &nctx->c_id_len, &nctx->c_id_rc);
  OCIBNDR(nctx->curn1, nctx->o_all_local_bp, errhp, ":o_all_local",
        ADR(o_all_local), SIZ(o_all_local),SQLT_INT, &nctx->o_all_local_ind,
        &nctx->o_all_local_len, &nctx->o_all_local_rc);
  OCIBNDR(nctx->curn1, nctx->o_all_cnt_bp, errhp, ":o_ol_cnt",ADR(o_ol_cnt),
        SIZ(o_ol_cnt),SQLT_INT,&nctx->o_ol_cnt_ind, &nctx->o_ol_cnt_len,
        &nctx->o_ol_cnt_rc);
  OCIBNDR(nctx->curn1, nctx->w_tax_bp, errhp, ":w_tax",ADR(w_tax),SIZ(w_tax),
        SQLT_FLT, &nctx->w_tax_ind, &nctx->w_tax_len, &nctx->w_tax_rc);
  OCIBNDR(nctx->curn1, nctx->d_tax_bp, errhp, ":d_tax",ADR(d_tax),SIZ(d_tax),
        SQLT_FLT, &nctx->d_tax_ind, &nctx->d_tax_len, &nctx->d_tax_rc);
  OCIBNDR(nctx->curn1, nctx->o_id_bp, errhp, ":o_id",ADR(o_id),SIZ(o_id),
        SQLT_INT, &nctx->o_id_ind, &nctx->o_id_len, &nctx->o_id_rc);
  OCIBNDR(nctx->curn1, nctx->c_discount_bp, errhp, ":c_discount",
        ADR(c_discount), SIZ(c_discount),SQLT_FLT,
      &nctx->c_discount_ind, &nctx->c_discount_len, &nctx->c_discount_rc);
  OCIBNDR(nctx->curn1, nctx->c_credit_bp, errhp, ":c_credit",c_credit,
        SIZ(c_credit),SQLT_CHR,
      &nctx->c_credit_ind, &nctx->c_credit_len, &nctx->c_credit_rc);
  OCIBNDR(nctx->curn1, nctx->c_last_bp, errhp, ":c_last",c_last,SIZ(c_last),
        SQLT_STR, &nctx->c_last_ind, &nctx->c_last_len, &nctx->c_last_rc);
  OCIBNDR(nctx->curn1, nctx->retries_bp, errhp, ":retry",ADR(retries),
        SIZ(retries),SQLT_INT,
      &nctx->retries_ind, &nctx->retries_len, &nctx->retries_rc);
  OCIBNDR(nctx->curn1, nctx->cr_date_bp, errhp, ":cr_date",&cr_date,SIZ(OCIDate),
 SQLT_ODT, &nctx->cr_date_ind, &nctx->cr_date_len, &nctx->cr_date_rc);

#ifdef PLSQLNO
  OCIBNDRAA(nctx->curn1, nctx->ol_i_id_bp,errhp,":ol_i_id",nol_i_id,
         SIZ(int), SQLT_INT, nctx->nol_i_id_ind,nctx->nol_i_id_len,
         nctx->nol_i_id_rcode,NITEMS,&nctx->nol_i_count);
  OCIBNDRAA(nctx->curn1, nctx->ol_supply_w_id_bp, errhp, ":ol_supply_w_id",
```

```
        nol_supply_w_id,SIZ(int),SQLT_INT, nctx->nol_supply_w_id_ind,
        nctx->nol_supply_w_id_len, nctx->nol_supply_w_id_rcode,
        NITEMS, &nctx->nol_s_count);
 OCIBNDRAA(nctx->curn1, nctx->ol_quantity_bp,errhp,":ol_quantity",nol_quantity,
        SIZ(int),SQLT_INT,nctx->nol_quantity_ind,nctx->nol_quantity_len,
        nctx->nol_quantity_rcode,NITEMS,&nctx->nol_q_count);
 OCIBNDRAA(nctx->curn1, nctx->i_price_bp,errhp,":i_price",i_price,SIZ(int),
         SQLT_INT, nctx->i_price_ind,nctx->i_price_len,nctx->i_price_rcode,
         NITEMS, &nctx->nol_item_count);
 OCIBNDRAA(nctx->curn1, nctx->i_name_bp,errhp,":i_name",i_name,
          SIZ(i_name[0]),SQLT_STR, nctx->i_name_ind,nctx->i_name_len,
          nctx->i_name_rcode,NITEMS,&nctx->nol_name_count);
 OCIBNDRAA(nctx->curn1, nctx->s_quantity_bp,errhp,":s_quantity",s_quantity,
        SIZ(int), SQLT_INT,nctx->s_quant_ind,nctx->s_quant_len,
        nctx->s_quant_rcode,NITEMS,&nctx->nol_qty_count);
 OCIBNDRAA(nctx->curn1, nctx->s_bg_bp,errhp,":brand_generic",brand_generic,
        SIZ(char), SQLT_CHR,nctx->s_bg_ind,nctx->s_bg_len,
        nctx->s_bg_rcode,NITEMS,&nctx->nol_bg_count);
 OCIBNDRAA(nctx->curn1, nctx->ol_amount_bp,errhp,":ol_amount",nol_amount,
        SIZ(int),SQLT_INT, nctx->nol_amount_ind,nctx->nol_amount_len,
        nctx->nol_amount_rcode,NITEMS,&nctx->nol_am_count);
 OCIBNDRAA(nctx->curn1, nctx->s_remote_bp,errhp,":s_remote",nctx->s_remote,
        SIZ(int),SQLT_INT, nctx->s_remote_ind,nctx->s_remote_len,
        nctx->s_remote_rcode,NITEMS,&nctx->s_remote_count);

 /* open second cursor */
 OCIERROR(errhp,OCIHandleAlloc(tpcenv, (dvoid **)(&nctx->curn2), OCI_HTYPE_STMT,
                                                    0, (dvoid**)0));
 sprintf ((char *) stmbuf, SQLTXT2);
 OCIERROR(errhp,OCIStmtPrepare(nctx->curn2, 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];
  ub2 idx1arr_rcode[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;
                o_ol_cnt = NITEMS;


  /* Bind array */
  OCIBNDRAA(nctx->curn2, idx1arr_bp,errhp,":idx1arr",idx1arr,
          SIZ(int), SQLT_INT, idx1arr_ind,idx1arr_len,
          idx1arr_rcode,NITEMS,&idx1arr_count);

   execstatus = OCIStmtExecute(tpcsvc,nctx->curn2,errhp,1,0,0,0,OCI_DEFAULT);
   if(execstatus != OCI_SUCCESS) {
     OCITransRollback(tpcsvc,errhp,OCI_DEFAULT);
     errcode = OCIERROR(errhp,execstatus);
     return -1;
   }
  }
#else

 /* open second cursor */
 OCIERROR(errhp,OCIHandleAlloc(tpcenv, (dvoid **)(&nctx->curn2), OCI_HTYPE_STMT,
                                                    0, (dvoid**)0));
 sprintf ((char *) stmbuf, SQLTXT2);
 OCIERROR(errhp,OCIStmtPrepare(nctx->curn2, errhp, stmbuf,
        strlen((char *)stmbuf), OCI_NTV_SYNTAX, OCI_DEFAULT));



 /* bind variables */

 OCIBNDRA(nctx->curn2, nctx->s_quantity_bp,errhp,":s_quantity",s_quantity,
        SIZ(int), SQLT_INT,nctx->s_quant_ind,nctx->s_quant_len,
        nctx->s_quant_rcode);
 OCIBNDRA(nctx->curn2, nctx->s_rowid_bp, errhp, ":s_rowid",nctx->s_rowid_ptr,
        sizeof(nctx->s_rowid_ptr[0]),SQLT_RDD,nctx->s_rowid_ind,
                nctx->s_rowid_len,nctx->s_rowid_rcode);
 OCIBNDRA(nctx->curn2, nctx->ol_quantity_bp,errhp,":ol_quantity",nol_quantity,
                SIZ(int),SQLT_INT,nctx->nol_quantity_ind,nctx->nol_quantity_len,
                nctx->nol_quantity_rcode);
 OCIBNDRA(nctx->curn2, nctx->s_remote_bp, errhp, ":s_remote",nctx->s_remote,
        SIZ(int), SQLT_INT,nctx->s_remote_ind,nctx->s_remote_len,
                nctx->s_remote_rcode);

 /* open third cursor and bind variables */

 for (i = 0; i < 10; i++)
 {
  j = i + 1;
  OCIERROR(errhp,OCIHandleAlloc(tpcenv, (dvoid **)&((nctx->curn3)[i]),
                                                    OCI_HTYPE_STMT, 0, (dvoid**)0));

  sprintf ((char *) stmbuf, SQLTXT3, j, j, j, j, j, j, j, j, j, j, j,
                  j, j, j);

  OCIERROR(errhp,OCIStmtPrepare((nctx->curn3)[i], errhp, stmbuf,
                strlen((char *)stmbuf),OCI_NTV_SYNTAX,
                                                    OCI_DEFAULT));
  OCIERROR(errhp,
        OCIAttrSet(nctx->curn3[i],OCI_HTYPE_STMT,(dvoid*)&nctx->norow,0,
            OCI_ATTR_PREFETCH_ROWS,errhp));
  for (j = 0; j < NITEMS; j++)
  {
   sprintf (id, ":%d", j + 10);
   sprintf (sd, ":%d", j + 30);
   OCIBNDRA((nctx->curn3)[i],(nctx->id_bp)[i][j],errhp,id,ADR(nol_i_id[j]),
                  SIZ(int),SQLT_INT,
                  &nctx->nol_i_id_ind[j],&nctx->nol_i_id_len[j],
                  &nctx->nol_i_id_rcode[j]);
   OCIBNDRA((nctx->curn3)[i],(nctx->sd_bp)[i][j],errhp,sd,
                  ADR(nol_supply_w_id[j]),SIZ(int),SQLT_INT,
                  &nctx->nol_supply_w_id_ind[j],&nctx->nol_supply_w_id_len[j],
                  &nctx->nol_supply_w_id_rcode[j]);
   nctx->nol_i_id_ind[j] = NA;
   nctx->nol_supply_w_id_ind[j] = NA;
   nctx->nol_i_id_len[j] = sizeof(int);
   nctx->nol_supply_w_id_len[j] = sizeof(int);
  }

  OCIDEF((nctx->curn3)[i],(nctx->Dcons)[i],errhp,1,&(nctx->cons[0]),
                  SIZ(nctx->cons[0]),SQLT_INT);
  OCIDEF((nctx->curn3)[i], (nctx->Ds_rowid)[i],errhp,2,
        nctx->s_rowid_ptr, sizeof(nctx->s_rowid_ptr[0]), SQLT_RDD);
  OCIDEF((nctx->curn3)[i], (nctx->Di_price)[i],errhp,3,i_price,SIZ(int),
        SQLT_INT);

  OCIDFNRA((nctx->curn3)[i], (nctx->Di_name)[i],errhp,4,i_name,
        SIZ(i_name[0]),SQLT_STR, nctx->i_name_ind,nctx->i_name_len,
        nctx->i_name_rcode);
  OCIDFNRA((nctx->curn3)[i], (nctx->Di_data)[i],errhp,5,nctx->i_data,
                SIZ(nctx->i_data[0]), SQLT_STR, NULL,nctx->i_data_len,NULL);
  OCIDFNRA((nctx->curn3)[i], (nctx->Ds_dist_info)[i],errhp,6,
        nctx->s_dist_info, SIZ(nctx->s_dist_info[0]),SQLT_STR,
        NULL,nctx->s_dist_info_len, NULL);
```

```
    OCIDFNRA((nctx->curn3)[i],(nctx->Ds_data)[i],errhp,7,nctx->s_data,
                    SIZ(nctx->s_data[0]),SQLT_STR,NULL,nctx->s_data_len,NULL);
    OCIDEF((nctx->curn3)[i],(nctx->Ds_quantity)[i],errhp,8,s_quantity,
                    SIZ(int),SQLT_INT);

    }

    /* open fourth cursor */
    OCIHandleAlloc(tpcenv, (dvoid **)(&nctx->curn4), OCI_HTYPE_STMT, 0,
                (dvoid**)0);
    sprintf ((char *) stmbuf, SQLTXT4);
    OCIStmtPrepare(nctx->curn4, errhp, stmbuf, strlen((char *)stmbuf),
                                    OCI_NTV_SYNTAX, OCI_DEFAULT);
    /* bind variables */

    OCIBNDRA(nctx->curn4, nctx->ol_o_id_bp,errhp,":ol_o_id",nctx->ol_o_id,
            SIZ(int),SQLT_INT, NULL,nctx->ol_o_id_len,
            NULL);
    OCIBNDRA(nctx->curn4, nctx->ol_d_id_bp,errhp,":ol_d_id",nctx->ol_d_id,
            SIZ(int),SQLT_INT, NULL,nctx->ol_d_id_len,
            NULL);
    OCIBNDRA(nctx->curn4, nctx->ol_w_id_bp,errhp,":ol_w_id",nctx->ol_w_id,
            SIZ(int),SQLT_INT, NULL,nctx->ol_w_id_len,
            NULL);
    OCIBNDRA(nctx->curn4, nctx->ol_number_bp,errhp,":ol_number",nctx->ol_number,
            SIZ(int),SQLT_INT, NULL,nctx->ol_number_len,
            NULL);
    OCIBNDRA(nctx->curn4, nctx->ol_i_id_bp4,errhp,":ol_i_id",nol_i_id,SIZ(int),
            SQLT_INT, NULL,nctx->nol_i_id_len, NULL);
    OCIBNDRA(nctx->curn4, nctx->ol_supply_w_id_bp4,errhp,":ol_supply_w_id",
            nol_supply_w_id,SIZ(int),SQLT_INT, NULL,
            nctx->nol_supply_w_id_len, NULL);
    OCIBNDRA(nctx->curn4, nctx->ol_quantity_bp4,errhp,":ol_quantity",nol_quantity,
            SIZ(int),SQLT_INT, NULL,nctx->nol_quantity_len,
                    NULL);
    OCIBNDRA(nctx->curn4, nctx->ol_amount_bp,errhp,":ol_amount",nol_amount,
            SIZ(int),SQLT_INT, NULL,nctx->nol_amount_len,
            NULL);
    OCIBNDRA(nctx->curn4, nctx->ol_dist_info_bp,errhp,":ol_dist_info",
            nctx->s_dist_info, SIZ(nctx->s_dist_info[0]),SQLT_AFC,
            NULL, nctx->ol_dist_info_len,
            NULL);
    OCIBNDRA(nctx->curn4, nctx->null_date_bp,errhp,":null_date",nctx->null_date,
            SIZ(OCIDate), SQLT_ODT,NULL,
            nctx->null_date_len, NULL);

    /* set up the null date Null date is 15-sep-11 */
    for (i=0;i<NITEMS;i++)
    {
      OCIDateSetDate(&nctx->null_date[i],(sb2)1811,(ub1)9,(ub1)15);
    }
#endif

    return (0);

}



tkvcn ()
{

    int i;
    int rcount;
# ifndef PLSQLNO
    ub4 flags;
    int rowoff,rpc,rpc3,iters,j,k;
# endif /* !PLSQLNO */
    int failed = 0;
```

```
retry:

    status = 0;                     /* number of invalid items */

    /* get number of order lines, and check if all are local */

    o_ol_cnt = NITEMS;
    o_all_local = 1;
    for (i = 0; i < NITEMS; i++) {
      if (nol_i_id[i] == 0) {
        o_ol_cnt = i;
        break;
      }
      if (nol_supply_w_id[i] != w_id) {
        nctx->s_remote[i] = 1;
        o_all_local = 0;
      }
      else
        nctx->s_remote[i] = 0;
    }

    nctx->w_id_ind = TRUE;
    nctx->w_id_len = sizeof(w_id);
    nctx->d_id_ind = TRUE;
    nctx->d_id_len = sizeof(d_id);
    nctx->c_id_ind = TRUE;
    nctx->c_id_len = sizeof(c_id);
    nctx->o_all_local_ind = TRUE;
    nctx->o_all_local_len = sizeof(o_all_local);
    nctx->o_ol_cnt_ind = TRUE;
    nctx->o_ol_cnt_len = sizeof(o_ol_cnt);
    nctx->w_tax_ind = TRUE;
    nctx->w_tax_len = 0;
    nctx->d_tax_ind = TRUE;
    nctx->d_tax_len = 0;
    nctx->o_id_ind = TRUE;
    nctx->o_id_len = sizeof(o_id);
    nctx->c_discount_ind = TRUE;
    nctx->c_discount_len = 0;
    nctx->c_credit_ind = TRUE;
    nctx->c_credit_len = 0;
    nctx->c_last_ind = TRUE;
    nctx->c_last_len = 0;
    nctx->retries_ind = TRUE;
    nctx->retries_len = sizeof(retries);
    nctx->cr_date_ind = TRUE;
    nctx->cr_date_len = sizeof(cr_date);
#ifdef PLSQLNO
    /* this is the row count */
    rcount = o_ol_cnt;
    nctx->nol_i_count = o_ol_cnt;
    nctx->nol_q_count = o_ol_cnt;
    nctx->nol_s_count = o_ol_cnt;
    nctx->s_remote_count = 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;
    /* following not relevant */
    nctx->s_data_count = o_ol_cnt;
    nctx->i_data_count = o_ol_cnt;

    /* initialization for array operations */
    for (i = 0; i < o_ol_cnt; i++) {
      nctx->ol_w_id[i] = w_id;
      nctx->ol_d_id[i] = d_id;
      nctx->ol_number[i] = i + 1;
      nctx->null_date_ind[i]= TRUE;
```

```
    nctx->nol_i_id_ind[i] = 0;
    nctx->nol_supply_w_id_ind[i] = TRUE;
    nctx->nol_quantity_ind[i] = TRUE;
    nctx->nol_amount_ind[i] = TRUE;
    nctx->ol_w_id_ind[i] = TRUE;
    nctx->ol_d_id_ind[i] = TRUE;
    nctx->ol_o_id_ind[i] = TRUE;
    nctx->ol_number_ind[i] = TRUE;
    nctx->ol_dist_info_ind[i] = TRUE;
    nctx->s_remote_ind[i] = TRUE;
    nctx->s_data_ind[i] = TRUE;
    nctx->i_data_ind[i] = TRUE;
    nctx->s_quant_ind[i] = TRUE;
    nctx->s_bg_ind[i] = TRUE;
    nctx->cons_ind[i] = TRUE;
    nctx->s_rowid_ind[i] = TRUE;
    nctx->nol_i_id_len[i] = sizeof(int);
    nctx->nol_supply_w_id_len[i] = sizeof(int);
    nctx->nol_quantity_len[i] = sizeof(int);
    nctx->nol_amount_len[i] = sizeof(int);
    nctx->ol_w_id_len[i] = sizeof(int);
    nctx->ol_d_id_len[i] = sizeof(int);
    nctx->ol_o_id_len[i] = sizeof(int);
    nctx->ol_number_len[i] = sizeof(int);
    nctx->ol_dist_info_len[i] = nctx->s_dist_info_len[i];
    nctx->null_date_len[i]=sizeof(OCIDate);
    nctx->s_remote_len[i] = sizeof(int);
    nctx->s_data_len[i] = sizeof(int);
    nctx->i_data_len[i] = sizeof(int);
    nctx->s_quant_len[i] = sizeof(int);
    nctx->s_rowid_len[i] = sizeof(nctx->s_rowid_ptr[0]);
    nctx->cons_len[i] = sizeof(int);
    nctx->i_name_len[i]=0;
    nctx->s_bg_len[i] = 0;
  }
  for (i = o_ol_cnt; i < NITEMS; i++) {
    nctx->nol_i_id_ind[i] = NA;
    nctx->nol_supply_w_id_ind[i] = NA;
    nctx->nol_quantity_ind[i] = NA;
    nctx->nol_amount_ind[i] = NA;
    nctx->ol_w_id_ind[i] = NA;
    nctx->ol_d_id_ind[i] = NA;
    nctx->ol_o_id_ind[i] = NA;
    nctx->ol_number_ind[i] = NA;
    nctx->ol_dist_info_ind[i] = NA;
    nctx->null_date_ind[i]= NA;
    nctx->s_remote_ind[i] = NA;
    nctx->s_data_ind[i] = NA;
    nctx->i_data_ind[i] = NA;
    nctx->s_quant_ind[i]= NA;
    nctx->s_bg_ind[i] = NA;
    nctx->cons_ind[i] = NA;
    nctx->s_rowid_ind[i] = NA;

    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_w_id_len[i] = 0;
    nctx->ol_d_id_len[i] = 0;
    nctx->ol_o_id_len[i] = 0;
    nctx->ol_number_len[i] = 0;
    nctx->ol_dist_info_len[i] = 0;
    nctx->null_date_len[i]= 0;
    nctx->s_remote_len[i] = 0;
    nctx->i_data_len[i] = 0;
    nctx->s_data_len[i] = 0;
    nctx->s_quant_len[i] = 0;
    nctx->s_rowid_len[i] = 0;
    nctx->cons_len[i] = 0;
    nctx->i_name_len[i]=0;
    nctx->s_bg_len[i] = 0;
  }

  execstatus = OCIStmtExecute(tpcsvc,nctx->curn1,errhp,1,0,0,0,
                                                    OCI_DEFAULT | OCI_COMMIT_ON_SUCCESS);

#else
  execstatus = OCIStmtExecute(tpcsvc,nctx->curn1,errhp,1,0,0,0,OCI_DEFAULT);
#endif


  if(execstatus != OCI_SUCCESS) {
    OCITransRollback(tpcsvc,errhp,OCI_DEFAULT);
    errcode = OCIERROR(errhp,execstatus);
    if(errcode == NOT_SERIALIZABLE) {
                retries++;
                goto retry;
    } else if (errcode == RECOVERR) {
                retries++;
                goto retry;
    } else if (errcode == SNAPSHOT_TOO_OLD) {
                retries++;
                goto retry;
    } else {
                return -1;
    }
  }

#ifdef PLSQLNO
  /* did the txn succeed ? */
  if (rcount != o_ol_cnt)
  {
    status = rcount - o_ol_cnt;
    o_ol_cnt = rcount;
  }
#endif

#ifdef DEBUG
  printf("w_id = %d, d_id = %d, c_id = %d\n",w_id, d_id, c_id);
#endif

#ifndef PLSQLNO
  /* initialization for array operations */

  for (i = 0; i < o_ol_cnt; i++) {
    nctx->ol_w_id[i] = w_id;
    nctx->ol_d_id[i] = d_id;
    nctx->ol_number[i] = i + 1;
    nctx->null_date_ind[i]= TRUE;
    nctx->nol_i_id_ind[i] = TRUE;
    nctx->nol_supply_w_id_ind[i] = TRUE;
    nctx->nol_quantity_ind[i] = TRUE;
    nctx->nol_amount_ind[i] = TRUE;
    nctx->ol_w_id_ind[i] = TRUE;
    nctx->ol_d_id_ind[i] = TRUE;
    nctx->ol_o_id_ind[i] = TRUE;
    nctx->ol_number_ind[i] = TRUE;
    nctx->ol_dist_info_ind[i] = TRUE;
    nctx->s_remote_ind[i] = TRUE;
    nctx->s_quant_ind[i] = TRUE;
    nctx->cons_ind[i] = TRUE;
    nctx->s_rowid_ind[i] = TRUE;

    nctx->nol_i_id_len[i] = sizeof(int);
    nctx->nol_supply_w_id_len[i] = sizeof(int);
    nctx->nol_quantity_len[i] = sizeof(int);
    nctx->nol_amount_len[i] = sizeof(int);
    nctx->ol_w_id_len[i] = sizeof(int);
    nctx->ol_d_id_len[i] = sizeof(int);
```

```
    nctx->ol_o_id_len[i] = sizeof(int);
    nctx->ol_number_len[i] = sizeof(int);
    nctx->ol_dist_info_len[i] = nctx->s_dist_info_len[i];
    nctx->null_date_len[i]=sizeof(OCIDate);
    nctx->s_remote_len[i] = sizeof(int);
    nctx->s_quant_len[i] = sizeof(int);
    nctx->s_rowid_len[i] = sizeof(nctx->s_rowid_ptr[0]);
    nctx->cons_len[i] = sizeof(int);
  }
  for (i = o_ol_cnt; i < NITEMS; i++) {
    nctx->nol_i_id_ind[i] = NA;
    nctx->nol_supply_w_id_ind[i] = NA;
    nctx->nol_quantity_ind[i] = NA;
    nctx->nol_amount_ind[i] = NA;
    nctx->ol_w_id_ind[i] = NA;
    nctx->ol_d_id_ind[i] = NA;
    nctx->ol_o_id_ind[i] = NA;
    nctx->ol_number_ind[i] = NA;
    nctx->ol_dist_info_ind[i] = NA;
    nctx->null_date_ind[i]= NA;
    nctx->s_remote_ind[i] = NA;
    nctx->s_quant_ind[i] = NA;
    nctx->cons_ind[i] = NA;
    nctx->s_rowid_ind[i] = NA;

    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_w_id_len[i] = 0;
    nctx->ol_d_id_len[i] = 0;
    nctx->ol_o_id_len[i] = 0;
    nctx->ol_number_len[i] = 0;
    nctx->ol_dist_info_len[i] = 0;
    nctx->null_date_len[i]= 0;
    nctx->s_remote_len[i] = 0;
    nctx->s_quant_len[i] = 0;
    nctx->s_rowid_len[i] = 0;
    nctx->cons_len[i] = 0;
  }

  rpc3 = SelItemStk ();
  if (rpc3 == -2)
    goto retry;
  else if (rpc3 == -1)
    return (-1);

  /* compute order line amounts, total amount and stock quantities */

  total_amount = 0.0;
  for (i = 0; i < o_ol_cnt; i++)
    {
    nctx->ol_o_id[i] = o_id;
    if (nctx->nol_i_id_ind[i] != NA) {
      s_quantity[i] -= nol_quantity[i];
      if (s_quantity[i] < 10)
        s_quantity[i] += 91;
      nol_amount[i] = (nol_quantity[i] * i_price[i]);
      total_amount += nol_amount[i];
      if (strstr (nctx->i_data[i], "ORIGINAL") &&
          strstr (nctx->s_data[i], "ORIGINAL"))
        brand_gen[i] = 'B';
      else
        brand_gen[i] = 'G';
    }

   }
  total_amount *= ((float)(1 - c_discount)) * (1.0 + ((float)d_tax) + ((float)w_tax));
  total_amount = total_amount/100;
```

```
    rpc = UpdStk2 ();
    if (rpc == -2)
      goto retry;
    else if (rpc == -1)
      return (-1);

    /* error processing - will keep it separated for readablity */
    /* number of items selected != number of stock updated */

    if (rpc3 != rpc) {
  #ifdef TUX
      userlog ("Error in TPC-C server %d: %d rows of item read, ",
               proc_no, rpc3);
      userlog ("                         but %d rows of stock updated\n", rpc);
  #else
      fprintf (stderr, "Error in TPC-C server %d: %d rows of item read, ",
               proc_no, rpc3);
      fprintf (stderr, "                         but %d rows of stock update\n", rpc);
  #endif
       /* rollback */
       OCITransRollback(tpcsvc,errhp,OCI_DEFAULT);
       return (-1);
    }


  /* common code for insert into order_line */
    for (i=0; i< o_ol_cnt; i++)  /* move district info in place */
    {
     nctx->ol_dist_info_len[i]=nctx->s_dist_info_len[i];
    }

    /* array insert into order line table */
    flags= (status ? OCI_DEFAULT : (OCI_DEFAULT|OCI_COMMIT_ON_SUCCESS));
    if ((o_ol_cnt - status) > 0)
    {
      execstatus = OCIStmtExecute(tpcsvc,nctx->curn4,errhp,o_ol_cnt - status,
                                  0,0,0,flags);
      if(execstatus != OCI_SUCCESS) {
        OCITransRollback(tpcsvc,errhp,OCI_DEFAULT);
        errcode = OCIERROR(errhp,execstatus);
        if(errcode == NOT_SERIALIZABLE) {
          retries++;
          goto retry;
        } else if (errcode == RECOVERR) {
          retries++;
          goto retry;
        } else if (errcode == SNAPSHOT_TOO_OLD) {
          retries++;
          goto retry;
        } else {
          return -1;
        }
      }
      OCIAttrGet(nctx->curn4,OCI_HTYPE_STMT,&rcount,NULL,
                                    OCI_ATTR_ROW_COUNT, errhp);
      if (rcount != (o_ol_cnt - status))
      {
  #ifdef TUX
        userlog ("Error in TPC-C server %d: array insert failed\n",
                                      proc_no);
  #else
         fprintf (stderr, "Error in TPC-C server %d: array insert failed\n",
                proc_no);
  #endif
        /* rollback */
        OCITransRollback(tpcsvc,errhp,OCI_DEFAULT);
        return (-1);
      }
    }
```

```
   /* commit if no invalid item */

   if (status) {
     OCITransRollback(tpcsvc,errhp,OCI_DEFAULT);
#ifndef TUX
     fflush(stdout);
#endif
   }

#endif
   total_amount = 0.0;
   for (i = 0; i < o_ol_cnt; i++)
   {
     if (nctx->nol_amount_ind[i] != NA) {
       total_amount += nol_amount[i];
     }

    }
   total_amount *= ((float)(1 - c_discount)) * (float)(1.0 + ((float)(d_tax)) + ((float)(w_tax)));
   total_amount = total_amount/100;

   return (0);

}



void tkvcndone ()

{

   int i;

   if (nctx)
   {
     OCIHandleFree((dvoid *)nctx->curn1,OCI_HTYPE_STMT);
     OCIHandleFree((dvoid *)nctx->curn2,OCI_HTYPE_STMT);
     for (i = 0; i < 10; i++)
       OCIHandleFree((dvoid *)(nctx->curn3)[i],OCI_HTYPE_STMT);
     OCIHandleFree((dvoid *)nctx->curn4,OCI_HTYPE_STMT);
     free (nctx);
   }
}

/* the arrays are initialized based on a successful select from */
/* stock/item. We need to shift the values in the orderline array */
/* one position up to compensate when we have an invalid item */

void shiftitemstock (i, j)

int i, j;

{
   /* shift up the values for the stock table */
    nctx->s_remote[i] =  nctx->s_remote[j];

   /* shift up the order_line values */

   nctx->nol_i_id_ind[i]=nctx->nol_i_id_ind[j];
   nol_i_id[i] = nol_i_id[j];

   nctx->nol_quantity_ind[i] =  nctx->nol_quantity_ind[j];
   nol_quantity[i] = nol_quantity[j];

   nctx->nol_supply_w_id_ind [i] =  nctx->nol_supply_w_id_ind[j];
   nol_supply_w_id[i] = nol_supply_w_id[j];
}

void swapitemstock (i, j)

int i, j;

{

   int tempi;
   int tempf;
   char tempstr[52];
   ub2 tempub2;
   sb2 tempsb2;
   OCIRowid  *tmprid;

   tempsb2 = nctx->cons_ind[i];
   nctx->cons_ind[i] = nctx->cons_ind[j];
   nctx->cons_ind[j] = tempsb2;
   tempub2 = nctx->cons_len[i];
   nctx->cons_len[i] = nctx->cons_len[j];
   nctx->cons_len[j] = tempub2;
   tempub2 = nctx->cons_rcode[i];
   nctx->cons_rcode[i] = nctx->cons_rcode[j];
   nctx->cons_rcode[j] = tempub2;
   tempi = nctx->cons[i];
   nctx->cons[i] = nctx->cons[j];
   nctx->cons[j] = tempi;

   tempsb2 = nctx->s_rowid_ind[i];
   nctx->s_rowid_ind[i] = nctx->s_rowid_ind[j];
   nctx->s_rowid_ind[j] = tempsb2;
   tempub2 = nctx->s_rowid_len[i];
   nctx->s_rowid_len[i] = nctx->s_rowid_len[j];
   nctx->s_rowid_len[j] = tempub2;
   tempub2 = nctx->s_rowid_rcode[i];
   nctx->s_rowid_rcode[i] = nctx->s_rowid_rcode[j];
   nctx->s_rowid_rcode[j] = tempub2;
   tmprid = nctx->s_rowid_ptr[i];
   nctx->s_rowid_ptr[i]= nctx->s_rowid_ptr[j];
   nctx->s_rowid_ptr[j]=tmprid;

   tempsb2 = nctx->i_price_ind[i];
   nctx->i_price_ind[i] = nctx->i_price_ind[j];
   nctx->i_price_ind[j] = tempsb2;
   tempub2 = nctx->i_price_len[i];
   nctx->i_price_len[i] = nctx->i_price_len[j];
   nctx->i_price_len[j] = tempub2;
   tempub2 = nctx->i_price_rcode[i];
   nctx->i_price_rcode[i] = nctx->i_price_rcode[j];
   nctx->i_price_rcode[j] = tempub2;
   tempf = i_price[i];
   i_price[i] = i_price[j];
   i_price[j] = tempf;

   tempsb2 = nctx->i_name_ind[i];
   nctx->i_name_ind[i] = nctx->i_name_ind[j];
   nctx->i_name_ind[j] = tempsb2;
   tempub2 = nctx->i_name_len[i];
   nctx->i_name_len[i] = nctx->i_name_len[j];
   nctx->i_name_len[j] = tempub2;
   tempub2 = nctx->i_name_rcode[i];
   nctx->i_name_rcode[i] = nctx->i_name_rcode[j];
   nctx->i_name_rcode[j] = tempub2;
   strncpy (tempstr, i_name[i], 25);
   strncpy (i_name[i], i_name[j], 25);
   strncpy (i_name[j], tempstr, 25);

   tempsb2 = nctx->i_data_ind[i];
   nctx->i_data_ind[i] = nctx->i_data_ind[j];
   nctx->i_data_ind[j] = tempsb2;
   tempub2 = nctx->i_data_len[i];
   nctx->i_data_len[i] = nctx->i_data_len[j];
   nctx->i_data_len[j] = tempub2;
   tempub2 = nctx->i_data_rcode[i];
```

```
  nctx->i_data_rcode[i] = nctx->i_data_rcode[j];
  nctx->i_data_rcode[j] = tempub2;
  strncpy (tempstr, nctx->i_data[i], 51);
  strncpy (nctx->i_data[i], nctx->i_data[j], 51);
  strncpy (nctx->i_data[j], tempstr, 51);

  tempsb2 = nctx->s_quantity_ind[i];
  nctx->s_quantity_ind[i] = nctx->s_quantity_ind[j];
  nctx->s_quantity_ind[j] = tempsb2;
  tempub2 = nctx->s_quantity_len[i];
  nctx->s_quantity_len[i] = nctx->s_quantity_len[j];
  nctx->s_quantity_len[j] = tempub2;
  tempub2 = nctx->s_quantity_rcode[i];
  nctx->s_quantity_rcode[i] = nctx->s_quantity_rcode[j];
  nctx->s_quantity_rcode[j] = tempub2;
  tempi = s_quantity[i];
  s_quantity[i] = s_quantity[j];
  s_quantity[j] = tempi;

  tempsb2 = nctx->s_dist_info_ind[i];
  nctx->s_dist_info_ind[i] = nctx->s_dist_info_ind[j];
  nctx->s_dist_info_ind[j] = tempsb2;
  tempub2 = nctx->s_dist_info_len[i];
  nctx->s_dist_info_len[i] = nctx->s_dist_info_len[j];
  nctx->s_dist_info_len[j] = tempub2;
  tempub2 = nctx->s_dist_info_rcode[i];
  nctx->s_dist_info_rcode[i] = nctx->s_dist_info_rcode[j];
  nctx->s_dist_info_rcode[j] = tempub2;
  strncpy (tempstr, nctx->s_dist_info[i], 25);
  strncpy (nctx->s_dist_info[i], nctx->s_dist_info[j], 25);
  strncpy (nctx->s_dist_info[j], tempstr, 25);

  tempsb2 = nctx->s_data_ind[i];
  nctx->s_data_ind[i] = nctx->s_data_ind[j];
  nctx->s_data_ind[j] = tempsb2;
  tempub2 = nctx->s_data_len[i];
  nctx->s_data_len[i] = nctx->s_data_len[j];
  nctx->s_data_len[j] = tempub2;
  tempub2 = nctx->s_data_rcode[i];
  nctx->s_data_rcode[i] = nctx->s_data_rcode[j];
  nctx->s_data_rcode[j] = tempub2;
  strncpy (tempstr, nctx->s_data[i], 51);
  strncpy (nctx->s_data[i], nctx->s_data[j], 51);
  strncpy (nctx->s_data[j], tempstr, 51);

}



SelItemStk ()
{

  int i, j, rpc3,rcount;

  /* array select from item and stock tables */
  execstatus=OCIStmtExecute(tpcsvc,(nctx->curn3)[d_id-1],errhp,o_ol_cnt,
                                    0,0,0,OCI_DEFAULT);
  if((execstatus != OCI_SUCCESS) && (execstatus != OCI_NO_DATA)) {
    errcode = OCIERROR(errhp,execstatus);
    if(errcode == NOT_SERIALIZABLE) {
      retries++;
      OCITransRollback(tpcsvc,errhp,OCI_DEFAULT);
      return (-2);
    } else if (errcode == RECOVERR) {
    /* In case of NO_DATA this should NOT return, but simply fall through */
      OCITransRollback(tpcsvc,errhp,OCI_DEFAULT);
      retries++;
      return (-2);
    } else if (errcode == SNAPSHOT_TOO_OLD) {
      OCITransRollback(tpcsvc,errhp,OCI_DEFAULT);
      retries++;
      return (-2);
    } else {
      OCITransRollback(tpcsvc,errhp,OCI_DEFAULT);
      return (-1);
    }
  }
  /* mark invalid items */
  OCIAttrGet((nctx->curn3)[d_id-1], OCI_HTYPE_STMT,&rcount,NULL,
                    OCI_ATTR_ROW_COUNT, errhp);
  rpc3 = rcount;

  /* the result is in order, so we have to shift up to fill    */
  /* the slot for the line with the invalid item.              */
  /* If more than one item is wrong, this is not an simulated  */
  /* error and we'll blow off */

  if ((status = o_ol_cnt - rcount) >1)
  {
#ifdef TUX
     userlog ("TPC-C server %d: more than 1 invalid item?\n", proc_no);
#else
     fprintf (stderr, "TPC-C server %d: more than 1 invalid item?\n", proc_no)
;
#endif
    return (rpc3);
  }
  if (status == 0) return (rpc3);

  /* find the invalid item, transfer the rowid information */

  for (i = 0; i < o_ol_cnt; i++) {
    if (nctx->cons[i] != i) break;   /* this item is invalid */
  }


#ifdef TUX
          userlog ("TPC-C server %d: reordering items and stocks\n",
                proc_no);
#else
/*
          fprintf (stderr, "TPC-C server %d: reordering items and stocks\n",
                proc_no);   */
#endif

  /* not the last item - shift up */

  for (j = i; j < o_ol_cnt-1; j++)
  {
   shiftitemstock (j, j+1);
  }
  /* zero the last item */
   i = o_ol_cnt-1;
   nctx->nol_i_id_ind[i] = NA;
   nctx->nol_supply_w_id_ind[i] = NA;
   nctx->nol_quantity_ind[i] = NA;
   nctx->nol_amount_ind[i] = NA;
   nctx->ol_w_id_ind[i] = NA;
   nctx->ol_d_id_ind[i] = NA;
   nctx->ol_o_id_ind[i] = NA;
   nctx->null_date_ind[i]= NA;
   nctx->ol_number_ind[i] = NA;
   nctx->ol_dist_info_ind[i] = NA;
   nctx->s_remote_ind[i] = NA;
   nctx->s_quant_ind[i] = NA;

   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_w_id_len[i] = 0;
    nctx->ol_d_id_len[i] = 0;
    nctx->ol_o_id_len[i] = 0;
    nctx->ol_number_len[i] = 0;
    nctx->ol_dist_info_len[i] = 0;
    nctx->null_date_ind[i] = 0;
    nctx->s_remote_len[i] = 0;
    nctx->s_quant_len[i] = 0;

  return (rpc3);

}



UpdStk2 ()
{

  int rpc, rcount;

  /* array update of stock table */

  execstatus = OCIStmtExecute(tpcsvc,nctx->curn2,errhp,o_ol_cnt-status,0,0,0,
                                                        OCI_DEFAULT);
  if(execstatus != OCI_SUCCESS) {
    OCITransRollback(tpcsvc,errhp,OCI_DEFAULT);
    errcode = OCIERROR(errhp,execstatus);
    if(errcode == NOT_SERIALIZABLE) {
      retries++;
                return (-2);
    } else if (errcode == RECOVERR) {
      retries++;
                return (-2);
    } else if (errcode == SNAPSHOT_TOO_OLD) {
      retries++;
                return (-2);
    } else {
      return -1;
    }
  }
  OCIAttrGet(nctx->curn2,OCI_HTYPE_STMT,&rcount,NULL, OCI_ATTR_ROW_COUNT, errhp);
  rpc = rcount;

  if (rpc != (o_ol_cnt - status)) {
#ifdef TUX
      userlog ("Error in TPC-C server %d: array update failed\n",
            proc_no);
#else
      fprintf (stderr, "Error in TPC-C server %d: array update failed\n",
            proc_no);
#endif
      OCITransRollback(tpcsvc,errhp,OCI_DEFAULT);
      return (-1);
  }

  return (rpc);

}
```

plsqlno

New Order Anonymous block

```
  DECLARE
      idx                   BINARY_INTEGER;
      dummy_local           BINARY_INTEGER;
      not_serializable      EXCEPTION;
      PRAGMA EXCEPTION_INIT(not_serializable,-8177);
      deadlock              EXCEPTION;
      PRAGMA EXCEPTION_INIT(deadlock,-60);
      snapshot_too_old      EXCEPTION;
      PRAGMA EXCEPTION_INIT(snapshot_too_old,-1555);
    PROCEDURE u1 IS
    BEGIN
        -- we found savings of ~900 SPARC instructions when using
        -- o_ol_cnt as a host bind instead of storing it in a variable.
        FORALL idx IN 1 .. :o_ol_cnt
          UPDATE stock_item
          SET s_order_cnt = s_order_cnt + 1,
          s_ytd = s_ytd + :ol_quantity(idx),
          s_remote_cnt = s_remote_cnt + :s_remote(idx),
          s_quantity = s_quantity - :ol_quantity(idx) +
                    DECODE(sign(s_quantity - :ol_quantity(idx) -
10),-1,91,0)
          WHERE i_id = :ol_i_id(idx)
          AND s_w_id = :w_id
          RETURNING i_price, i_name, s_quantity, s_dist_01,
                    DECODE (instr(i_data,'original'), 0, 'G',
                   DECODE(instr(s_data,'original'), 0, 'G', 'B'))
                    BULK COLLECT INTO :i_price, :i_name, :s_quantity, initnew.s_dist,
:brand_generic;

        -- We plan to put the calculation of ol_amount into the bulk update
        -- of stock_item statement above. i.e.
        -- UPDATE stock_item ...
        -- RETURNING i_price*:ol_quantity(idx)
        -- BULK COLLECT INTO :ol_amount;
        -- A bug, which is currently being addressed, is preventing us from doing this.

    END u1;

    PROCEDURE u2 IS
    BEGIN
        FORALL idx IN 1 .. :o_ol_cnt
          UPDATE stock_item
          SET s_order_cnt = s_order_cnt + 1,
          s_ytd = s_ytd + :ol_quantity(idx),
          s_remote_cnt = s_remote_cnt + :s_remote(idx),
          s_quantity = s_quantity - :ol_quantity(idx) +
                    DECODE(sign(s_quantity - :ol_quantity(idx) -
10),-1,91,0)
          WHERE i_id = :ol_i_id(idx)
          AND s_w_id = :w_id
          RETURNING i_price, i_name, s_quantity, s_dist_02,
                    DECODE (instr(i_data,'original'), 0, 'G',
                   DECODE(instr(s_data,'original'), 0, 'G', 'B'))
                    BULK COLLECT INTO :i_price, :i_name, :s_quantity, initnew.s_dist,
                      :brand_generic;
    END u2;

    PROCEDURE u3 IS
    BEGIN
        FORALL idx IN 1 .. :o_ol_cnt
          UPDATE stock_item
          SET s_order_cnt = s_order_cnt + 1,
          s_ytd = s_ytd + :ol_quantity(idx),
          s_remote_cnt = s_remote_cnt + :s_remote(idx),
          s_quantity = s_quantity - :ol_quantity(idx) +
                    DECODE(sign(s_quantity - :ol_quantity(idx) -
10),-1,91,0)
          WHERE i_id = :ol_i_id(idx)
          AND s_w_id = :w_id
          RETURNING i_price, i_name, s_quantity, s_dist_03,
                    DECODE (instr(i_data,'original'), 0, 'G',
                   DECODE(instr(s_data,'original'), 0, 'G', 'B'))
                    BULK COLLECT INTO :i_price, :i_name, :s_quantity, initnew.s_dist,
                      :brand_generic;
```

```
  END u3;

  PROCEDURE u4 IS
  BEGIN
      FORALL idx IN 1 .. :o_ol_cnt
       UPDATE stock_item
       SET s_order_cnt = s_order_cnt + 1,
       s_ytd = s_ytd + :ol_quantity(idx),
       s_remote_cnt = s_remote_cnt + :s_remote(idx),
       s_quantity = s_quantity - :ol_quantity(idx) +
                DECODE(sign(s_quantity - :ol_quantity(idx) -
10),-1,91,0)
       WHERE i_id = :ol_i_id(idx)
       AND s_w_id = :w_id
       RETURNING i_price, i_name, s_quantity, s_dist_04,
                  DECODE (instr(i_data,'original'), 0, 'G',
                DECODE(instr(s_data,'original'), 0, 'G', 'B'))
                  BULK COLLECT INTO :i_price, :i_name, :s_quantity, initnew.s_dist,
                    :brand_generic;
  END u4;

  PROCEDURE u5 IS
  BEGIN
      FORALL idx IN 1 .. :o_ol_cnt
       UPDATE stock_item
       SET s_order_cnt = s_order_cnt + 1,
       s_ytd = s_ytd + :ol_quantity(idx),
       s_remote_cnt = s_remote_cnt + :s_remote(idx),
       s_quantity = s_quantity - :ol_quantity(idx) +
                DECODE(sign(s_quantity - :ol_quantity(idx) -
10),-1,91,0)
       WHERE i_id = :ol_i_id(idx)
       AND s_w_id = :w_id
       RETURNING i_price, i_name, s_quantity, s_dist_05,
                  DECODE (instr(i_data,'original'), 0, 'G',
                DECODE(instr(s_data,'original'), 0, 'G', 'B'))
                  BULK COLLECT INTO :i_price, :i_name, :s_quantity, initnew.s_dist,
                    :brand_generic;
  END u5;

  PROCEDURE u6 IS
  BEGIN
      FORALL idx IN 1 .. :o_ol_cnt
       UPDATE stock_item
       SET s_order_cnt = s_order_cnt + 1,
       s_ytd = s_ytd + :ol_quantity(idx),
       s_remote_cnt = s_remote_cnt + :s_remote(idx),
       s_quantity = s_quantity - :ol_quantity(idx) +
                DECODE(sign(s_quantity - :ol_quantity(idx) -
10),-1,91,0)
       WHERE i_id = :ol_i_id(idx)
       AND s_w_id = :w_id
       RETURNING i_price, i_name, s_quantity, s_dist_06,
                  DECODE (instr(i_data,'original'), 0, 'G',
                DECODE(instr(s_data,'original'), 0, 'G', 'B'))
                  BULK COLLECT INTO :i_price, :i_name, :s_quantity, initnew.s_dist,
                    :brand_generic;
  END u6;

  PROCEDURE u7 IS
  BEGIN
      FORALL idx IN 1 .. :o_ol_cnt
       UPDATE stock_item
       SET s_order_cnt = s_order_cnt + 1,
       s_ytd = s_ytd + :ol_quantity(idx),
       s_remote_cnt = s_remote_cnt + :s_remote(idx),
       s_quantity = s_quantity - :ol_quantity(idx) +
                DECODE(sign(s_quantity - :ol_quantity(idx) -
10),-1,91,0)
       WHERE i_id = :ol_i_id(idx)
       AND s_w_id = :w_id
       RETURNING i_price, i_name, s_quantity, s_dist_07,
                  DECODE (instr(i_data,'original'), 0, 'G',
                DECODE(instr(s_data,'original'), 0, 'G', 'B'))
                  BULK COLLECT INTO :i_price, :i_name, :s_quantity, initnew.s_dist,
                    :brand_generic;
  END u7;

  PROCEDURE u8 IS
  BEGIN
      FORALL idx IN 1 .. :o_ol_cnt
       UPDATE stock_item
       SET s_order_cnt = s_order_cnt + 1,
       s_ytd = s_ytd + :ol_quantity(idx),
       s_remote_cnt = s_remote_cnt + :s_remote(idx),
       s_quantity = s_quantity - :ol_quantity(idx) +
                DECODE(sign(s_quantity - :ol_quantity(idx) -
10),-1,91,0)
       WHERE i_id = :ol_i_id(idx)
       AND s_w_id = :w_id
       RETURNING i_price, i_name, s_quantity, s_dist_08,
                  DECODE (instr(i_data,'original'), 0, 'G',
                DECODE(instr(s_data,'original'), 0, 'G', 'B'))
                  BULK COLLECT INTO :i_price, :i_name, :s_quantity, initnew.s_dist,
                    :brand_generic;
  END u8;

  PROCEDURE u9 IS
  BEGIN
      FORALL idx IN 1 .. :o_ol_cnt
       UPDATE stock_item
       SET s_order_cnt = s_order_cnt + 1,
       s_ytd = s_ytd + :ol_quantity(idx),
       s_remote_cnt = s_remote_cnt + :s_remote(idx),
       s_quantity = s_quantity - :ol_quantity(idx) +
                DECODE(sign(s_quantity - :ol_quantity(idx) -
10),-1,91,0)
       WHERE i_id = :ol_i_id(idx)
       AND s_w_id = :w_id
       RETURNING i_price, i_name, s_quantity, s_dist_09,
                  DECODE (instr(i_data,'original'), 0, 'G',
                DECODE(instr(s_data,'original'), 0, 'G', 'B'))
                  BULK COLLECT INTO :i_price, :i_name, :s_quantity, initnew.s_dist,
                    :brand_generic;
  END u9;

  PROCEDURE u10 IS
  BEGIN
      FORALL idx IN 1 .. :o_ol_cnt
       UPDATE stock_item
       SET s_order_cnt = s_order_cnt + 1,
       s_ytd = s_ytd + :ol_quantity(idx),
       s_remote_cnt = s_remote_cnt + :s_remote(idx),
       s_quantity = s_quantity - :ol_quantity(idx) +
                DECODE(sign(s_quantity - :ol_quantity(idx) -
10),-1,91,0)
       WHERE i_id = :ol_i_id(idx)
       AND s_w_id = :w_id
       RETURNING i_price, i_name, s_quantity, s_dist_10,
                  DECODE (instr(i_data,'original'), 0, 'G',
                DECODE(instr(s_data,'original'), 0, 'G', 'B'))
                  BULK COLLECT INTO :i_price, :i_name, :s_quantity, initnew.s_dist,
                    :brand_generic;
  END u10;

  PROCEDURE fix_items IS
    rows_lost               BINARY_INTEGER;
    max_index               BINARY_INTEGER;
    temp_index              BINARY_INTEGER;
  BEGIN
```

```
-- gotta shift price, name, s_quantity, brand_generic, s_dist, ol_amount
        idx := 1;
-- found 0 bad rows
        rows_lost := 0;
-- so many rows in out array to begin with
                        max_index := sql%rowcount;

        WHILE (max_index != :o_ol_cnt) LOOP

-- find item where item ids dont match
                        WHILE (idx <= sql%rowcount AND
                                sql%bulk_rowcount(idx + rows_lost) = 1)
          LOOP
                        idx := idx + 1;
          END LOOP;

-- shift the items please
          temp_index := max_index;
          WHILE (temp_index >= idx + rows_lost) LOOP
                        :i_price(temp_index + 1)       :=  :i_price(temp_index);
            :i_name(temp_index + 1)        :=  :i_name(temp_index);
                        :s_quantity(temp_index + 1)    :=  :s_quantity(temp_index);
            initnew.s_dist(temp_index + 1) :=  initnew.s_dist(temp_index);
                        :brand_generic(temp_index + 1) :=  :brand_generic(temp_index);
                        temp_index := temp_index - 1;
          END LOOP;

--  values for the non-existent items if not at end
           IF (idx + rows_lost <= :o_ol_cnt) THEN
                        :i_price(idx + rows_lost)     :=   0;
                        :i_name(idx + rows_lost)      :=   NULL;
          :s_quantity(idx + rows_lost)  :=   0;
          initnew.s_dist(idx + rows_lost) := NULL;
          :brand_generic(idx + rows_lost) := NULL;

--  one more bad row
           rows_lost := rows_lost + 1;
           max_index := max_index + 1;
                        END IF;

        END LOOP;
    END fix_items;

    BEGIN
      LOOP BEGIN
        UPDATE district SET d_next_o_id = d_next_o_id + 1
         WHERE d_id = :d_id AND  d_w_id = :w_id
         RETURNING d_tax, d_next_o_id-1
         INTO :d_tax, :o_id;

        SELECT c_discount, c_last, c_credit, w_tax
         INTO :c_discount, :c_last, :c_credit , :w_tax
         FROM customer , warehouse
         WHERE c_id = :c_id AND c_d_id = :d_id AND c_w_id = :w_id
         AND  w_id = :w_id;


        INSERT INTO new_order (no_o_id, no_d_id, no_w_id)
         VALUES (:o_id, :d_id, :w_id);
         INSERT INTO orders  (o_id,o_d_id, o_w_id, o_c_id, o_entry_d,
                        o_carrier_id, o_ol_cnt, o_all_local)
         VALUES (:o_id, :d_id, :w_id, :c_id,
                :cr_date, 11, :o_ol_cnt, :o_all_local);

        -- copying :d_id in local variable is important - lots of instr.
        dummy_local :=  :d_id;

        IF (dummy_local = 1) THEN u1; END IF;

        IF (dummy_local = 2) THEN u2; END IF;

        IF (dummy_local = 3) THEN u3; END IF;

        IF (dummy_local = 4) THEN u4; END IF;

        IF (dummy_local = 5) THEN u5; END IF;

        IF (dummy_local = 6) THEN u6; END IF;

        IF (dummy_local = 7) THEN u7; END IF;

        IF (dummy_local = 8) THEN u8; END IF;

        IF (dummy_local = 9) THEN u9; END IF;

        IF (dummy_local = 10) THEN u10; END IF;

-- cache the no of rows processed
        dummy_local := sql%rowcount;

-- fix the rows if necessary
        IF (dummy_local != :o_ol_cnt )  THEN fix_items; END IF;

-- calculate ol_amount

        FOR idx IN 1 ..:o_ol_cnt LOOP
         :ol_amount(idx):=:ol_quantity(idx)*:i_price(idx);
        END LOOP;

        -- I attempted to put the ol_amount calculation in this
        -- statement, however it resulted in a SPARC instruction increase ~5%

        FORALL idx IN 1..:o_ol_cnt
-- doesnt hurt if we insert entries for invalid item too
         INSERT INTO order_line
           (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 (:o_id, :d_id, :w_id, initnew.idx1arr(idx), initnew.nulldate,
                :ol_i_id(idx), :ol_supply_w_id(idx),
                        :ol_quantity(idx), :ol_amount(idx), initnew.s_dist(idx));

--If there are no errors, then just return without COMMITing
--The COMMIT is done on the driver side by OCI
-- If there are errors, then rollback and set o_ol_cnt to the processed value
-- note that this is an extra bind ### till we manage to get errors handled
-- properly
                IF (dummy_local != :o_ol_cnt) THEN
          :o_ol_cnt := dummy_local;
          ROLLBACK;
        END IF;

        EXIT;

        EXCEPTION
          WHEN not_serializable OR deadlock OR snapshot_too_old THEN
            ROLLBACK;
            :retry := :retry + 1;
       END;
      END LOOP;
    END;
```

client/oracle/plpay.c

```
#ifdef RCSID
static char *RCSid =
```

```
   "$Header: plpay.c 7030100.1 95/07/19 14:44:59 plai Generic<base> $ Copyr (c) 1994 Oracle";
#endif /* RCSID */

/*============================================================+
 |       Copyright (c) 1995  Oracle Corp, Redwood Shores, CA       |
 |                  OPEN SYSTEMS PERFORMANCE GROUP                 |
 |                     All Rights Reserved                         |
 +============================================================+
 | FILENAME
 |    plpay.c
 | DESCRIPTION
 |    OCI version (using PL/SQL stored procedure) of
 |    PAYMENT transaction in TPC-C benchmark.
 +============================================================*/

#include "ora_tpcc.h"
#include "tpccflags.h"

#ifdef TUX
#include <userlog.h>
#endif


#define SQLTXT_INIT "BEGIN initpay.pay_init; END;"
#define SQLTXT_STP  "begin payment.dopayment(:w_id,:d_id,:c_w_id,:c_d_id,     \
                :c_id,:by_lname,:h_amount,:c_last,:w_street_1,:w_street_2,\
                :w_city,:w_state,:w_zip,:d_street_1,:d_street_2,:d_city,  \
                :d_state,:d_zip,:c_first,:c_middle,:c_street_1,           \
                :c_street_2,:c_city,:c_state,:c_zip,:c_phone,:c_since,    \
                :c_credit,:c_credit_lim,:c_discount,:c_balance,:c_data,   \
                :cr_date,:retry); end;"


struct payctx {
  OCIStmt *curpi;
  OCIStmt *curp0;
  OCIStmt *curp1;
  OCIBind *w_id_bp;
  OCIBind *w_id_bp1;
  sb2 w_id_ind;
  ub2 w_id_len;
  ub2 w_id_rc;

  OCIBind *d_id_bp;
  OCIBind *d_id_bp1;
  sb2 d_id_ind;
  ub2 d_id_len;
  ub2 d_id_rc;

  OCIBind *c_w_id_bp;
  OCIBind *c_w_id_bp1;
  sb2 c_w_id_ind;
  ub2 c_w_id_len;
  ub2 c_w_id_rc;

  OCIBind *c_d_id_bp;
  OCIBind *c_d_id_bp1;
  sb2 c_d_id_ind;
  ub2 c_d_id_len;
  ub2 c_d_id_rc;

  OCIBind *c_id_bp;
  OCIBind *c_id_bp1;
  sb2 c_id_ind;
  ub2 c_id_len;
  ub2 c_id_rc;

  OCIBind *by_lname_bp;

  OCIBind *h_amount_bp;
  OCIBind *h_amount_bp1;
  sb2 h_amount_ind;
  ub2 h_amount_len;
  ub2 h_amount_rc;

  OCIBind *c_last_bp;
  OCIBind *c_last_bp1;
  sb2 c_last_ind;
  ub2 c_last_len;
  ub2 c_last_rc;

  OCIBind *w_street_1_bp;
  OCIBind *w_street_1_bp1;
  sb2 w_street_1_ind;
  ub2 w_street_1_len;
  ub2 w_street_1_rc;

  OCIBind *w_street_2_bp;
  OCIBind *w_street_2_bp1;
  sb2 w_street_2_ind;
  ub2 w_street_2_len;
  ub2 w_street_2_rc;

  OCIBind *w_city_bp;
  OCIBind *w_city_bp1;
  sb2 w_city_ind;
  ub2 w_city_len;
  ub2 w_city_rc;

  OCIBind *w_state_bp;
  OCIBind *w_state_bp1;
  sb2 w_state_ind;
  ub2 w_state_len;
  ub2 w_state_rc;

  OCIBind *w_zip_bp;
  OCIBind *w_zip_bp1;
  sb2 w_zip_ind;
  ub2 w_zip_len;
  ub2 w_zip_rc;

  OCIBind *d_street_1_bp;
  OCIBind *d_street_1_bp1;
  sb2 d_street_1_ind;
  ub2 d_street_1_len;
  ub2 d_street_1_rc;

  OCIBind *d_street_2_bp;
  OCIBind *d_street_2_bp1;
  sb2 d_street_2_ind;
  ub2 d_street_2_len;
  ub2 d_street_2_rc;

  OCIBind *d_city_bp;
  OCIBind *d_city_bp1;
  sb2 d_city_ind;
  ub2 d_city_len;
  ub2 d_city_rc;

  OCIBind *d_state_bp;
  OCIBind *d_state_bp1;
  sb2 d_state_ind;
  ub2 d_state_len;
  ub2 d_state_rc;

  OCIBind *d_zip_bp;
  OCIBind *d_zip_bp1;
  sb2 d_zip_ind;
  ub2 d_zip_len;
  ub2 d_zip_rc;
```

```
  OCIBind *c_first_bp;
  OCIBind *c_first_bp1;
  sb2 c_first_ind;
  ub2 c_first_len;
  ub2 c_first_rc;

  OCIBind *c_middle_bp;
  OCIBind *c_middle_bp1;
  sb2 c_middle_ind;
  ub2 c_middle_len;
  ub2 c_middle_rc;

  OCIBind *c_street_1_bp;
  OCIBind *c_street_1_bp1;
  sb2 c_street_1_ind;
  ub2 c_street_1_len;
  ub2 c_street_1_rc;

  OCIBind *c_street_2_bp;
  OCIBind *c_street_2_bp1;
  sb2 c_street_2_ind;
  ub2 c_street_2_len;
  ub2 c_street_2_rc;

  OCIBind *c_city_bp;
  OCIBind *c_city_bp1;
  sb2 c_city_ind;
  ub2 c_city_len;
  ub2 c_city_rc;

  OCIBind *c_state_bp;
  OCIBind *c_state_bp1;
  sb2 c_state_ind;
  ub2 c_state_len;
  ub2 c_state_rc;

  OCIBind *c_zip_bp;
  OCIBind *c_zip_bp1;
  sb2 c_zip_ind;
  ub2 c_zip_len;
  ub2 c_zip_rc;

  OCIBind *c_phone_bp;
  OCIBind *c_phone_bp1;
  sb2 c_phone_ind;
  ub2 c_phone_len;
  ub2 c_phone_rc;

  OCIBind *c_since_bp;
  OCIBind *c_since_bp1;
  sb2 c_since_ind;
  ub2 c_since_len;
  ub2 c_since_rc;

  OCIBind *c_credit_bp;
  OCIBind *c_credit_bp1;
  sb2 c_credit_ind;
  ub2 c_credit_len;
  ub2 c_credit_rc;

  OCIBind *c_credit_lim_bp;
  OCIBind *c_credit_lim_bp1;
  sb2 c_credit_lim_ind;
  ub2 c_credit_lim_len;
  ub2 c_credit_lim_rc;

  OCIBind *c_discount_bp;
  OCIBind *c_discount_bp1;
  sb2 c_discount_ind;
  ub2 c_discount_len;
  ub2 c_discount_rc;

  OCIBind *c_balance_bp;
  OCIBind *c_balance_bp1;
  sb2 c_balance_ind;
  ub2 c_balance_len;
  ub2 c_balance_rc;

  OCIBind *c_data_bp;
  OCIBind *c_data_bp1;
  sb2 c_data_ind;
  ub2 c_data_len;
  ub2 c_data_rc;

  OCIBind *h_date_bp;
  OCIBind *h_date_bp1;
  sb2 h_date_ind;
  ub2 h_date_len;
  ub2 h_date_rc;

  OCIBind *retries_bp;
  OCIBind *retries_bp1;
  sb2 retries_ind;
  ub2 retries_len;
  ub2 retries_rc;

  OCIBind *cr_date_bp;
  OCIBind *cr_date_bp1;
  sb2 cr_date_ind;
  ub2 cr_date_len;
  ub2 cr_date_rc;

  OCIBind *byln_bp;
  sb2 byln_ind;
  ub2 byln_len;
  ub2 byln_rc;
};

typedef struct payctx payctx;



payctx *pctx;

int tkvcpinit (void)

{

   text stmbuf[SQL_BUF_SIZE];
   pctx = (payctx *)malloc(sizeof(payctx));
   memset(pctx,(char)0,sizeof(payctx));

/* cursor for init */
   OCIERROR(errhp,OCIHandleAlloc(tpcenv, (dvoid **)(&(pctx->curpi)),
          OCI_HTYPE_STMT,0,(dvoid**)0));

   OCIERROR(errhp,OCIHandleAlloc(tpcenv, (dvoid **)(&(pctx->curp0)),
          OCI_HTYPE_STMT,0,(dvoid**)0));
   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);
   OCIERROR(errhp,OCIStmtPrepare(pctx->curpi, errhp, stmbuf,
          strlen((char *)stmbuf), OCI_NTV_SYNTAX, OCI_DEFAULT));
   OCIERROR(errhp,
     OCIStmtExecute(tpcsvc,pctx->curpi,errhp,1,0,0,0,OCI_DEFAULT));
```

```
#ifdef PLSQLPAY
  /*   prepare the stub for calling plsql stored procedure */
   sprintf ((char*)stmbuf, SQLTXT_STP);
   OCIERROR(errhp,OCIStmtPrepare(pctx->curp0, errhp, stmbuf,
          strlen((char *)stmbuf), OCI_NTV_SYNTAX, OCI_DEFAULT));
#else

   /* customer id !=  0, go by last name */

   sqlfile("/project/tpcc/blocks/paynz.sql",stmbuf);
   OCIERROR(errhp,OCIStmtPrepare(pctx->curp0, errhp, stmbuf,
          strlen((char *)stmbuf), OCI_NTV_SYNTAX, OCI_DEFAULT));

   /* customer id ==  0, go by last name */

   sqlfile("/project/tpcc/blocks/payz.sql",stmbuf); /* sqlfile opens $O/bench/.../blocks/... */
   OCIERROR(errhp,OCIStmtPrepare(pctx->curp1, errhp, stmbuf,
          strlen((char *)stmbuf), OCI_NTV_SYNTAX, OCI_DEFAULT));

#endif
  pctx->w_id_ind = TRUE;
  pctx->w_id_len = SIZ(w_id);
  pctx->d_id_ind = TRUE;
  pctx->d_id_len = SIZ(d_id);
  pctx->c_w_id_ind = TRUE;
  pctx->c_w_id_len = SIZ(c_w_id);
  pctx->c_d_id_ind = TRUE;
  pctx->c_d_id_len = SIZ(c_d_id);
  pctx->c_id_ind = TRUE;
  pctx->c_id_len = 0;
  pctx->h_amount_len = SIZ(h_amount);
  pctx->h_amount_ind = TRUE;
  pctx->c_last_ind = TRUE;
  pctx->c_last_len = 0;
  pctx->w_street_1_ind = TRUE;
  pctx->w_street_1_len = 0;
  pctx->w_street_2_ind = TRUE;
  pctx->w_street_2_len = 0;
  pctx->w_city_ind = TRUE;
  pctx->w_city_len = 0;
  pctx->w_state_ind = TRUE;
  pctx->w_state_len = 0;
  pctx->w_zip_ind = TRUE;
  pctx->w_zip_len = 0;
  pctx->d_street_1_ind = TRUE;
  pctx->d_street_1_len = 0;
  pctx->d_street_2_ind = TRUE;
  pctx->d_street_2_len = 0;
  pctx->d_city_ind = TRUE;
  pctx->d_city_len = 0;
  pctx->d_state_ind = TRUE;
  pctx->d_state_len = 0;
  pctx->d_zip_ind = TRUE;
  pctx->d_zip_len = 0;
  pctx->c_first_ind = TRUE;
  pctx->c_first_len = 0;
  pctx->c_middle_ind = TRUE;
  pctx->c_middle_len = 0;
  pctx->c_street_1_ind = TRUE;
  pctx->c_street_1_len = 0;
  pctx->c_street_2_ind = TRUE;
  pctx->c_street_2_len = 0;
  pctx->c_city_ind = TRUE;
  pctx->c_city_len = 0;
  pctx->c_state_ind = TRUE;
  pctx->c_state_len = 0;
  pctx->c_zip_ind = TRUE;
  pctx->c_zip_len = 0;
  pctx->c_phone_ind = TRUE;
  pctx->c_phone_len = 0;
  pctx->c_since_ind = TRUE;
  pctx->c_since_len = 0;
  pctx->c_credit_ind = TRUE;
  pctx->c_credit_len = 0;
  pctx->c_credit_lim_ind = TRUE;
  pctx->c_credit_lim_len = 0;
  pctx->c_discount_ind = TRUE;
  pctx->c_discount_len = 0;
  pctx->c_balance_ind = TRUE;
  pctx->c_balance_len = sizeof(double);
  pctx->c_data_ind = TRUE;
  pctx->c_data_len = 0;
  pctx->h_date_ind = TRUE;
  pctx->h_date_len = 0;
  pctx->retries_ind = TRUE;
  pctx->retries_len = sizeof(retries);
  pctx->cr_date_ind = TRUE;
  pctx->cr_date_len = 7;



  /* bind variables */


  OCIBNDR(pctx->curp0, pctx->w_id_bp, errhp,":w_id",ADR(w_id),SIZ(int),
        SQLT_INT, &pctx->w_id_ind, NULL, NULL);
  OCIBNDR(pctx->curp0, pctx->d_id_bp, errhp,":d_id",ADR(d_id),SIZ(int),
        SQLT_INT, &pctx->d_id_ind, NULL, NULL);
  OCIBND(pctx->curp0, pctx->c_w_id_bp, errhp,":c_w_id",ADR(c_w_id),SIZ(int),
        SQLT_INT);
  OCIBND(pctx->curp0, pctx->c_d_id_bp, errhp,":c_d_id",ADR(c_d_id),SIZ(int),
        SQLT_INT);
  OCIBND(pctx->curp0, pctx->c_id_bp, errhp,":c_id",ADR(c_id),SIZ(int),
        SQLT_INT);
#ifdef PLSQLPAY
  OCIBND(pctx->curp0, pctx->by_lname_bp, errhp,":by_lname",ADR(bylastname),
       SIZ(int), SQLT_INT);
#endif
  OCIBNDR(pctx->curp0, pctx->h_amount_bp, errhp,":h_amount",ADR(h_amount),
        SIZ(int),SQLT_INT, &pctx->h_amount_ind, &pctx->h_amount_len,
        &pctx->h_amount_rc);
  OCIBNDR(pctx->curp0, pctx->c_last_bp, errhp,":c_last",c_last,SIZ(c_last),
        SQLT_STR, &pctx->c_last_ind, &pctx->c_last_len, &pctx->c_last_rc);
  OCIBNDR(pctx->curp0, pctx->w_street_1_bp, errhp,":w_street_1",w_street_1,
        SIZ(w_street_1),SQLT_STR, &pctx->w_street_1_ind,
        &pctx->w_street_1_len, &pctx->w_street_1_rc);
  OCIBNDR(pctx->curp0, pctx->w_street_2_bp, errhp,":w_street_2",w_street_2,
        SIZ(w_street_2),SQLT_STR, &pctx->w_street_2_ind,
        &pctx->w_street_2_len, &pctx->w_street_2_rc);
  OCIBNDR(pctx->curp0, pctx->w_city_bp, errhp,":w_city",w_city,SIZ(w_city),
        SQLT_STR, &pctx->w_city_ind, &pctx->w_city_len, &pctx->w_city_rc);
  OCIBNDR(pctx->curp0, pctx->w_state_bp, errhp,":w_state",w_state,SIZ(w_state),
        SQLT_STR, &pctx->w_state_ind, &pctx->w_state_len, &pctx->w_state_rc);
  OCIBNDR(pctx->curp0, pctx->w_zip_bp, errhp,":w_zip",w_zip,SIZ(w_zip),
        SQLT_STR, &pctx->w_zip_ind, &pctx->w_zip_len, &pctx->w_zip_rc);
  OCIBNDR(pctx->curp0, pctx->d_street_1_bp, errhp,":d_street_1",d_street_1,
        SIZ(d_street_1),SQLT_STR, &pctx->d_street_1_ind,
        &pctx->d_street_1_len, &pctx->d_street_1_rc);
  OCIBNDR(pctx->curp0, pctx->d_street_2_bp, errhp,":d_street_2",d_street_2,
        SIZ(d_street_2),SQLT_STR, &pctx->d_street_2_ind,
        &pctx->d_street_2_len, &pctx->d_street_2_rc);
  OCIBNDR(pctx->curp0, pctx->d_city_bp, errhp,":d_city",d_city,SIZ(d_city),
        SQLT_STR, &pctx->d_city_ind, &pctx->d_city_len, &pctx->d_city_rc);
  OCIBNDR(pctx->curp0, pctx->d_state_bp, errhp,":d_state",d_state,SIZ(d_state),
        SQLT_STR, &pctx->d_state_ind, &pctx->d_state_len, &pctx->d_state_rc);
  OCIBNDR(pctx->curp0, pctx->d_zip_bp, errhp,":d_zip",d_zip,SIZ(d_zip),
        SQLT_STR, &pctx->d_zip_ind, &pctx->d_zip_len, &pctx->d_zip_rc);
  OCIBNDR(pctx->curp0, pctx->c_first_bp, errhp,":c_first",c_first,SIZ(c_first),
        SQLT_STR, &pctx->c_first_ind, &pctx->c_first_len, &pctx->c_first_rc);
  OCIBNDR(pctx->curp0, pctx->c_middle_bp, errhp,":c_middle",c_middle,2,
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        SQLT_AFC, &pctx->c_middle_ind, &pctx->c_middle_len,
        &pctx->c_middle_rc);
    OCIBNDR(pctx->curp0, pctx->c_street_1_bp, errhp,":c_street_1",c_street_1,
        SIZ(c_street_1),SQLT_STR, &pctx->c_street_1_ind,
        &pctx->c_street_1_len, &pctx->c_street_1_rc);
    OCIBNDR(pctx->curp0, pctx->c_street_2_bp, errhp,":c_street_2",c_street_2,
        SIZ(c_street_2),SQLT_STR, &pctx->c_street_2_ind,
        &pctx->c_street_2_len, &pctx->c_street_2_rc);
    OCIBNDR(pctx->curp0, pctx->c_city_bp, errhp,":c_city",c_city,SIZ(c_city),
        SQLT_STR, &pctx->c_city_ind, &pctx->c_city_len, &pctx->c_city_rc);
    OCIBNDR(pctx->curp0, pctx->c_state_bp, errhp,":c_state",c_state,SIZ(c_state),
        SQLT_STR, &pctx->c_state_ind, &pctx->c_state_len, &pctx->c_state_rc);
    OCIBNDR(pctx->curp0, pctx->c_zip_bp, errhp,":c_zip",c_zip,SIZ(c_zip),
        SQLT_STR, &pctx->c_zip_ind, &pctx->c_zip_len, &pctx->c_zip_rc);
    OCIBNDR(pctx->curp0, pctx->c_phone_bp, errhp,":c_phone",c_phone,SIZ(c_phone),      SQLT_STR, &pctx->c_phone_ind,
&pctx->c_phone_len, &pctx->c_phone_rc);
    OCIBNDR(pctx->curp0, pctx->c_since_bp, errhp,":c_since",&c_since,
        SIZ(OCIDate), SQLT_ODT, &pctx->c_since_ind, &pctx->c_since_len,
        &pctx->c_since_rc);
    OCIBNDR(pctx->curp0, pctx->c_credit_bp, errhp,":c_credit",c_credit,
        SIZ(c_credit),SQLT_CHR, &pctx->c_credit_ind, &pctx->c_credit_len,
        &pctx->c_credit_rc);
    OCIBNDR(pctx->curp0, pctx->c_credit_lim_bp, errhp,":c_credit_lim",
        ADR(c_credit_lim),SIZ(int), SQLT_INT, &pctx->c_credit_lim_ind,
        &pctx->c_credit_lim_len, &pctx->c_credit_lim_rc);
    OCIBNDR(pctx->curp0, pctx->c_discount_bp, errhp,":c_discount",
        ADR(c_discount),SIZ(c_discount), SQLT_FLT, &pctx->c_discount_ind,
        &pctx->c_discount_len, &pctx->c_discount_rc);
    OCIBNDR(pctx->curp0, pctx->c_balance_bp, errhp,":c_balance",ADR(c_balance),
        SIZ(double),SQLT_FLT, &pctx->c_balance_ind, &pctx->c_balance_len,
        &pctx->c_balance_rc);
    OCIBNDR(pctx->curp0, pctx->c_data_bp, errhp,":c_data",c_data,SIZ(c_data),
        SQLT_STR, &pctx->c_data_ind, &pctx->c_data_len, &pctx->c_data_rc);
/*
    OCIBNDR(pctx->curp0, pctx->h_date_bp, errhp,":h_date",h_date,SIZ(h_date),
        SQLT_STR, &pctx->h_date_ind, &pctx->h_date_len, &pctx->h_date_rc);
*/
    OCIBNDR(pctx->curp0, pctx->retries_bp, errhp,":retry",ADR(retries),SIZ(int),
        SQLT_INT, &pctx->retries_ind, &pctx->retries_len, &pctx->retries_rc);
    OCIBNDR(pctx->curp0, pctx->cr_date_bp, errhp,":cr_date",ADR(cr_date),
        SIZ(OCIDate),SQLT_ODT, &pctx->cr_date_ind, &pctx->cr_date_len,
        &pctx->cr_date_rc);
#ifndef PLSQLPAY

/* ---- Binds for  the second cursor   */


    OCIBNDR(pctx->curp1, pctx->w_id_bp1, errhp,":w_id",ADR(w_id),SIZ(int),
        SQLT_INT, &pctx->w_id_ind, &pctx->w_id_len, &pctx->w_id_rc);
    OCIBNDR(pctx->curp1, pctx->d_id_bp1, errhp,":d_id",ADR(d_id),SIZ(int),
        SQLT_INT, &pctx->d_id_ind, &pctx->d_id_len, &pctx->d_id_rc);
    OCIBND(pctx->curp1, pctx->c_w_id_bp1, errhp,":c_w_id",ADR(c_w_id),SIZ(int),
        SQLT_INT);
    OCIBND(pctx->curp1, pctx->c_d_id_bp1, errhp,":c_d_id",ADR(c_d_id),SIZ(int),
        SQLT_INT);
    OCIBNDR(pctx->curp1, pctx->c_id_bp1, errhp,":c_id",ADR(c_id),SIZ(int),
        SQLT_INT, &pctx->c_id_ind, &pctx->c_id_len, &pctx->c_id_rc);
    OCIBNDR(pctx->curp1, pctx->h_amount_bp1, errhp,":h_amount",ADR(h_amount),
        SIZ(int),SQLT_INT, &pctx->h_amount_ind, &pctx->h_amount_len,
        &pctx->h_amount_rc);
    OCIBND(pctx->curp1, pctx->c_last_bp1, errhp,":c_last",c_last,SIZ(c_last),
        SQLT_STR);
    OCIBNDR(pctx->curp1, pctx->w_street_1_bp1, errhp,":w_street_1",w_street_1,
        SIZ(w_street_1),SQLT_STR, &pctx->w_street_1_ind,
        &pctx->w_street_1_len, &pctx->w_street_1_rc);
    OCIBNDR(pctx->curp1, pctx->w_street_2_bp1, errhp,":w_street_2",w_street_2,
        SIZ(w_street_2),SQLT_STR, &pctx->w_street_2_ind,
        &pctx->w_street_2_len, &pctx->w_street_2_rc);
    OCIBNDR(pctx->curp1, pctx->w_city_bp1, errhp,":w_city",w_city,SIZ(w_city),
        SQLT_STR, &pctx->w_city_ind, &pctx->w_city_len, &pctx->w_city_rc);
    OCIBNDR(pctx->curp1, pctx->w_state_bp1, errhp,":w_state",w_state,SIZ(w_state),
        SQLT_STR, &pctx->w_state_ind, &pctx->w_state_len, &pctx->w_state_rc);
    OCIBNDR(pctx->curp1, pctx->w_zip_bp1, errhp,":w_zip",w_zip,SIZ(w_zip),
        SQLT_STR, &pctx->w_zip_ind, &pctx->w_zip_len, &pctx->w_zip_rc);
    OCIBNDR(pctx->curp1, pctx->d_street_1_bp1, errhp,":d_street_1",d_street_1,
        SIZ(d_street_1),SQLT_STR, &pctx->d_street_1_ind,
        &pctx->d_street_1_len, &pctx->d_street_1_rc);
    OCIBNDR(pctx->curp1, pctx->d_street_2_bp1, errhp,":d_street_2",d_street_2,
        SIZ(d_street_2),SQLT_STR, &pctx->d_street_2_ind,
        &pctx->d_street_2_len, &pctx->d_street_2_rc);
    OCIBNDR(pctx->curp1, pctx->d_city_bp1, errhp,":d_city",d_city,SIZ(d_city),
        SQLT_STR, &pctx->d_city_ind, &pctx->d_city_len, &pctx->d_city_rc);
    OCIBNDR(pctx->curp1, pctx->d_state_bp1, errhp,":d_state",d_state,
        SIZ(d_state), SQLT_STR, &pctx->d_state_ind, &pctx->d_state_len,
        &pctx->d_state_rc);
    OCIBNDR(pctx->curp1, pctx->d_zip_bp1, errhp,":d_zip",d_zip,SIZ(d_zip),
        SQLT_STR, &pctx->d_zip_ind, &pctx->d_zip_len, &pctx->d_zip_rc);
    OCIBNDR(pctx->curp1, pctx->c_first_bp1, errhp,":c_first",c_first,
        SIZ(c_first), SQLT_STR, &pctx->c_first_ind, &pctx->c_first_len,
        &pctx->c_first_rc);
    OCIBNDR(pctx->curp1, pctx->c_middle_bp1, errhp,":c_middle",c_middle,2,
        SQLT_AFC, &pctx->c_middle_ind, &pctx->c_middle_len,
        &pctx->c_middle_rc);

    OCIBNDR(pctx->curp1, pctx->c_street_1_bp1, errhp,":c_street_1",c_street_1,
        SIZ(c_street_1),SQLT_STR, &pctx->c_street_1_ind,
        &pctx->c_street_1_len, &pctx->c_street_1_rc);
    OCIBNDR(pctx->curp1, pctx->c_street_2_bp1, errhp,":c_street_2",c_street_2,
        SIZ(c_street_2),SQLT_STR, &pctx->c_street_2_ind,
        &pctx->c_street_2_len, &pctx->c_street_2_rc);
    OCIBNDR(pctx->curp1, pctx->c_city_bp1, errhp,":c_city",c_city,SIZ(c_city),SQLT_STR,
                &pctx->c_city_ind, &pctx->c_city_len, &pctx->c_city_rc);
    OCIBNDR(pctx->curp1, pctx->c_state_bp1, errhp,":c_state",c_state,SIZ(c_state),      SQLT_STR, &pctx->c_state_ind, &pctx->
>c_state_len, &pctx->c_state_rc);
    OCIBNDR(pctx->curp1, pctx->c_zip_bp1, errhp,":c_zip",c_zip,SIZ(c_zip),
        SQLT_STR, &pctx->c_zip_ind, &pctx->c_zip_len, &pctx->c_zip_rc);
    OCIBNDR(pctx->curp1, pctx->c_phone_bp1, errhp,":c_phone",c_phone,SIZ(c_phone),
        SQLT_STR, &pctx->c_phone_ind, &pctx->c_phone_len, &pctx->c_phone_rc);
    OCIBNDR(pctx->curp1, pctx->c_since_bp1, errhp,":c_since",&c_since,
        SIZ(OCIDate), SQLT_ODT, &pctx->c_since_ind, &pctx->c_since_len,
        &pctx->c_since_rc);
    OCIBNDR(pctx->curp1, pctx->c_credit_bp1, errhp,":c_credit",c_credit,
        SIZ(c_credit),SQLT_CHR, &pctx->c_credit_ind, &pctx->c_credit_len,
        &pctx->c_credit_rc);
    OCIBNDR(pctx->curp1, pctx->c_credit_lim_bp1, errhp,":c_credit_lim",
        ADR(c_credit_lim),SIZ(int), SQLT_INT, &pctx->c_credit_lim_ind,
        &pctx->c_credit_lim_len, &pctx->c_credit_lim_rc);
    OCIBNDR(pctx->curp1, pctx->c_discount_bp1, errhp,":c_discount",
        ADR(c_discount),SIZ(c_discount), SQLT_FLT, &pctx->c_discount_ind,
        &pctx->c_discount_len, &pctx->c_discount_rc);
    OCIBNDR(pctx->curp1, pctx->c_balance_bp1, errhp,":c_balance",ADR(c_balance),
        SIZ(double),SQLT_FLT, &pctx->c_balance_ind, &pctx->c_balance_len,
        &pctx->c_balance_rc);
    OCIBNDR(pctx->curp1, pctx->c_data_bp1, errhp,":c_data",c_data,SIZ(c_data),
        SQLT_STR, &pctx->c_data_ind, &pctx->c_data_len, &pctx->c_data_rc);
/*
    OCIBNDR(pctx->curp1, pctx->h_date_bp1, errhp,":h_date",h_date,SIZ(h_date),
        SQLT_STR, &pctx->h_date_ind, &pctx->h_date_len, &pctx->h_date_rc);
*/
    OCIBNDR(pctx->curp1, pctx->retries_bp1, errhp,":retry",ADR(retries),SIZ(int),
        SQLT_INT, &pctx->retries_ind, &pctx->retries_len, &pctx->retries_rc);
    OCIBNDR(pctx->curp1, pctx->cr_date_bp1, errhp,":cr_date",ADR(cr_date),
        SIZ(OCIDate),SQLT_ODT, &pctx->cr_date_ind, &pctx->cr_date_len,
        &pctx->cr_date_rc);
#endif

    return (0);

}
```

```
tkvcp ()

{

retry:

  pctx->w_id_ind = TRUE;
  pctx->w_id_len = SIZ(w_id);
  pctx->d_id_ind = TRUE;
  pctx->d_id_len = SIZ(d_id);
  pctx->c_w_id_ind = TRUE;
  pctx->c_w_id_len = 0;
  pctx->c_d_id_ind = TRUE;
  pctx->c_d_id_len = 0;
  pctx->c_id_ind = TRUE;
  pctx->c_id_len = 0;
  pctx->h_amount_len = SIZ(h_amount);
  pctx->h_amount_ind = TRUE;
  pctx->c_last_ind = TRUE;
  pctx->c_last_len = SIZ(c_last);
  pctx->w_street_1_ind = TRUE;
  pctx->w_street_1_len = 0;
  pctx->w_street_2_ind = TRUE;
  pctx->w_street_2_len = 0;
  pctx->w_city_ind = TRUE;
  pctx->w_city_len = 0;
  pctx->w_state_ind = TRUE;
  pctx->w_state_len = 0;
  pctx->w_zip_ind = TRUE;
  pctx->w_zip_len = 0;
  pctx->d_street_1_ind = TRUE;
  pctx->d_street_1_len = 0;
  pctx->d_street_2_ind = TRUE;
  pctx->d_street_2_len = 0;
  pctx->d_city_ind = TRUE;
  pctx->d_city_len = 0;
  pctx->d_state_ind = TRUE;
  pctx->d_state_len = 0;
  pctx->d_zip_ind = TRUE;
  pctx->d_zip_len = 0;
  pctx->c_first_ind = TRUE;
  pctx->c_first_len = 0;
  pctx->c_middle_ind = TRUE;
  pctx->c_middle_len = 0;
  pctx->c_street_1_ind = TRUE;
  pctx->c_street_1_len = 0;
  pctx->c_street_2_ind = TRUE;
  pctx->c_street_2_len = 0;
  pctx->c_city_ind = TRUE;
  pctx->c_city_len = 0;
  pctx->c_state_ind = TRUE;
  pctx->c_state_len = 0;
  pctx->c_zip_ind = TRUE;
  pctx->c_zip_len = 0;
  pctx->c_phone_ind = TRUE;
  pctx->c_phone_len = 0;
  pctx->c_since_ind = TRUE;
  pctx->c_since_len = 0;
  pctx->c_credit_ind = TRUE;
  pctx->c_credit_len = 0;
  pctx->c_credit_lim_ind = TRUE;
  pctx->c_credit_lim_len = 0;
  pctx->c_discount_ind = TRUE;
  pctx->c_discount_len = 0;
  pctx->c_balance_ind = TRUE;
  pctx->c_balance_len = sizeof(double);
  pctx->c_data_ind = TRUE;
  pctx->c_data_len = 0;
  pctx->h_date_ind = TRUE;
  pctx->h_date_len = 0;
  pctx->retries_ind = TRUE;
  pctx->retries_len = sizeof(retries);
  pctx->cr_date_ind = TRUE;
  pctx->cr_date_len = 7;

#ifdef PLSQLPAY
    execstatus=OCIStmtExecute(tpcsvc,pctx->curp0,errhp,1,0,0,0,OCI_DEFAULT|OCI_COMMIT_ON_SUCCESS);
#else
  if(bylastname) {
    execstatus=OCIStmtExecute(tpcsvc,pctx->curp1,errhp,1,0,0,0,OCI_DEFAULT|OCI_COMMIT_ON_SUCCESS);
  } else {
    execstatus=OCIStmtExecute(tpcsvc,pctx->curp0,errhp,1,0,0,0,OCI_DEFAULT|OCI_COMMIT_ON_SUCCESS);
  }
#endif


  if(execstatus != OCI_SUCCESS) {
     OCITransRollback(tpcsvc,errhp,OCI_DEFAULT);
     errcode = OCIERROR(errhp,execstatus);
     if(errcode == NOT_SERIALIZABLE) {
        retries++;
        goto retry;
     } else if (errcode == RECOVERR) {
        retries++;
        goto retry;
     } else if (errcode == SNAPSHOT_TOO_OLD) {
        retries++;
        goto retry;
     } else {
        return -1;
     }
   }
   return 0;
}



void tkvcpdone ()

{
  if(pctx) {
    free(pctx);
  }
}
```

client/oracle/plord.c

```
#ifdef RCSID
static char *RCSid =
   "$Header: plord.c 7030100.1 95/07/19 14:46:13 plai Generic<base> $ Copyr (c) 1994 Oracle";
#endif /* RCSID */

/*=================================================================+
 |       Copyright (c) 1995  Oracle Corp, Redwood Shores, CA       |
 |                  OPEN SYSTEMS PERFORMANCE GROUP                 |
 |                     All Rights Reserved                         |
 +=================================================================+
 | FILENAME
 |    plord.c
 | DESCRIPTION
 |    OCI version (using PL/SQL anynomous block) of
 |    ORDER STATUS transaction in TPC-C benchmark.
 +=================================================================*/

#include "ora_tpcc.h"
```

```
#include "tpccflags.h"

#ifdef PLSQLORD
#define SQLTXT "BEGIN orderstatus.getstatus (:w_id, :d_id, :c_id, :byln, \
  :c_last, :c_first, :c_middle, :c_balance, :o_id, :o_entry_d, :o_cr_id, \
  :o_ol_cnt, :ol_s_w_id, :ol_i_id, :ol_quantity, :ol_amount, :ol_d_d); END;"
#else

#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 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, o_d_id, o_w_id, o_id DESC"


#define SQLCUR2 "SELECT c_balance, c_first, c_middle, c_last, \
            o_id, o_entry_d, o_carrier_id, o_ol_cnt,c_id \
            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, o_d_id, o_w_id, o_id DESC"


#define SQLCUR3 "SELECT ol_i_id,ol_supply_w_id,ol_quantity,ol_amount, \
           ol_delivery_d\
           FROM ordl \
           WHERE ol_d_id = :d_id AND ol_w_id = :w_id AND ol_o_id = :o_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 "
#endif



struct ordctx {
  sb2 c_rowid_ind[100];
  sb2 ol_supply_w_id_ind[NITEMS];
  sb2 ol_i_id_ind[NITEMS];
  sb2 ol_quantity_ind[NITEMS];
  sb2 ol_amount_ind[NITEMS];
  sb2 ol_delivery_d_ind[NITEMS];
  sb2 ol_w_id_ind;
  sb2 ol_d_id_ind;
  sb2 ol_o_id_ind;
  sb2 c_id_ind;
  sb2 c_first_ind;
  sb2 c_middle_ind;
  sb2 c_balance_ind;
  sb2 c_last_ind;
  sb2 o_id_ind;
  sb2 o_entry_d_ind;
  sb2 o_carrier_id_ind;
  sb2 o_ol_cnt_ind;

  ub4 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;

  ub2 c_rowid_rcode[100];
  ub2 ol_supply_w_id_rcode[NITEMS];
  ub2 ol_i_id_rcode[NITEMS];
  ub2 ol_quantity_rcode[NITEMS];
  ub2 ol_amount_rcode[NITEMS];
  ub2 ol_delivery_d_rcode[NITEMS];
  ub2 ol_w_id_rcode;
  ub2 ol_d_id_rcode;
  ub2 ol_o_id_rcode;

  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;
  OCIBind *w_id_bp0;
  OCIBind *d_id_bp0;
  OCIBind *c_id_bp;
  OCIBind *c_last_bp;
#ifdef PLSQLORD
  OCIBind *byln_bp;
  OCIBind *c_first_bp;
  OCIBind *c_middle_bp;
  OCIBind *c_balance_bp;
  OCIBind *o_entry_d_bp;
  OCIBind *o_cr_id_bp;
  OCIBind *o_ol_cnt_bp;
  OCIBind *ol_i_id_bp;
  OCIBind *ol_supply_w_id_bp;
  OCIBind *ol_quantity_bp;
  OCIBind *ol_amount_bp;
  OCIBind *ol_d_base_bp;
  ub4 ol_i_id_cnt;
  ub4 ol_sup_cnt;
  ub4 ol_qty_cnt;
  ub4 ol_amt_cnt;
  ub4 ol_del_d_cnt;
#else
  OCIStmt *curo1;
  OCIStmt *curo2;
  OCIStmt *curo3;
  OCIStmt *curo4;
  OCIBind *w_id_bp2;
  OCIBind *w_id_bp3;
  OCIBind *w_id_bp4;
  OCIBind *d_id_bp2;
  OCIBind *d_id_bp3;
  OCIBind *d_id_bp4;
  OCIBind *c_last_bp4;
  OCIBind *o_id_bp;
  OCIBind *c_rowid_bp;
  OCIDefine *c_rowid_dp;
  OCIDefine *c_last_dp;
  OCIDefine *c_last_dp1;
  OCIDefine *c_id_dp;
  OCIDefine *c_id_dp1;
  OCIDefine *c_first_dp1;
  OCIDefine *c_first_dp2;
  OCIDefine *c_middle_dp1;
  OCIDefine *c_middle_dp2;
  OCIDefine *c_balance_dp1;
  OCIDefine *c_balance_dp2;
  OCIDefine *o_id_dp1;
  OCIDefine *o_id_dp2;
  OCIDefine *o_entry_d_dp1;
  OCIDefine *o_entry_d_dp2;
```

```
  OCIDefine *o_cr_id_dp1;
  OCIDefine *o_cr_id_dp2;
  OCIDefine *o_ol_cnt_dp1;
  OCIDefine *o_ol_cnt_dp2;
  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 *middle_cust;

  int cs;
  int cust_idx;
  int norow;
  int rcount;
  int somerows;
#endif
};

typedef struct ordctx ordctx;

struct defctx
{
 boolean reexec;
 ub4 count;
};
typedef struct defctx defctx;

ordctx *octx;

defctx cbctx;

#ifndef PLSQLORD
sb4 rid_data(dvoid *ctxp, OCIDefine *dp, ub4 iter,
             dvoid **bufpp, ub4 **alenp, ub1 *piecep,
             dvoid **indpp, ub2 **rcodepp)
{
  ub4 i;
  if (((defctx*)ctxp)->reexec)/* if this is the second execute - use entry 0 */
  {
     i = 0;
    ((defctx*)ctxp)->count--;   /* count down */
  }
  else
     i = iter;
  *bufpp = octx->c_rowid_ptr[i];
  *indpp= &octx->c_rowid_ind[i];
  *alenp= &octx->c_rowid_len[i];
  *rcodepp = &octx->c_rowid_rcode[i];
  *piecep =OCI_ONE_PIECE;
  return (OCI_CONTINUE);
}
#endif

tkvcoinit ()

{

  int i;
  text stmbuf[SQL_BUF_SIZE];

  octx = (ordctx *) malloc (sizeof(ordctx));
  memset(octx,(char)0,sizeof(ordctx));
#ifndef PLSQLORD
  octx->cs = 1;
  octx->norow = 0;
  octx->somerows = 10;

/* get the rowid handles */
  for(i=0;i<100;i++) {
   OCIERROR(errhp, OCIDescriptorAlloc(tpcenv,(dvoid**)&octx->c_rowid_ptr[i],
     OCI_DTYPE_ROWID,0,(dvoid**)0));
  }
#endif


  OCIERROR(errhp,
    OCIHandleAlloc(tpcenv,(dvoid**)&octx->curo0,OCI_HTYPE_STMT,0,(dvoid**)0));
  OCIERROR(errhp,
    OCIHandleAlloc(tpcenv,(dvoid**)&octx->curo0,OCI_HTYPE_STMT,0,(dvoid**)0));
#ifndef PLSQLORD
  OCIERROR(errhp,
    OCIHandleAlloc(tpcenv,(dvoid**)&octx->curo1,OCI_HTYPE_STMT,0,(dvoid**)0));
  OCIERROR(errhp,
    OCIHandleAlloc(tpcenv,(dvoid**)&octx->curo2,OCI_HTYPE_STMT,0,(dvoid**)0));
  OCIERROR(errhp,
    OCIHandleAlloc(tpcenv,(dvoid**)&octx->curo3,OCI_HTYPE_STMT,0,(dvoid**)0));
  OCIERROR(errhp,
    OCIHandleAlloc(tpcenv,(dvoid**)&octx->curo4,OCI_HTYPE_STMT,0,(dvoid**)0));
#endif

#ifdef PLSQLORD
  sprintf((char *) stmbuf, SQLTXT);
  OCIERROR(errhp,
    OCIStmtPrepare(octx->curo0,errhp,stmbuf,strlen((char *)stmbuf),
             OCI_NTV_SYNTAX,OCI_DEFAULT));
#else
/*  c_id = 0, use find customer by lastname. Get an array or rowid's back*/
  sprintf((char *) stmbuf, SQLCUR0);
  OCIERROR(errhp,
    OCIStmtPrepare(octx->curo0,errhp,stmbuf,strlen((char *)stmbuf),
                           OCI_NTV_SYNTAX,OCI_DEFAULT));
  OCIERROR(errhp,
    OCIAttrSet(octx->curo0,OCI_HTYPE_STMT,(dvoid*)&octx->norow,0,
          OCI_ATTR_PREFETCH_ROWS,errhp));
/* get order/customer info back based on rowid */
  sprintf((char *) stmbuf, SQLCUR1);
  OCIERROR(errhp,
    OCIStmtPrepare(octx->curo1,errhp,stmbuf,strlen((char *)stmbuf),
                           OCI_NTV_SYNTAX,OCI_DEFAULT));
  OCIERROR(errhp,
    OCIAttrSet(octx->curo1,OCI_HTYPE_STMT,(dvoid*)&octx->norow,0,
          OCI_ATTR_PREFETCH_ROWS,errhp));

/*  c_id == 0, use lastname to find customer */
  sprintf((char *) stmbuf, SQLCUR2);
  OCIERROR(errhp,
    OCIStmtPrepare(octx->curo2,errhp,stmbuf,strlen((char *)stmbuf),
                           OCI_NTV_SYNTAX,OCI_DEFAULT));
  OCIERROR(errhp,
    OCIAttrSet(octx->curo2,OCI_HTYPE_STMT,(dvoid*)&octx->norow,0,
          OCI_ATTR_PREFETCH_ROWS,errhp));

  sprintf((char *) stmbuf, SQLCUR3);
  OCIERROR(errhp,
    OCIStmtPrepare(octx->curo3,errhp,stmbuf,strlen((char *)stmbuf),
                           OCI_NTV_SYNTAX,OCI_DEFAULT));
  OCIERROR(errhp,
    OCIAttrSet(octx->curo3,OCI_HTYPE_STMT,(dvoid*)&octx->norow,0,
          OCI_ATTR_PREFETCH_ROWS,errhp));

  sprintf((char *) stmbuf, SQLCUR4);
  OCIERROR(errhp,
    OCIStmtPrepare(octx->curo4,errhp,stmbuf,strlen((char *)stmbuf),
                           OCI_NTV_SYNTAX,OCI_DEFAULT));
  OCIERROR(errhp,
    OCIAttrSet(octx->curo4,OCI_HTYPE_STMT,(dvoid*)&octx->norow,0,
          OCI_ATTR_PREFETCH_ROWS,errhp));
```

```
#endif

   for (i = 0; i < NITEMS; i++) {
     octx->ol_supply_w_id_ind[i] = TRUE;
     octx->ol_i_id_ind[i] = TRUE;
     octx->ol_quantity_ind[i] = TRUE;
     octx->ol_amount_ind[i] = TRUE;
     octx->ol_delivery_d_ind[i] = TRUE;

     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(ol_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_ind = TRUE;
   octx->ol_d_id_ind = TRUE;
   octx->ol_o_id_ind = TRUE;
   octx->ol_w_id_len = sizeof(int);
   octx->ol_d_id_len = sizeof(int);
   octx->ol_o_id_len = sizeof(int);

   /* bind variables */
#ifdef PLSQLORD

   OCIBND(octx->curo0, octx->w_id_bp0, errhp,":w_id",ADR(w_id),
        SIZ(int),SQLT_INT);
   OCIBND(octx->curo0, octx->d_id_bp0, errhp,":d_id",ADR(d_id),
        SIZ(int), SQLT_INT);
   OCIBND(octx->curo0, octx->c_id_bp , errhp,":c_id",ADR(c_id),
        SIZ(c_id),SQLT_INT);
   OCIBND(octx->curo0, octx->byln_bp , errhp,":byln",ADR(bylastname),
        SIZ(int),SQLT_INT);
   OCIBND(octx->curo0, octx->c_last_bp , errhp,":c_last",c_last,
        SIZ(c_last),SQLT_STR);
   OCIBND(octx->curo0, octx->c_first_bp , errhp,":c_first",c_first,
        SIZ(c_first),SQLT_STR);
   OCIBND(octx->curo0, octx->c_middle_bp , errhp,":c_middle",c_middle,
        SIZ(c_middle),SQLT_STR);
   OCIBND(octx->curo0, octx->c_balance_bp , errhp,":c_balance",
        ADR(c_balance),SIZ (float),SQLT_FLT);
   OCIBND(octx->curo0, octx->c_id_bp , errhp,":o_id",ADR(o_id),
        SIZ(int),SQLT_INT);
   OCIBND(octx->curo0, octx->o_entry_d_bp , errhp,":o_entry_d",o_entry_d,
        SIZ(o_entry_d),SQLT_STR);
   OCIBND(octx->curo0, octx->o_cr_id_bp , errhp,":o_cr_id",ADR(o_carrier_id),
        SIZ(int), SQLT_INT);
   OCIBND(octx->curo0, octx->o_ol_cnt_bp , errhp,":o_ol_cnt",ADR(o_ol_cnt),
        SIZ(int),SQLT_INT);

   OCIBNDRAA(octx->curo0, octx->ol_i_id_bp, errhp, ":ol_i_id",
         ol_i_id,SIZ(int),SQLT_INT,
         octx->ol_i_id_ind,octx->ol_i_id_len,
         octx->ol_i_id_rcode,NITEMS,&octx->ol_i_id_cnt);
   OCIBNDRAA(octx->curo0,octx->ol_supply_w_id_bp,errhp,":ol_s_w_id",
         ol_supply_w_id,SIZ(int),SQLT_INT,
         octx->ol_supply_w_id_ind,octx->ol_supply_w_id_len,
         octx->ol_supply_w_id_rcode,NITEMS,&octx->ol_sup_cnt);
   OCIBNDRAA(octx->curo0, octx->ol_quantity_bp,errhp,":ol_quantity",
         ol_quantity,SIZ(int),SQLT_INT,
         octx->ol_quantity_ind,octx->ol_quantity_len,
         octx->ol_quantity_rcode,NITEMS,&octx->ol_qty_cnt);
   OCIBNDRAA(octx->curo0,octx->ol_amount_bp,errhp,":ol_amount",ol_amount,
         SIZ(float),SQLT_FLT,octx->ol_amount_ind,
         octx->ol_amount_len, octx->ol_amount_rcode,NITEMS,
         &octx->ol_amt_cnt);
   OCIBNDRAA(octx->curo0,octx->ol_d_base_bp,errhp,":ol_d_d",ol_d_base,
         SIZ(OCIDate),SQLT_ODT,octx->ol_delivery_d_ind,
         octx->ol_delivery_d_len, octx->ol_delivery_d_rcode,NITEMS,
         &octx->ol_del_d_cnt);

#else

   /* c_id (customer id) is not known */
   OCIBND(octx->curo0,octx->w_id_bp0,errhp,":w_id",ADR(w_id),SIZ(int),SQLT_INT);
   OCIBND(octx->curo0,octx->d_id_bp0,errhp,":d_id",ADR(d_id),SIZ(int),SQLT_INT);
   OCIBND(octx->curo0,octx->c_last_bp,errhp,":c_last",c_last,SIZ(c_last),
        SQLT_STR);
   OCIDFNDYN(octx->curo0,octx->c_rowid_dp,errhp,1,octx->c_rowid_ptr,
         SIZ(OCIRowid*), SQLT_RDD, octx->c_rowid_ind, &cbctx,rid_data);

   OCIBND(octx->curo1,octx->c_rowid_bp,errhp,":cust_rowid",
       &octx->middle_cust, sizeof( octx->middle_cust),SQLT_RDD);

   OCIDEF(octx->curo1,octx->c_id_dp,errhp,1,ADR(c_id),SIZ(int),SQLT_INT);
   OCIDEF(octx->curo1,octx->c_balance_dp1,errhp,2,ADR(c_balance),
        SIZ(double),SQLT_FLT);
   OCIDEF(octx->curo1,octx->c_first_dp1,errhp,3,c_first,SIZ(c_first)-1,
        SQLT_CHR);
   OCIDEF(octx->curo1,octx->c_middle_dp1,errhp,4,c_middle,
        SIZ(c_middle)-1,SQLT_AFC);
   OCIDEF(octx->curo1,octx->c_last_dp1,errhp,5,c_last,SIZ(c_last)-1,
        SQLT_CHR);
   OCIDEF(octx->curo1,octx->o_id_dp1,errhp,6,ADR(o_id),SIZ(int),SQLT_INT);
   OCIDEF(octx->curo1,octx->o_entry_d_dp1,errhp,7,
        &o_entry_d_base,SIZ(OCIDate),SQLT_ODT);
   OCIDEF(octx->curo1,octx->o_cr_id_dp1,errhp,8,ADR(o_carrier_id),
        SIZ(int),SQLT_INT);
   OCIDEF(octx->curo1,octx->o_ol_cnt_dp1,errhp,9,ADR(o_ol_cnt),
        SIZ(int),SQLT_INT);

/* Bind for third cursor , no-zero customer id */
   OCIBND(octx->curo2,octx->w_id_bp2,errhp,":w_id",ADR(w_id),SIZ(int),SQLT_INT);
   OCIBND(octx->curo2,octx->d_id_bp2,errhp,":d_id",ADR(d_id),SIZ(int),SQLT_INT);
   OCIBND(octx->curo2,octx->c_id_bp,errhp,":c_id",ADR(c_id),SIZ(int),SQLT_INT);
   OCIDEF(octx->curo2,octx->c_balance_dp2,errhp,1,ADR(c_balance),
        SIZ(double),SQLT_FLT);
   OCIDEF(octx->curo2,octx->c_first_dp2,errhp,2,c_first,SIZ(c_first)-1,
        SQLT_CHR);
   OCIDEF(octx->curo2,octx->c_middle_dp2,errhp,3,c_middle,
        SIZ(c_middle)-1,SQLT_AFC);
   OCIDEF(octx->curo2,octx->c_last_dp,errhp,4,c_last,SIZ(c_last)-1, SQLT_CHR);
   OCIDEF(octx->curo2,octx->o_id_dp2,errhp,5,ADR(o_id),SIZ(int),SQLT_INT);
   OCIDEF(octx->curo2,octx->o_entry_d_dp2,errhp,6, &o_entry_d_base,
        SIZ(OCIDate),SQLT_ODT);
   OCIDEF(octx->curo2, octx->o_cr_id_dp2,errhp,7,ADR(o_carrier_id),
        SIZ(int), SQLT_INT);
   OCIDEF(octx->curo2,octx->o_ol_cnt_dp2,errhp,8,ADR(o_ol_cnt),
        SIZ(int),SQLT_INT);
   OCIDEF(octx->curo2,octx->c_id_dp1,errhp,9,ADR(c_id),SIZ(int),SQLT_INT);

/* Bind for last cursor */

   OCIBND(octx->curo3,octx->w_id_bp3,errhp,":w_id",ADR(w_id),SIZ(int),SQLT_INT);
   OCIBND(octx->curo3,octx->d_id_bp3,errhp,":d_id",ADR(d_id),SIZ(int),SQLT_INT);
   OCIBND(octx->curo3,octx->o_id_bp,errhp,":o_id",ADR(o_id),SIZ(int),SQLT_INT);

   OCIDFNRA(octx->curo3, octx->ol_i_id_dp, errhp, 1, ol_i_id,SIZ(int),SQLT_INT,
                octx->ol_i_id_ind,octx->ol_i_id_len, octx->ol_i_id_rcode);
   OCIDFNRA(octx->curo3,octx->ol_supply_w_id_dp,errhp,2, ol_supply_w_id,
         SIZ(int),SQLT_INT, octx->ol_supply_w_id_ind,
         octx->ol_supply_w_id_len, octx->ol_supply_w_id_rcode);
```

```
  OCIDFNRA(octx->curo3, octx->ol_quantity_dp,errhp,3, ol_quantity,SIZ(int),
        SQLT_INT, octx->ol_quantity_ind,octx->ol_quantity_len,
                octx->ol_quantity_rcode);
  OCIDFNRA(octx->curo3,octx->ol_amount_dp,errhp,4,ol_amount, SIZ(int),
        SQLT_INT,octx->ol_amount_ind, octx->ol_amount_len,
        octx->ol_amount_rcode);
  OCIDFNRA(octx->curo3,octx->ol_d_base_dp,errhp,5,ol_d_base,SIZ(OCIDate),
        SQLT_ODT, octx->ol_delivery_d_ind,octx->ol_delivery_d_len,
                octx->ol_delivery_d_rcode);

  OCIBND(octx->curo4,octx->w_id_bp4,errhp,":w_id",ADR(w_id),SIZ(int),SQLT_INT);
  OCIBND(octx->curo4,octx->d_id_bp4,errhp,":d_id",ADR(d_id),SIZ(int),SQLT_INT);
  OCIBND(octx->curo4,octx->c_last_bp4,errhp,":c_last",c_last,SIZ(c_last),
        SQLT_STR);
  OCIDEF(octx->curo4,octx->c_count_dp,errhp,1,ADR(octx->rcount),SIZ(int),
        SQLT_INT);


#endif
  return (0);

}



tkvco ()

{

  int i;
  int rcount;

  for (i = 0; i < NITEMS; i++) {
    octx->ol_supply_w_id_ind[i] = TRUE;
    octx->ol_i_id_ind[i] = TRUE;
    octx->ol_quantity_ind[i] = TRUE;
    octx->ol_amount_ind[i] = TRUE;
    octx->ol_delivery_d_ind[i] = TRUE;
    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(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;
#ifdef PLSQLORD
  octx->ol_i_id_cnt = 0;
  octx->ol_sup_cnt = 0;
  octx->ol_qty_cnt = 0;
  octx->ol_amt_cnt = 0;
  octx->ol_del_d_cnt = 0;
  OCIERROR(errhp,
    OCIStmtExecute(tpcsvc,octx->curo0,errhp,1,0,0,0,OCI_DEFAULT));
#else
retry:
  if(bylastname)
  {
    cbctx.reexec = FALSE;
    execstatus=OCIStmtExecute(tpcsvc,octx->curo0,errhp,100,0,0,0,OCI_DEFAULT);
    /* will get OCI_NO_DATA if <100 found */
    if ((execstatus != OCI_NO_DATA) && (execstatus != OCI_SUCCESS))
    {
      errcode=OCIERROR(errhp, execstatus);
      if((errcode == NOT_SERIALIZABLE) || (errcode == RECOVERR)
              || (errcode == SNAPSHOT_TOO_OLD))
      {
        OCITransCommit(tpcsvc,errhp,OCI_DEFAULT);
        retries++;
        goto retry;
      } else {
        return -1;
      }
    }
    if (execstatus == OCI_NO_DATA) /* there are no more rows */
    {
     /* get rowcount, find middle one */
     OCIAttrGet(octx->curo0,OCI_HTYPE_STMT,&rcount,NULL,OCI_ATTR_ROW_COUNT,errhp);
     if (rcount <1)
     {
       userlog("No Data Found\n");
       return (-1);
     }
     octx->cust_idx=(rcount-1)/2 ;
    }
    else
    {
     /* count the number of rows */
     execstatus=OCIStmtExecute(tpcsvc,octx->curo4,errhp,1,0,0,0,OCI_DEFAULT);
     if ((execstatus != OCI_NO_DATA) && (execstatus != OCI_SUCCESS))
     {
       if ((errcode == NOT_SERIALIZABLE) || (errcode == RECOVERR)
             || (errcode == SNAPSHOT_TOO_OLD))
       {
         OCITransCommit(tpcsvc,errhp,OCI_DEFAULT);
         retries++;
         goto retry;
       } else {
         return -1;
       }
     }
     if (octx->rcount+1 < 200 )
       octx->cust_idx=(octx->rcount-1)/2 ;
     else          /* */
     {
       cbctx.reexec = TRUE;
       cbctx.count = (octx->rcount+1)/2 ;
       execstatus=OCIStmtExecute(tpcsvc,octx->curo0,errhp,cbctx.count,
                        0,0,0,OCI_DEFAULT);
       /* will get OCI_NO_DATA if <100 found */
       if (cbctx.count > 0)
       {
         userlog ("did not get all rows ");
         return (-1);
       }

       if ((execstatus != OCI_NO_DATA) && (execstatus != OCI_SUCCESS))
       {
         errcode=OCIERROR(errhp, execstatus);
         if((errcode == NOT_SERIALIZABLE) || (errcode == RECOVERR)
               || (errcode == SNAPSHOT_TOO_OLD))
         {
           OCITransCommit(tpcsvc,errhp,OCI_DEFAULT);
           retries++;
           goto retry;
          } else {
           return -1;
          }
       }
       octx->cust_idx=0 ;
     }
    }

    octx->middle_cust = octx->c_rowid_ptr[octx->cust_idx];
    execstatus=OCIStmtExecute(tpcsvc,octx->curo1,errhp,1,0,0,0,OCI_DEFAULT);
    if (execstatus != OCI_SUCCESS)
    {
```

```
      errcode=OCIERROR(errhp,execstatus);
      OCITransCommit(tpcsvc,errhp,OCI_DEFAULT);
      if((errcode == NOT_SERIALIZABLE) || (errcode == RECOVERR) ||
          (errcode == SNAPSHOT_TOO_OLD))
      {
        retries++;
        goto retry;
        } else {
        return -1;
      }
    }
  }
  else
  {
    execstatus=OCIStmtExecute(tpcsvc,octx->curo2,errhp,1,0,0,0,OCI_DEFAULT);
    if (execstatus != OCI_SUCCESS)
    {
      errcode=OCIERROR(errhp,execstatus);
      OCITransCommit(tpcsvc,errhp,OCI_DEFAULT);
      if((errcode == NOT_SERIALIZABLE) || (errcode == RECOVERR)
          || (errcode == SNAPSHOT_TOO_OLD))
      {
        retries++;
        goto retry;
      }
      else
      {
        return -1;
      }
    }
  }
  octx->ol_w_id_ind = TRUE;
  octx->ol_d_id_ind = TRUE;
  octx->ol_o_id_ind = TRUE;
  octx->ol_w_id_len = sizeof(int);
  octx->ol_d_id_len = sizeof(int);
  octx->ol_o_id_len = sizeof(int);

  execstatus = OCIStmtExecute(tpcsvc,octx->curo3,errhp,o_ol_cnt,0,0,0,
               OCI_DEFAULT | OCI_COMMIT_ON_SUCCESS);
  if (execstatus != OCI_SUCCESS )
  {
    errcode=OCIERROR(errhp,execstatus);
    OCITransCommit(tpcsvc,errhp,OCI_DEFAULT);
    if((errcode == NOT_SERIALIZABLE) || (errcode == RECOVERR)
        || (errcode == SNAPSHOT_TOO_OLD))
    {
      retries++;
      goto retry;
    }
    else
    {
      return -1;
    }

  }
#endif
  /* clean up and convert the delivery dates */
  for (i = 0; i < o_ol_cnt; i++)
  {
    if (octx->ol_delivery_d_ind[i] == -1) /* null date in field */
                strncpy((char*)ol_delivery_d[i],"01-01-1811",10);
    else
    {
      ol_del_len[i]=sizeof(ol_delivery_d[i]);
      OCIERROR(errhp,OCIDateToText(errhp,&ol_d_base[i],
        (text*)SHORTDATE,strlen(SHORTDATE),(text*)0,0,&ol_del_len[i],ol_delivery_d[i]));
    }
/*
                cvtdmy(ol_d_base[i],ol_delivery_d[i]);
*/
    }

  return (0);

}


void tkvcodone ()

{

  if (octx)
    free (octx);

}
```

client/oracle/plsto.c

```
#ifdef RCSID
static char *RCSid =
   "$Header: plsto.c 7010000.3 95/02/14 12:48:03 plai Generic<base> $ Copyr (c) 1994 Oracle";
#endif /* RCSID */

/*============================================================================+
 |       Copyright (c) 1994  Oracle Corp, Redwood Shores, CA       |
 |                  OPEN SYSTEMS PERFORMANCE GROUP                 |
 |                       All Rights Reserved                       |
 +============================================================================+
 | FILENAME
 |    plsto.c
 | DESCRIPTION
 |    OCI version of STOCK LEVEL transaction in TPC-C benchmark.
 +============================================================================*/

#include "ora_tpcc.h"
#include "tpccflags.h"

#ifdef PLSQLSTO
#define SQLTXT "BEGIN stocklevel.getstocklevel (:w_id, :d_id, :threshold, \
   :low_stock); END;"
#else
#define SQLTXT "SELECT 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)"
/* query using functional index */
/*
#define SQLTXT "SELECT 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_o_id BETWEEN (d_next_o_id - 20) AND (d_next_o_id - 1) AND \
               decode(SIGN(s_quantity -21) , -1, s_w_id*100000 + s_i_id, NULL) \
                                    = ol_w_id*100000 + ol_i_id  AND \
               s_quantity < :threshold;"

*/

#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;

stoctx *sctx;


tkvcsinit ()

{

   text stmbuf[SQL_BUF_SIZE];
   sctx = (stoctx *)malloc(sizeof(stoctx));
   memset(sctx,(char)0,sizeof(stoctx));

   sctx->norow=0;

   OCIERROR(errhp,
     OCIHandleAlloc(tpcenv,(dvoid**)&sctx->curs,OCI_HTYPE_STMT,0,(dvoid**)0));
   sprintf ((char *) stmbuf, SQLTXT);
   OCIERROR(errhp,OCIStmtPrepare(sctx->curs,errhp,stmbuf,strlen((char *)stmbuf),
                                 OCI_NTV_SYNTAX,OCI_DEFAULT));
#ifndef PLSQLSTO
   OCIERROR(errhp,
     OCIAttrSet(sctx->curs,OCI_HTYPE_STMT,(dvoid*)&sctx->norow,0,
           OCI_ATTR_PREFETCH_ROWS,errhp));
#endif

   /* bind variables */

   OCIBND(sctx->curs,sctx->w_id_bp,errhp, ":w_id", ADR(w_id),sizeof(int),
        SQLT_INT);
   OCIBND(sctx->curs,sctx->d_id_bp,errhp, ":d_id", ADR(d_id),sizeof(int),
     SQLT_INT);
   OCIBND(sctx->curs,sctx->threshold_bp,errhp, ":threshold", ADR(threshold),
     sizeof(int),SQLT_INT);
#ifdef PLSQLSTO
   OCIBND(sctx->curs,sctx->low_stock_bp,errhp,":low_stock" , ADR(low_stock),
     sizeof(int), SQLT_INT);
#else
   OCIDEFINE(sctx->curs,sctx->low_stock_bp,errhp, 1, ADR(low_stock),
     sizeof(int), SQLT_INT);
#endif

   return (0);

}


tkvcs ()

{

retry:
    execstatus= OCIStmtExecute(tpcsvc,sctx->curs,errhp,1,0,0,0,
                          OCI_COMMIT_ON_SUCCESS | OCI_DEFAULT);
    if (execstatus != OCI_SUCCESS)
    {
      errcode=OCIERROR(errhp,execstatus);
      OCITransCommit(tpcsvc,errhp,OCI_DEFAULT);
      if((errcode == NOT_SERIALIZABLE) || (errcode == RECOVERR)
         || (errcode == SNAPSHOT_TOO_OLD))
      {
        retries++;
        goto retry;
      } else {
        return -1;
      }
    }

  return (0);
}


void tkvcsdone ()

{
  if(sctx) free(sctx);
}
```

client/oracle/pldel.c

```
#ifdef RCSID
static char *RCSid =
   "$Header: pldel.c 7030100.5 96/06/24 16:26:06 plai Generic<base> $ Copyr (c) 1994 Oracle";
#endif /* RCSID */

/*============================================================================+
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 |                  OPEN SYSTEMS PERFORMANCE GROUP                 |
 |                       All Rights Reserved                       |
 +============================================================================+
 | FILENAME
 |    pldel.c
 | DESCRIPTION
 |    OCI version of DELIVERY transaction in TPC-C benchmark.
 +============================================================================*/

#include "ora_tpcc.h"
#ifdef TUX
#include <userlog.h>
#endif

/*
extern int userlog();
*/

#include "tpccflags.h"

#if defined(ISO) || defined(ISO5) || defined(ISO6) || defined(ISO8)
#define SQLTXT0 "SELECT substr(value,1,5) FROM v$parameter \
   WHERE name = 'instance_number'"
#endif

#ifdef PLSQLDEL
#define SQLTXT "BEGIN delivery.deliver (:w_id, :carrier_id, :order_id,\
 :retry); END;"
#else
# ifdef DMLRETDEL
#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 "
# else
#define SQLTXT1A "\
SELECT /*+ USE_NL(nord ordr) ORDERED */ 1, no_o_id, nord.rowid, o_c_id, ordr.rowid \
FROM nord, ordr \
```

```
WHERE no_w_id = :w_id AND no_d_id = 1 AND o_w_id = :w_id AND o_d_id = 1 AND \
   o_id = no_o_id AND rownum <= 1 UNION ALL \
"

#define SQLTXT1B "\
SELECT /*+ USE_NL(nord ordr) ORDERED */ 2, no_o_id, nord.rowid, o_c_id, ordr.rowid \
FROM nord, ordr \
WHERE no_w_id = :w_id AND no_d_id = 2 AND o_w_id = :w_id AND o_d_id = 2 AND \
   o_id = no_o_id AND rownum <= 1 UNION ALL \
"

#define SQLTXT1C "\
SELECT /*+ USE_NL(nord ordr) ORDERED */ 3, no_o_id, nord.rowid, o_c_id, ordr.rowid \
FROM nord, ordr \
WHERE no_w_id = :w_id AND no_d_id = 3 AND o_w_id = :w_id AND o_d_id = 3 AND \
   o_id = no_o_id AND rownum <= 1 UNION ALL \
"

#define SQLTXT1D "\
SELECT /*+ USE_NL(nord ordr) ORDERED */ 4, no_o_id, nord.rowid, o_c_id, ordr.rowid \
FROM nord, ordr \
WHERE no_w_id = :w_id AND no_d_id = 4 AND o_w_id = :w_id AND o_d_id = 4 AND \
   o_id = no_o_id AND rownum <= 1 UNION ALL \
"

#define SQLTXT1E "\
SELECT /*+ USE_NL(nord ordr) ORDERED */ 5, no_o_id, nord.rowid, o_c_id, ordr.rowid \
FROM nord, ordr \
WHERE no_w_id = :w_id AND no_d_id = 5 AND o_w_id = :w_id AND o_d_id = 5 AND \
   o_id = no_o_id AND rownum <= 1 UNION ALL \
"

#define SQLTXT1F "\
SELECT /*+ USE_NL(nord ordr) ORDERED */ 6, no_o_id, nord.rowid, o_c_id, ordr.rowid \
FROM nord, ordr \
WHERE no_w_id = :w_id AND no_d_id = 6 AND o_w_id = :w_id AND o_d_id = 6 AND \
   o_id = no_o_id AND rownum <= 1 UNION ALL \
"

#define SQLTXT1G "\
SELECT /*+ USE_NL(nord ordr) ORDERED */ 7, no_o_id, nord.rowid, o_c_id, ordr.rowid \
FROM nord, ordr \
WHERE no_w_id = :w_id AND no_d_id = 7 AND o_w_id = :w_id AND o_d_id = 7 AND \
   o_id = no_o_id AND rownum <= 1 UNION ALL \
"

#define SQLTXT1H "\
SELECT /*+ USE_NL(nord ordr) ORDERED */ 8, no_o_id, nord.rowid, o_c_id, ordr.rowid \
FROM nord, ordr \
WHERE no_w_id = :w_id AND no_d_id = 8 AND o_w_id = :w_id AND o_d_id = 8 AND \
   o_id = no_o_id AND rownum <= 1 UNION ALL \
"

#define SQLTXT1I "\
SELECT /*+ USE_NL(nord ordr) ORDERED */ 9, no_o_id, nord.rowid, o_c_id, ordr.rowid \
FROM nord, ordr \
WHERE no_w_id = :w_id AND no_d_id = 9 AND o_w_id = :w_id AND o_d_id = 9 AND \
   o_id = no_o_id AND rownum <= 1 UNION ALL \
"

#define SQLTXT1J "\
SELECT /*+ USE_NL(nord ordr) ORDERED */ 10, no_o_id, nord.rowid, o_c_id, ordr.rowid \
FROM nord, ordr \
WHERE no_w_id = :w_id AND no_d_id = 10 AND o_w_id = :w_id AND o_d_id = 10 AND \
   o_id = no_o_id AND rownum <= 1"

#define SQLTXT2 "DELETE FROM nord WHERE rowid = :no_rowid"
#endif

#ifdef DMLRETDEL
#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"
#else
#define SQLTXT3 "UPDATE ordr SET o_carrier_id = :carrier_id \
   WHERE rowid = :o_rowid"
#endif

#ifdef DMLRETDEL
#define SQLTXT4 "UPDATE /*+ buffer */ 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 ol_amount into :ol_amount "
#else
#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"

#define SQLTXT5A "\
SELECT :d_id1, SUM(ol_amount) FROM ordl WHERE ol_w_id = :w_id AND \
 ol_d_id = :d_id1 AND ol_o_id = :o_id1 UNION ALL \
SELECT :d_id2, SUM(ol_amount) FROM ordl WHERE ol_w_id = :w_id AND \
 ol_d_id = :d_id2 AND ol_o_id = :o_id2 UNION ALL \
"

#define SQLTXT5B "\
SELECT :d_id3, SUM(ol_amount) FROM ordl WHERE ol_w_id = :w_id AND \
 ol_d_id = :d_id3 AND ol_o_id = :o_id3 UNION ALL \
SELECT :d_id4, SUM(ol_amount) FROM ordl WHERE ol_w_id = :w_id AND \
 ol_d_id = :d_id4 AND ol_o_id = :o_id4 UNION ALL \
"

#define SQLTXT5C "\
SELECT :d_id5, SUM(ol_amount) FROM ordl WHERE ol_w_id = :w_id AND \
 ol_d_id = :d_id5 AND ol_o_id = :o_id5 UNION ALL \
SELECT :d_id6, SUM(ol_amount) FROM ordl WHERE ol_w_id = :w_id AND \
 ol_d_id = :d_id6 AND ol_o_id = :o_id6 UNION ALL \
"

#define SQLTXT5D "\
SELECT :d_id7, SUM(ol_amount) FROM ordl WHERE ol_w_id = :w_id AND \
 ol_d_id = :d_id7 AND ol_o_id = :o_id7 UNION ALL \
SELECT :d_id8, SUM(ol_amount) FROM ordl WHERE ol_w_id = :w_id AND \
 ol_d_id = :d_id8 AND ol_o_id = :o_id8 UNION ALL \
"

#define SQLTXT5E "\
SELECT :d_id9, SUM(ol_amount) FROM ordl WHERE ol_w_id = :w_id AND \
 ol_d_id = :d_id9 AND ol_o_id = :o_id9 UNION ALL \
SELECT :d_id10, SUM(ol_amount) FROM ordl WHERE ol_w_id = :w_id AND \
 ol_d_id = :d_id10 AND ol_o_id = :o_id10"

#endif
#endif /* PLSQLDEL */

#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 delctx {
   sb2 del_o_id_ind[NDISTS];
   sb2 cons_ind[NDISTS];
   sb2 w_id_ind[NDISTS];
   sb2 d_id_ind[NDISTS];
   sb2 c_id_ind[NDISTS];
   sb2 del_date_ind[NDISTS];
   sb2 carrier_id_ind[NDISTS];
   sb2 amt_ind[NDISTS];
```

```
  sb2 no_rowid_ind[NDISTS];
  sb2 o_rowid_ind[NDISTS];
#if defined(ISO) || defined(ISO5) || defined(ISO6) || defined(ISO8)
  sb2 inum_ind;
#endif

#ifdef DMLRETDEL
  ub4 del_o_id_len[NDISTS];
  ub4 c_id_len[NDISTS];
  int oid_ctx;
  int cid_ctx;
  OCIBind *olamt_bp;
#else
  ub2 del_o_id_len[NDISTS];
  ub2 c_id_len[NDISTS];
#endif

  ub2 cons_len[NDISTS];
  ub2 w_id_len[NDISTS];
  ub2 d_id_len[NDISTS];
  ub2 del_date_len[NDISTS];
  ub2 carrier_id_len[NDISTS];
  ub2 amt_len[NDISTS];
  ub2 no_rowid_len[NDISTS];
  ub2 no_rowid_ptr_len[NDISTS];
  ub2 o_rowid_len[NDISTS];
  ub2 o_rowid_ptr_len[NDISTS];
#if defined(ISO) || defined(ISO5) || defined(ISO6) || defined(ISO8)
  ub2 inum_len;
#endif

  ub2 del_o_id_rcode[NDISTS];
  ub2 cons_rcode[NDISTS];
  ub2 w_id_rcode[NDISTS];
  ub2 d_id_rcode[NDISTS];
  ub2 c_id_rcode[NDISTS];
  ub2 del_date_rcode[NDISTS];
  ub2 carrier_id_rcode[NDISTS];
  ub2 amt_rcode[NDISTS];
  ub2 no_rowid_rcode[NDISTS];
  ub2 o_rowid_rcode[NDISTS];
#if defined(ISO) || defined(ISO5) || defined(ISO6) || defined(ISO8)
  ub2 inum_rcode;
#endif

  int del_o_id[NDISTS];
  int cons[NDISTS];
  int w_id[NDISTS];
  int d_id[NDISTS];
  int c_id[NDISTS];
  int carrier_id[NDISTS];
  int amt[NDISTS];
  ub4 del_o_id_rcnt;
  int retry;
  OCIRowid *no_rowid_ptr[NDISTS];
  OCIRowid *o_rowid_ptr[NDISTS];
  OCIDate del_date[NDISTS];
#if defined(ISO) || defined(ISO5) || defined(ISO6) || defined(ISO8)
  char inum[10];
#endif
  OCIStmt *curd0;
  OCIStmt *curd1;
  OCIStmt *curd2;
  OCIStmt *curd3;
  OCIStmt *curd4;
  OCIStmt *curd5;
  OCIStmt *curd6;
  OCIStmt *curdtest;

  OCIBind *w_id_bp;
  OCIBind *w_id_bp3;
  OCIBind *w_id_bp4;
  OCIBind *w_id_bp5;
  OCIBind *w_id_bp6;
  OCIBind *d_id_bp;
  OCIBind *d_id_bp3;
  OCIBind *d_id_bp4;
  OCIBind *d_id_bp6;
  OCIBind *o_id_bp;
  OCIBind *cr_date_bp;
  OCIBind *c_id_bp;
  OCIBind *c_id_bp3;
  OCIBind *no_rowid_bp;
  OCIBind *carrier_id_bp;
  OCIBind *o_rowid_bp;
  OCIBind *del_o_id_bp;
  OCIBind *del_o_id_bp3;
  OCIBind *amt_bp;
  OCIBind *bstr1_bp[10];
  OCIBind *bstr2_bp[10];
  OCIBind *retry_bp;
  OCIDefine *inum_dp;
  OCIDefine *d_id_dp;
  OCIDefine *del_o_id_dp;
  OCIDefine *no_rowid_dp;
  OCIDefine *c_id_dp;
  OCIDefine *o_rowid_dp;
  OCIDefine *cons_dp;
  OCIDefine *amt_dp;

  int norow;
};

typedef struct delctx delctx;

delctx *dctx;

#ifdef DMLRETDEL
struct amtctx {
  int ol_amt[NDISTS][NITEMS];
  sb2 ol_amt_ind[NDISTS][NITEMS];
  ub4 ol_amt_len[NDISTS][NITEMS];
  ub2 ol_amt_rcode[NDISTS][NITEMS];
  int ol_cnt[NDISTS];
};
typedef struct amtctx amtctx;
amtctx *actx;

#endif


#ifdef DMLRETDEL
extern sb4 no_data();

sb4 TPC_oid_data(dvoid *ctxp, OCIBind *bp, ub4 iter, ub4 index,
              dvoid **bufpp, ub4 **alenp, ub1 *piecep,
              dvoid **indpp, ub2 **rcodepp)
{
  *bufpp = &dctx->del_o_id[iter];
  *indpp= &dctx->del_o_id_ind[iter];
  dctx->del_o_id_len[iter]=sizeof(dctx->del_o_id[0]);
  *alenp= &dctx->del_o_id_len[iter];
  *rcodepp = &dctx->del_o_id_rcode[iter];
  *piecep =OCI_ONE_PIECE;
  return (OCI_CONTINUE);
}
sb4 cid_data(dvoid *ctxp, OCIBind *bp, ub4 iter, ub4 index,
              dvoid **bufpp, ub4 **alenp, ub1 *piecep,
              dvoid **indpp, ub2 **rcodepp)
{
```

```
  *bufpp = &dctx->c_id[iter];
  *indpp= &dctx->c_id_ind[iter];
  dctx->c_id_len[iter]=sizeof(dctx->c_id[0]);
  *alenp= &dctx->c_id_len[iter];
  *rcodepp = &dctx->c_id_rcode[iter];
  *piecep =OCI_ONE_PIECE;
  return (OCI_CONTINUE);
}


sb4 amt_data(dvoid *ctxp, OCIBind *bp, ub4 iter, ub4 index,
             dvoid **bufpp, ub4 **alenp, ub1 *piecep,
             dvoid **indpp, ub2 **rcodepp)
{
  amtctx *actx;
  actx =(amtctx*)ctxp;
  actx->ol_cnt[iter]=actx->ol_cnt[iter]+1;
  *bufpp = &actx->ol_amt[iter][index];
  *indpp= &actx->ol_amt_ind[iter][index];
  actx->ol_amt_len[iter][index]=sizeof(actx->ol_amt[0][0]);
  *alenp= &actx->ol_amt_len[iter][index];
  *rcodepp = &actx->ol_amt_rcode[iter][index];
  *piecep =OCI_ONE_PIECE;
  return (OCI_CONTINUE);
}

#endif


tkvcdinit ()

{

# ifndef DMLRETDEL
   int i,j;
   char bstr1[10];
   char bstr2[10];
# endif /* !DMLRETDEL */
   text stmbuf[SQL_BUF_SIZE];

   dctx = (delctx *) malloc (sizeof(delctx));
   memset(dctx,(char)0,sizeof(delctx));
   dctx->norow = 0;
#ifdef DMLRETDEL
   actx = (amtctx *) malloc (sizeof(amtctx));
   memset(actx,(char)0,sizeof(amtctx));
#else
   for(i=0;i<NDISTS;i++) {
    OCIERROR(errhp, OCIDescriptorAlloc(tpcenv,(dvoid**)&dctx->o_rowid_ptr[i],
            OCI_DTYPE_ROWID,0,(dvoid**)0));
    OCIERROR(errhp, OCIDescriptorAlloc(tpcenv,(dvoid**)&dctx->no_rowid_ptr[i],
            OCI_DTYPE_ROWID,0,(dvoid**)0));
   }
#endif

#if defined(ISO) || defined(ISO5) || defined(ISO6) || defined(ISO8)
   OCIHandleAlloc(tpcenv, (dvoid **)(&dctx->curd0), OCI_HTYPE_STMT, 0, (dvoid**)0);
   sprintf ((char *) stmbuf, SQLTXT0);
   OCIStmtPrepare(dctx->curd0, errhp, stmbuf, strlen((char *)stmbuf),OCI_NTV_SYNTAX, OCI_DEFAULT);

   OCIDFNRA(dctx->curd0, dctx->inum_dp,errhp,1,dctx->inum,SIZ(dctx->inum),SQLT_STR,
         &(dctx->inum_ind),&(dctx->inum_len),&(dctx->inum_rcode));
#endif

/* If PLSQLDEL and ISO? are both defined, then they both try to use
   curd0! This could cause a problem. Will try to fix later - VMM 12/30/97 */

#ifdef PLSQLDEL
   OCIHandleAlloc(tpcenv, (dvoid **)(&dctx->curd0), OCI_HTYPE_STMT,
                0, (dvoid**)0);
   sprintf ((char *) stmbuf, SQLTXT);
   OCIStmtPrepare(dctx->curd0, errhp, stmbuf, strlen((char *)stmbuf),
            OCI_NTV_SYNTAX, OCI_DEFAULT);
   OCIBND(dctx->curd0, dctx->w_id_bp , errhp,":w_id",ADR(w_id),SIZ(int),
         SQLT_INT);
   OCIBND(dctx->curd0, dctx->carrier_id_bp , errhp,":carrier_id",
         ADR(dctx->carrier_id), SIZ(int), SQLT_INT);

   OCIBNDRAA(dctx->curd0, dctx->o_id_bp, errhp, ":order_id",
          dctx->del_o_id,SIZ(int),SQLT_INT, dctx->del_o_id_ind,
          dctx->del_o_id_len,dctx->del_o_id_rcode,NDISTS,
          &dctx->del_o_id_rcnt);
   OCIBND(dctx->curd0, dctx->retry_bp , errhp,":retry",ADR(dctx->retry),
         SIZ(int),SQLT_INT);
#else
# ifdef DMLRETDEL
   OCIHandleAlloc(tpcenv, (dvoid **)(&dctx->curd1), OCI_HTYPE_STMT, 0, (dvoid**)0);
   sprintf ((char *) stmbuf, "%s",     SQLTXT1);
   OCIStmtPrepare(dctx->curd1, errhp, stmbuf, strlen((char *)stmbuf),OCI_NTV_SYNTAX, OCI_DEFAULT);

   OCIBND(dctx->curd1, dctx->w_id_bp,errhp,":w_id",dctx->w_id,SIZ(int),
         SQLT_INT);
   OCIBNDRA(dctx->curd1, dctx->d_id_bp,errhp,":d_id",dctx->d_id,SIZ(int),
         SQLT_INT,NULL,NULL,NULL);

   OCIBNDRAD(dctx->curd1, dctx->del_o_id_bp, errhp, ":o_id",
            SIZ(int),SQLT_INT,NULL,
            &dctx->oid_ctx,no_data,TPC_oid_data);
# else

   OCIHandleAlloc(tpcenv, (dvoid **)(&dctx->curd1), OCI_HTYPE_STMT, 0, (dvoid**)0);
   sprintf ((char *) stmbuf, "%s%s%s%s%s%s%s%s%s%s",     SQLTXT1A,
                                                                  SQLTXT1B,
                                                                  SQLTXT1C,
                                                                  SQLTXT1D,
                                                                  SQLTXT1E,
                                                                  SQLTXT1F,
                                                                  SQLTXT1G,
                                                                  SQLTXT1H,
                                                                  SQLTXT1I,
                                                                  SQLTXT1J
                );
   OCIStmtPrepare(dctx->curd1, errhp, stmbuf, strlen((char *)stmbuf),OCI_NTV_SYNTAX, OCI_DEFAULT);

   OCIERROR(errhp,
     OCIAttrSet(dctx->curd1,OCI_HTYPE_STMT,(dvoid*)&dctx->norow,0,
              OCI_ATTR_PREFETCH_ROWS,errhp));



   /* bind variables */

   OCIBND(dctx->curd1, dctx->w_id_bp,errhp,":w_id",ADR(w_id),SIZ(int),SQLT_INT);

   OCIDFNRA(dctx->curd1, dctx->d_id_dp,errhp,1,dctx->d_id,SIZ(int),
         SQLT_INT, dctx->d_id_ind,dctx->d_id_len,dctx->d_id_rcode);
   OCIDFNRA(dctx->curd1, dctx->del_o_id_dp,errhp,2,dctx->del_o_id,
         SIZ(int), SQLT_INT,dctx->del_o_id_ind,
         dctx->del_o_id_len, dctx->del_o_id_rcode);
   OCIDFNRA(dctx->curd1, dctx->no_rowid_dp,errhp,3,dctx->no_rowid_ptr,
         SIZ(OCIRowid *), SQLT_RDD,dctx->no_rowid_ind,
         dctx->no_rowid_len, dctx->no_rowid_rcode);
   OCIDFNRA(dctx->curd1, dctx->c_id_dp,errhp,4,dctx->c_id,SIZ(dctx->c_id[0]),
         SQLT_INT, dctx->c_id_ind,dctx->c_id_len,dctx->c_id_rcode);
   OCIDFNRA(dctx->curd1, dctx->o_rowid_dp,errhp,5,dctx->o_rowid_ptr,
         SIZ(OCIRowid *), SQLT_RDD,dctx->o_rowid_ind,
         dctx->o_rowid_len, dctx->o_rowid_rcode);

   /* open second cursor */
```

```
  OCIHandleAlloc(tpcenv, (dvoid **)(&dctx->curd2), OCI_HTYPE_STMT, 0, (dvoid**)0);
  sprintf ((char *) stmbuf, SQLTXT2);
  OCIStmtPrepare(dctx->curd2, errhp, stmbuf, strlen((char *)stmbuf),
                                OCI_NTV_SYNTAX, OCI_DEFAULT);

  /* bind variables */
  OCIBNDRA(dctx->curd2, dctx->no_rowid_bp,errhp,":no_rowid",&(dctx->no_rowid_ptr[0]),
                SIZ(dctx->no_rowid_ptr[0]),SQLT_RDD,dctx->no_rowid_ind,
                dctx->no_rowid_len,dctx->no_rowid_rcode);

# endif /*DMLRETDEL*/

  /* open third cursor */

  OCIHandleAlloc(tpcenv, (dvoid **)(&dctx->curd3), OCI_HTYPE_STMT, 0, (dvoid**)0);
  sprintf ((char *) stmbuf, SQLTXT3);
  OCIStmtPrepare(dctx->curd3, errhp, stmbuf, strlen((char *)stmbuf),
                                OCI_NTV_SYNTAX, OCI_DEFAULT);


  /* bind variables */

  OCIBNDRA(dctx->curd3, dctx->carrier_id_bp,errhp,":carrier_id",dctx->carrier_id,
       SIZ(dctx->carrier_id[0]),SQLT_INT,dctx->carrier_id_ind,
       dctx->carrier_id_len,dctx->carrier_id_rcode);

# ifdef DMLRETDEL
  OCIBNDRA(dctx->curd3, dctx->w_id_bp3, errhp, ":w_id", dctx->w_id,SIZ(int),
         SQLT_INT, NULL, NULL, NULL);
  OCIBNDRA(dctx->curd3, dctx->d_id_bp3, errhp, ":d_id", dctx->d_id,SIZ(int),
         SQLT_INT,NULL, NULL, NULL);
  OCIBNDRA(dctx->curd3, dctx->del_o_id_bp3, errhp, ":o_id", dctx->del_o_id,
         SIZ(int), SQLT_INT,NULL,NULL,NULL);
  OCIBNDRAD(dctx->curd3, dctx->c_id_bp3, errhp, ":o_c_id", SIZ(int),
         SQLT_INT,NULL,&dctx->cid_ctx,no_data, cid_data);
# else

  OCIBNDRA(dctx->curd3, dctx->o_rowid_bp,errhp,":o_rowid",&(dctx->o_rowid_ptr[0]),
                SIZ(dctx->o_rowid_ptr[0]),SQLT_RDD,dctx->o_rowid_ind,
                dctx->o_rowid_ptr_len,dctx->o_rowid_rcode);
#endif

  /* open fourth cursor */

  OCIHandleAlloc(tpcenv, (dvoid **)(&dctx->curd4), OCI_HTYPE_STMT, 0, (dvoid**)0);
  sprintf ((char *) stmbuf, SQLTXT4);
  OCIStmtPrepare(dctx->curd4, errhp, stmbuf, strlen((char *)stmbuf),
                                OCI_NTV_SYNTAX, OCI_DEFAULT);

  /* bind variables */

  OCIBND(dctx->curd4, dctx->w_id_bp4,errhp,":w_id",dctx->w_id,
       SIZ(int), SQLT_INT);
  OCIBND(dctx->curd4, dctx->d_id_bp4,errhp,":d_id",dctx->d_id,
       SIZ(int), SQLT_INT);
  OCIBND(dctx->curd4, dctx->o_id_bp,errhp,":o_id",dctx->del_o_id,
         SIZ(int),SQLT_INT);
  OCIBND(dctx->curd4, dctx->cr_date_bp,errhp,":cr_date", dctx->del_date,
         SIZ(OCIDate), SQLT_ODT);
# ifdef DMLRETDEL
  OCIBNDRAD(dctx->curd4, dctx->olamt_bp, errhp, ":ol_amount",
          SIZ(int), SQLT_INT,NULL, actx,no_data,amt_data);
# else



  /* open fifth cursor */

  OCIHandleAlloc(tpcenv, (dvoid **)(&dctx->curd5), OCI_HTYPE_STMT, 0, (dvoid**)0);
  sprintf ((char *) stmbuf, "%s%s%s%s%s",                    SQLTXT5A,
                                                                SQLTXT5B,
                                                                SQLTXT5C,
                                                                SQLTXT5D,
                                                                SQLTXT5E
  );
  OCIStmtPrepare(dctx->curd5, errhp, stmbuf, strlen((char *)stmbuf),
                                OCI_NTV_SYNTAX, OCI_DEFAULT);

  OCIERROR(errhp,
    OCIAttrSet(dctx->curd5,OCI_HTYPE_STMT,(dvoid*)&dctx->norow,0,
          OCI_ATTR_PREFETCH_ROWS,errhp));

  /* bind variables */

  OCIBND(dctx->curd5,dctx->w_id_bp,errhp,":w_id",ADR(w_id),SIZ(w_id),SQLT_INT);
  for (i = 0; i < NDISTS; i++) {
    sprintf (bstr1, ":d_id%d", i + 1);
    sprintf (bstr2, ":o_id%d", i + 1);
    OCIBNDRA(dctx->curd5,dctx->bstr1_bp[i],errhp,bstr1,ADR(dctx->d_id[i]),
                SIZ(dctx->d_id[0]),SQLT_INT, &(dctx->d_id_ind[i]),
                &(dctx->d_id_len[i]),&(dctx->d_id_rcode[i]));
    OCIBNDRA(dctx->curd5,dctx->bstr2_bp[i],errhp,bstr2,ADR(dctx->del_o_id[i]),
                SIZ(dctx->del_o_id[0]),SQLT_INT, &(dctx->del_o_id_ind[i]),
                &(dctx->del_o_id_len[i]),&(dctx->del_o_id_rcode[i]));
  }

  OCIDFNRA(dctx->curd5,dctx->cons_dp,errhp,1,dctx->cons,SIZ(dctx->cons[0]),SQLT_INT,
       dctx->cons_ind,dctx->cons_len,dctx->cons_rcode);
  OCIDFNRA(dctx->curd5,dctx->amt_dp,errhp,2,dctx->amt,SIZ(dctx->amt[0]),SQLT_INT,
       dctx->amt_ind,dctx->amt_len,dctx->amt_rcode);
#endif
  /* open sixth cursor */

  OCIHandleAlloc(tpcenv, (dvoid **)(&dctx->curd6), OCI_HTYPE_STMT, 0, (dvoid**)0);
  sprintf ((char *) stmbuf, SQLTXT6);
  OCIStmtPrepare(dctx->curd6, errhp, stmbuf, strlen((char *)stmbuf),
                                OCI_NTV_SYNTAX, OCI_DEFAULT);

  /* bind variables */


  OCIBND(dctx->curd6,dctx->amt_bp,errhp,":amt",dctx->amt,SIZ(int),
       SQLT_INT);
  OCIBND(dctx->curd6,dctx->w_id_bp6,errhp,":w_id",dctx->w_id,SIZ(int),
         SQLT_INT);
  OCIBND(dctx->curd6,dctx->d_id_bp6,errhp,":d_id",dctx->d_id,SIZ(int),
         SQLT_INT);
  OCIBND(dctx->curd6,dctx->c_id_bp,errhp,":c_id",dctx->c_id,SIZ(int),
         SQLT_INT);
#endif
  return (0);

}


void shiftdata(from)
int from ;
{
  int i;
  for (i=from;i<NDISTS-1; i++)
  {
   dctx->del_o_id_ind[i] = dctx->del_o_id_ind[i+1];
   dctx->del_o_id[i] = dctx->del_o_id[i+1];
   dctx->w_id[i] = dctx->w_id[i+1];
   dctx->d_id[i] = dctx->d_id[i+1];
   dctx->carrier_id[i] = dctx->carrier_id[i+1];
  }
}
```

```
tkvcd ()

{

   int i, j;
   int rpc,rcount,count;
   int invalid;
# ifndef DMLRETDEL
   int tmp_id,v;
   int tmp_amt;
# endif /*  !DMLRETDEL */

#if defined(ISO) || defined(ISO5) || defined(ISO6) || defined(ISO8)
   int hasno;
   int reread;
   char sdate[30];

   OCIStmtExecute(tpcsvc,dctx->curd0,errhp,1,0,0,0,OCI_DEFAULT);
   sysdate (sdate);
   printf ("Delivery started at %s on node %s\n", sdate, dctx->inum);
#endif
#ifdef PLSQLDEL
   for (i = 0; i < NDISTS; i++)
   {
     dctx->del_o_id_ind[i] = TRUE;
     dctx->del_o_id_len[i] = sizeof(int);
   }

   OCIERROR(errhp,
     OCIStmtExecute(tpcsvc,dctx->curd0,errhp,1,0,0,0,OCI_DEFAULT));

   for (i = 0; i < NDISTS; i++)
   {
     del_o_id[i] = 0;
     if (dctx->del_o_id_ind[i] == 0)
     {
       del_o_id[i] = dctx->del_o_id[i];
     }
   }
#else

retry:

#if defined(ISO) || defined(ISO5) || defined(ISO6) || defined(ISO8)
   reread = 1;
#endif

#if defined(ISO) || defined(ISO5) || defined(ISO6) || defined(ISO8)
iso:
#endif

   invalid = 0;

   /* initialization for array operations */

   for (i = 0; i < NDISTS; i++) {
     dctx->del_o_id_ind[i] = TRUE;
     dctx->cons_ind[i] = TRUE;
     dctx->w_id_ind[i] = TRUE;
     dctx->d_id_ind[i] = TRUE;
     dctx->c_id_ind[i] = TRUE;
     dctx->del_date_ind[i] = TRUE;
     dctx->carrier_id_ind[i] = TRUE;
     dctx->amt_ind[i] = TRUE;
     dctx->no_rowid_ind[i] = TRUE;
     dctx->o_rowid_ind[i] = TRUE;

     dctx->del_o_id_len[i] = SIZ(dctx->del_o_id[0]);
     dctx->cons_len[i] = SIZ(dctx->cons[0]);
     dctx->w_id_len[i] = SIZ(dctx->w_id[0]);
     dctx->d_id_len[i] = SIZ(dctx->d_id[0]);
     dctx->c_id_len[i] = SIZ(dctx->c_id[0]);
     dctx->del_date_len[i] = DEL_DATE_LEN;
     dctx->carrier_id_len[i] = SIZ(dctx->carrier_id[0]);
     dctx->amt_len[i] = SIZ(dctx->amt[0]);
     dctx->no_rowid_len[i] = ROWIDLEN;
     dctx->o_rowid_len[i] = ROWIDLEN;
     dctx->o_rowid_ptr_len[i] = SIZ(dctx->o_rowid_ptr[0]);
     dctx->no_rowid_ptr_len[i] = SIZ(dctx->no_rowid_ptr[0]);

     dctx->w_id[i] = w_id;
     dctx->d_id[i] = i+1;
     dctx->carrier_id[i] = o_carrier_id;
     memcpy(&dctx->del_date[i],&cr_date,sizeof(OCIDate));
   }

#ifdef DMLRETDEL /* VMM 1/13/98 */
   memset(actx,(char)0,sizeof(amtctx));
#endif /* DMLRETDEL */
   /* array select from new_order and orders tables */

   execstatus=OCIStmtExecute(tpcsvc,dctx->curd1,errhp,NDISTS,0,0,0,OCI_DEFAULT);
   if((execstatus != OCI_SUCCESS) && (execstatus != OCI_NO_DATA)) {
     OCITransRollback(tpcsvc,errhp,OCI_DEFAULT);
     errcode = OCIERROR(errhp,execstatus);
     if(errcode == NOT_SERIALIZABLE) {
       retries++;
       goto retry;
     } else if (errcode == RECOVERR) {
       retries++;
       goto retry;
     } else if (errcode == SNAPSHOT_TOO_OLD) {
       retries++;
       goto retry;
     } else {
       return -1;
     }
   }
   /* mark districts with no new order */
   OCIAttrGet(dctx->curd1,OCI_HTYPE_STMT,&rcount,0,OCI_ATTR_ROW_COUNT,errhp);
   rpc = rcount;
#ifdef DMLRETDEL   /* we have to compress the array here */
   if (rcount != NDISTS )
   {
     int j = 0;
     for (i=0;i < NDISTS; i++)
     {
      if (dctx->del_o_id_ind[j] == 0) /* there is data here */
        j++;
      else
        shiftdata(j);
     }
   }
#else
   invalid = NDISTS - rcount;
   for (i = rpc; i < NDISTS; i++) {
     dctx->del_o_id_ind[i] = NA;
     dctx->w_id_ind[i] = NA;
     dctx->d_id_ind[i] = NA;
     dctx->c_id_ind[i] = NA;
     dctx->carrier_id_ind[i] = NA;
     dctx->no_rowid_ind[i] = NA;
     dctx->o_rowid_ind[i] = NA;
   }
#endif

#if defined(ISO) || defined(ISO5) || defined(ISO6) || defined(ISO8)
   if (invalid) {
     sysdate (sdate);
     for (i = 1; i <= NDISTS; i++) {
```

```
        hasno = 0;
        for (j = 0; j < rpc; j++) {
          if (dctx->d_id[j] == i) {
            hasno = 1;
            break;
          }
        }
        if (!hasno)
          printf ("Delivery [dist %d] found no new order at %s\n", i, sdate);
      }
      if (reread) {
        sleep (60);
        sysdate (sdate);
        printf ("Delivery wake up at %s\n", sdate);
        reread = 0;
        goto iso;
      }
    }
#endif

#ifndef DMLRETDEL
    /* array delete of new_order table */
    execstatus=OCIStmtExecute(tpcsvc,dctx->curd2,errhp,rpc,0,0,0,OCI_DEFAULT);
    if(execstatus != OCI_SUCCESS) {
      OCITransRollback(tpcsvc,errhp,OCI_DEFAULT);
      errcode = OCIERROR(errhp,execstatus);
      if(errcode == NOT_SERIALIZABLE) {
        retries++;
        goto retry;
      } else if (errcode == RECOVERR) {
        retries++;
        goto retry;
      } else if (errcode == SNAPSHOT_TOO_OLD) {
        retries++;
        goto retry;
      } else {
        return -1;
      }
    }

    /* mark districts with no new order */
    OCIAttrGet(dctx->curd2,OCI_HTYPE_STMT,&rcount,0,OCI_ATTR_ROW_COUNT,errhp);

    if (rcount != rpc) {
#ifdef TUX
      userlog ("Error in TPC-C server %d: %d rows selected, %d rows deleted\n",
               proc_no, rpc, dctx->curd2.rpc);
#else
      fprintf (stderr,
               "Error in TPC-C server %d: %d rows selected, %d rows deleted\n",
               proc_no, rpc, rcount);
#endif /* TUX */
      OCITransRollback(tpcsvc,errhp,OCI_DEFAULT);
      return (DEL_ERROR);
    }
#endif /* DMLRETDEL */

    execstatus=OCIStmtExecute(tpcsvc,dctx->curd3,errhp,rpc,0,0,0,OCI_DEFAULT);
    if(execstatus != OCI_SUCCESS) {
      OCITransRollback(tpcsvc,errhp,OCI_DEFAULT);
      errcode = OCIERROR(errhp,execstatus);
      if(errcode == NOT_SERIALIZABLE) {
        retries++;
        goto retry;
      } else if (errcode == RECOVERR) {
        retries++;
        goto retry;
      } else if (errcode == SNAPSHOT_TOO_OLD) {
        retries++;
        goto retry;
      } else {
        return -1;
      }
    }

    OCIAttrGet(dctx->curd3,OCI_HTYPE_STMT,&rcount,0,OCI_ATTR_ROW_COUNT,errhp);

    if (rcount != rpc) {
#ifdef TUX
      userlog ("Error in TPC-C server %d: %d rows selected, %d ords updated\n",
               proc_no, rpc, rcount);
#else
      fprintf (stderr,
               "Error in TPC-C server %d: %d rows selected, %d ords updated\n",
               proc_no, rpc, rcount);
#endif
      OCITransRollback(tpcsvc,errhp,OCI_DEFAULT);
      return (-1);
    }

    /* array update of order_line table */
    execstatus=OCIStmtExecute(tpcsvc,dctx->curd4,errhp,rpc,0,0,0,OCI_DEFAULT);
    if(execstatus != OCI_SUCCESS) {
      OCITransRollback(tpcsvc,errhp,OCI_DEFAULT);
      errcode = OCIERROR(errhp,execstatus);
      if(errcode == NOT_SERIALIZABLE) {
        retries++;
        goto retry;
      } else if (errcode == RECOVERR) {
        retries++;
        goto retry;
      } else if (errcode == SNAPSHOT_TOO_OLD) {
        retries++;
        goto retry;
      } else {
        return -1;
      }
    }
#ifdef DMLRETDEL
    OCIAttrGet(dctx->curd4,OCI_HTYPE_STMT,&rcount,NULL,OCI_ATTR_ROW_COUNT,errhp);
/* add up amounts */
    count=0;
    for (i=0;i<rpc;i++)
    {
      dctx->amt[i]=0;
      for (j=0;j<actx->ol_cnt[i];j++)
        if ( actx->ol_amt_rcode[i][j] == 0)
        {
          dctx->amt[i] = dctx->amt[i] + actx->ol_amt[i][j];
          count = count+1;
        }
    }
    if (rcount > rpc*NITEMS) {
      userlog ("Error in TPC-C server %d: %d ordnrs updated, %d ordl updated\n",
               proc_no, rpc, rcount);
    }
#else
    /* array select from order_line table */
    execstatus=OCIStmtExecute(tpcsvc,dctx->curd5,errhp,rpc,0,0,0,OCI_DEFAULT);
    if((execstatus != OCI_SUCCESS) && (execstatus != OCI_NO_DATA)) {
      OCITransRollback(tpcsvc,errhp,OCI_DEFAULT);
      errcode = OCIERROR(errhp,execstatus);
      if(errcode == NOT_SERIALIZABLE) {
        retries++;
        goto retry;
      } else if (errcode == RECOVERR) {
        retries++;
        goto retry;
      } else if (errcode == SNAPSHOT_TOO_OLD) {
        retries++;
```

```
      goto retry;
    } else {
      return -1;
    }
  }

  OCIAttrGet(dctx->curd5,OCI_HTYPE_STMT,&rcount,0,OCI_ATTR_ROW_COUNT,errhp);
  if (rcount != rpc) {
#ifdef TUX
    userlog ("Error in TPC-C server %d: %d rows selected, %d ordl selected\n",
          proc_no, rpc, rcount);
#else
    fprintf (stderr,
          "Error in TPC-C server %d: %d rows selected, %d ordl selected\n",
          proc_no, rpc, rcount);
#endif
    OCITransRollback(tpcsvc,errhp,OCI_DEFAULT);
    return (-1);
  }

  /* reorder amount selected if necessary */

  for (i = 0; i < rpc; i++) {
    if (dctx->cons[i] != dctx->d_id[i]) {
#ifdef TUX
      userlog ("TPC-C server %d: reordering amount\n", proc_no);
#else
      fprintf (stderr, "TPC-C server %d: reordering amount\n", proc_no);
#endif
      for (j = i + 1; j < rpc; j++) {
        if (dctx->cons[j] == dctx->d_id[i]) {
          tmp_id = dctx->cons[i];
          dctx->cons[i] = dctx->cons[j];
          dctx->cons[j] = tmp_id;
          tmp_amt = dctx->amt[i];
          dctx->amt[i] = dctx->amt[j];
          dctx->amt[j] = tmp_amt;
          break;
        }
      }
      if (j >= rpc) {
#ifdef TUX
        userlog ("Error in TPC-C server %d: missing ordl?\n", proc_no);
#else
        fprintf (stderr,
              "Error in TPC-C server %d: missing ordl?\n", proc_no);
#endif
                OCITransRollback(tpcsvc,errhp,OCI_DEFAULT);
        return (-1);
      }
    }
  }
#endif
#if defined(ISO5) || defined(ISO6)
  printf ("d_id:amount\n");
  for (i = 0; i < rpc; i++)
    printf ("%d:%.2f ", dctx->d_id[i], (float)dctx->amt[i]/100);
  printf ("\n");
#endif

  /* array update of customer table */
#if defined(ISO5) || defined (ISO6)
  execstatus=OCIStmtExecute(tpcsvc,dctx->curd6,errhp,rpc,0,0,0,
                                                    OCI_DEFAULT);
#else
  execstatus=OCIStmtExecute(tpcsvc,dctx->curd6,errhp,rpc,0,0,0,
                        OCI_COMMIT_ON_SUCCESS | OCI_DEFAULT);
#endif

  if(execstatus != OCI_SUCCESS) {
    OCITransRollback(tpcsvc,errhp,OCI_DEFAULT);
    errcode = OCIERROR(errhp,execstatus);
    if(errcode == NOT_SERIALIZABLE) {
      retries++;
      goto retry;
    } else if (errcode == RECOVERR) {
      retries++;
      goto retry;
    } else if (errcode == SNAPSHOT_TOO_OLD) {
      retries++;
      goto retry;
    } else {
      return -1;
    }
  }

  OCIAttrGet(dctx->curd6,OCI_HTYPE_STMT,&rcount,0,OCI_ATTR_ROW_COUNT,errhp);

  if (rcount != rpc) {
#ifdef TUX
    userlog ("Error in TPC-C server %d: %d rows selected, %d cust updated\n",
          proc_no, rpc, rcount);
#else
    fprintf (stderr,
          "Error in TPC-C server %d: %d rows selected, %d cust updated\n",
          proc_no, rpc, rcount);
#endif
    OCITransRollback(tpcsvc, errhp, OCI_DEFAULT);
    return (-1);
  }

#if defined(ISO5) || defined(ISO6)
  sysdate (sdate);
#ifdef ISO5
  printf ("Delivery sleep before commit at %s\n", sdate);
#else
  printf ("Delivery sleep before abort at %s\n", sdate);
#endif
  sleep (60);
  sysdate (sdate);
  printf ("Delivery wake up at %s\n", sdate);
#endif

#ifdef ISO6
  printf("Delivery ISO6 Rolling back.\n");
  OCITransRollback(tpcsvc,errhp,OCI_DEFAULT);
#endif

#ifdef ISO5
  OCITransCommit(tpcsvc, errhp, OCI_DEFAULT);
#endif

#if defined(ISO5) || defined(ISO6)
  sysdate (sdate);
  printf ("Delivery completed at: %s\n", sdate);
#endif

  /* return o_id's in district id order */

  for (i = 0; i < NDISTS; i++)
    del_o_id[i] = 0;
  for (i = 0; i < rpc; i++)
    del_o_id[dctx->d_id[i] - 1] = dctx->del_o_id[i];
#endif

  return (0);

}
```

```
void tkvcddone ()

{

  if (dctx)
  {
#if defined(ISO) || defined(ISO5) || defined(ISO6) || defined(ISO8)
    OCIHandleFree((dvoid *)dctx->curd0,OCI_HTYPE_STMT);
#endif
#ifdef PLSQLDEL
    OCIHandleFree((dvoid *)dctx->curd0,OCI_HTYPE_STMT);
#else
    /* Again the above will cause a problem if both PSQLDEL and ISO are
                defined - VMM 12/30/97 */
    OCIHandleFree((dvoid *)dctx->curd1,OCI_HTYPE_STMT);
    OCIHandleFree((dvoid *)dctx->curd2,OCI_HTYPE_STMT);
    OCIHandleFree((dvoid *)dctx->curd3,OCI_HTYPE_STMT);
    OCIHandleFree((dvoid *)dctx->curd4,OCI_HTYPE_STMT);
    OCIHandleFree((dvoid *)dctx->curd5,OCI_HTYPE_STMT);
    OCIHandleFree((dvoid *)dctx->curd6,OCI_HTYPE_STMT);
#endif
    free (dctx);
  }

}
```

client/oracle/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 <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;


/* 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();


/* 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.hh:mi:ss"
#define SHORTDATE "dd-mm-yyyy"



#define DELRT 80.0

extern int tkvcninit ();
extern int tkvcpinit ();
extern int tkvcoinit ();
extern int tkvcdinit ();
extern int tkvcsinit ();

extern int tkvcn ();
extern int tkvcp ();
extern int tkvco ();
extern int tkvcd ();
extern int tkvcs ();

extern void tkvcndone ();
extern void tkvcpdone ();
extern void tkvcodone ();
extern void tkvcddone ();
extern void tkvcsdone ();

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(char *fname, int lineno,OCIError *errhp, sword status);
extern int sqlfile(char *fname, text *linebuf);

extern FILE *lfp;
extern FILE *fopen ();
extern int proc_no;
extern int doid[];

extern int execstatus;
extern int errcode;

extern OCIEnv *tpcenv;
extern OCIServer *tpcsrv;
extern OCIError *errhp;
extern OCISvcCtx *tpcsvc;
extern OCISession *tpcusr;
extern OCIStmt *curntest;
/* The bind and define handles for each transaction are
   included in their respective header files. */



/* for stock-level transaction */

extern int w_id;
extern int d_id;
extern int c_id;
extern int threshold;
extern int low_stock;

/* for delivery transaction */

extern int del_o_id[10];
extern int carrier_id;
extern int retries;

/* for order-status transaction */

extern int bylastname;
extern char c_last[17];
extern char c_first[17];
extern char c_middle[3];
extern double c_balance;
extern int o_id;
extern text o_entry_d[20];
extern int o_carrier_id;
extern int o_ol_cnt;
extern int ol_supply_w_id[15];
extern int ol_i_id[15];
extern int ol_quantity[15];
extern int ol_amount[15];
ub4    ol_del_len[15];
extern text ol_delivery_d[15][11];

/* for payment transaction */

extern int c_w_id;
extern int c_d_id;
extern int h_amount;
extern char w_street_1[21];
extern char w_street_2[21];
extern char w_city[21];
extern char w_state[3];
extern char w_zip[10];
extern char d_street_1[21];
extern char d_street_2[21];
extern char d_city[21];
extern char d_state[3];
extern char d_zip[10];
extern char c_street_1[21];
extern char c_street_2[21];
extern char c_city[21];
extern char c_state[3];
extern char c_zip[10];
extern char c_phone[17];
extern text c_since_d[11];
extern char c_credit[3];
extern int c_credit_lim;
extern float c_discount;
extern char c_data[201];
extern text h_date[20];

/* for new order transaction */

extern int nol_i_id[15];
extern int nol_supply_w_id[15];
extern int nol_quantity[15];
extern int nol_quanti10[15];
extern int nol_quanti91[15];
extern int nol_ytdqty[15];
extern int nol_amount[15];
extern int o_all_local;
extern float w_tax;
extern float d_tax;
extern float total_amount;
extern char i_name[15][25];
extern int i_name_strlen[15];
extern ub2 i_name_strlen_len[15];
extern ub2 i_name_strlen_rcode[15];
extern ub4 i_name_strlen_csize;
extern int s_quantity[15];
extern char brand_gen[15];
extern ub2 brand_gen_len[15];
extern ub2 brand_gen_rcode[15];
extern ub4 brand_gen_csize;
extern int i_price[15];
extern char brand_generic[15][1];
extern int status;
extern int tracelevel;

/* Miscellaneous */
extern OCIDate cr_date;
extern OCIDate c_since;
extern OCIDate o_entry_d_base;
extern OCIDate ol_d_base[15];

#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 min(x,y)  (((x) < (y)) ? (x) : (y))

#define OCIERROR(errp,function)\
       ocierror(__FILE__,__LINE__,(errp),(function));

#define OCIBND(stmp, bndp, errp, sqlvar, progv, progvl, ftype)\
      ocierror(__FILE__,__LINE__,(errp), \
          OCIHandleAlloc((stmp),(dvoid**)&(bndp),OCI_HTYPE_BIND,0,(dvoid**)0)); \
      ocierror(__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,arcode) \
      ocierror(__FILE__,__LINE__,(errp), \
          OCIHandleAlloc((stmp),(dvoid**)&(bndp),OCI_HTYPE_BIND,0,(dvoid**)0)); \
      ocierror(__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_nodata,cbf_data) \
      ocierror(__FILE__,__LINE__,(errp), \
          OCIHandleAlloc((stmp),(dvoid**)&(bndp),OCI_HTYPE_BIND,0,(dvoid**)0)); \
      ocierror(__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__,__LINE__,(errp), \
          OCIBindDynamic((bndp),(errp),(ctxp),(cbf_nodata),(ctxp),(cbf_data)));



#define OCIBNDR(stmp,bndp,errp,sqlvar,progv,progvl,ftype,indp,alen,arcode) \
      ocierror(__FILE__,__LINE__,(errp), \
        OCIHandleAlloc((stmp),(dvoid**)&(bndp),OCI_HTYPE_BIND,0,(dvoid**)0)); \
      ocierror(__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,arcode,ms,cu) \
      ocierror(__FILE__,__LINE__, (errp), \
        OCIHandleAlloc((stmp),(dvoid**)&(bndp),OCI_HTYPE_BIND,0,(dvoid**)0));\
      ocierror(__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(__FILE__,__LINE__,(errp), \
      OCIHandleAlloc((stmp),(dvoid**)&(dfnp),OCI_HTYPE_DEFINE,0,\
                                                    (dvoid**)0));\
      ocierror(__FILE__,__LINE__,(errp), \
      OCIDefineByPos((stmp),&(dfnp),(errp),(pos),(progv), (progvl),(ftype),\
                        (indp),NULL,NULL, OCI_DYNAMIC_FETCH));\
      ocierror(__FILE__,__LINE__,(errp), \
      OCIDefineDynamic((dfnp),(errp),(ctxp),(cbf_data)));



/* New order */

struct newinstruct {
   int w_id;
   int d_id;
   int c_id;
   int ol_i_id[15];
   int ol_supply_w_id[15];
   int ol_quantity[15];
};

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];
   float total_amount;
   char i_name[15][25];
   int s_quantity[15];
   char brand_generic[15];
   float i_price[15];
   float ol_amount[15];
   char status[26];
   int retry;
};

struct newstruct {
   struct newinstruct newin;
   struct newoutstruct newout;
};


/* Payment */

struct payinstruct {
   int w_id;
   int d_id;
   int c_w_id;
   int c_d_id;
   int c_id;
   int bylastname;
   int h_amount;
   char c_last[17];
};

struct payoutstruct {
   int terror;
   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];
  char c_since[11];
  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 {
  struct payinstruct payin;
  struct payoutstruct payout;
};


/* Order status */

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;
  char o_entry_d[20];
  int o_carrier_id;
  int o_ol_cnt;
  int ol_supply_w_id[15];
  int ol_i_id[15];
  int ol_quantity[15];
  float ol_amount[15];
  char ol_delivery_d[15][11];
  int retry;
};

struct ordstruct {
  struct ordinstruct ordin;
  struct ordoutstruct ordout;
};


/* Delivery */

struct delinstruct {
  int w_id;
  int o_carrier_id;
  double qtime;
  int in_timing_int;
};

struct deloutstruct {
  int terror;
  int retry;
};

struct delstruct {
  struct delinstruct delin;
  struct deloutstruct delout;
};


/* Stock level */

struct stoinstruct {
  int w_id;
  int d_id;
  int threshold;
};

struct stooutstruct {
  int terror;
  int low_stock;
  int retry;
};

struct stostruct {
  struct stoinstruct stoin;
  struct stooutstruct stoout;
};

#endif
```

client/oracle/tpccflags.h

```
#define PLSQLNO
#define DMLRETDEL
```

A.4 Server Stored Procedures

ACID/blocks/new.sql

```
DECLARE   /* new order */
  not_serializable        EXCEPTION;
  PRAGMA EXCEPTION_INIT(not_serializable,-8177);
  deadlock                EXCEPTION;
  PRAGMA EXCEPTION_INIT(deadlock,-60);
  snapshot_too_old        EXCEPTION;
  PRAGMA EXCEPTION_INIT(snapshot_too_old,-1555);
BEGIN
  LOOP BEGIN
    SELECT c_discount, c_last, c_credit
      INTO :c_discount, :c_last, :c_credit
      FROM cust
      WHERE c_id = :c_id
        AND c_d_id = :d_id
        AND c_w_id = :w_id;
```

```
      UPDATE wh_dist SET d_next_o_id = d_next_o_id + 1, d_tax=d_tax+0
       WHERE  d_id = :d_id
         AND  w_id = :w_id
    RETURNING d_tax, d_next_o_id-1, w_tax
       INTO :d_tax, :o_id, :w_tax;

      INSERT INTO nord  (no_o_id, no_d_id, no_w_id)
          VALUES (:o_id , :d_id, :w_id);
      INSERT INTO ordr (o_id, o_w_id, o_d_id, o_c_id, o_carrier_id,
                    o_ol_cnt, o_all_local,o_entry_d)
          VALUES (:o_id, :w_id, :d_id, :c_id, 11,
                :o_ol_cnt, :o_all_local, :cr_date);
      EXIT;

      EXCEPTION
        WHEN not_serializable OR deadlock OR snapshot_too_old THEN
          ROLLBACK;
          :retry := :retry + 1;
      END;
    END LOOP;
  END;
```

ACID/blocks/payz.sql

```
DECLARE /* payz */
     not_serializable         EXCEPTION;
     PRAGMA EXCEPTION_INIT(not_serializable,-8177);
     deadlock                 EXCEPTION;
     PRAGMA EXCEPTION_INIT(deadlock,-60);
     snapshot_too_old         EXCEPTION;
     PRAGMA EXCEPTION_INIT(snapshot_too_old,-1555);
   BEGIN
     LOOP BEGIN
       UPDATE ware
         SET w_ytd = w_ytd+:h_amount
         WHERE w_id = :w_id
         RETURNING w_name,
                w_street_1, w_street_2, w_city, w_state, w_zip
          INTO initpay.ware_name,
              :w_street_1, :w_street_2, :w_city, :w_state, :w_zip;


       SELECT rowid
       BULK COLLECT INTO initpay.row_id
       FROM cust
       WHERE c_d_id = :c_d_id AND c_w_id = :c_w_id AND c_last = :c_last
       ORDER BY c_last, c_d_id, c_w_id, c_first;

      initpay.c_num := sql%rowcount;
      initpay.cust_rowid := initpay.row_id((initpay.c_num) / 2);

       UPDATE cust
         SET c_balance = c_balance - :h_amount,
           c_ytd_payment = c_ytd_payment+ :h_amount,
           c_payment_cnt = c_payment_cnt+1
       WHERE rowid = initpay.cust_rowid
       RETURNING
            c_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
         INTO :c_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_data := '';
       IF :c_credit = 'BC' THEN
         UPDATE cust
           SET c_data = substr ((to_char (:c_id) || ''||
                        to_char (:c_d_id) || ''||
                        to_char (:c_w_id) || ''||
                        to_char (:d_id) || ''||
                        to_char (:w_id) || ''||
                        to_char (:h_amount/100, '9999.99') || '' )
                        || c_data, 1, 500)
           WHERE rowid = initpay.cust_rowid
           RETURNING substr(c_data,1, 200)
           INTO :c_data;

       END IF;

       UPDATE dist
         SET d_ytd = d_ytd+:h_amount
         WHERE d_id = :d_id
          AND d_w_id = :w_id
         RETURNING  d_name, d_street_1, d_street_2, d_city,
                    d_state, d_zip
         INTO initpay.dist_name, :d_street_1, :d_street_2, :d_city,
             :d_state, :d_zip;

         IF  SQL%NOTFOUND
                 THEN
                          raise NO_DATA_FOUND;
         END IF;

       INSERT INTO hist (h_c_id, h_c_d_id, h_c_w_id, h_d_id, h_w_id,
                    h_amount, h_date, h_data)
          VALUES (:c_id, :c_d_id, :c_w_id, :d_id, :w_id, :h_amount,
          :cr_date, initpay.ware_name || '    '|| initpay.dist_name);

       EXIT;

       EXCEPTION
         WHEN not_serializable OR deadlock OR snapshot_too_old THEN
           ROLLBACK;
           :retry := :retry + 1;
       END;

     END LOOP;
   END;
```

ACID/blocks/paynz.sql

```
DECLARE /* paynz */
--     cust_rowid              ROWID;
--     dist_name               VARCHAR2(11);
--     ware_name               VARCHAR2(11);
     not_serializable         EXCEPTION;
     PRAGMA EXCEPTION_INIT(not_serializable,-8177);
     deadlock                 EXCEPTION;
     PRAGMA EXCEPTION_INIT(deadlock,-60);
     snapshot_too_old         EXCEPTION;
     PRAGMA EXCEPTION_INIT(snapshot_too_old,-1555);
   BEGIN
     LOOP BEGIN
         UPDATE ware
           SET w_ytd = w_ytd + :h_amount
           WHERE w_id = :w_id
     RETURNING w_name, w_street_1, w_street_2, w_city, w_state, w_zip
          INTO initpay.ware_name, :w_street_1, :w_street_2, :w_city,
              :w_state, :w_zip;
```

```
        UPDATE  cust
          SET  c_balance = c_balance - :h_amount,
               c_ytd_payment = c_ytd_payment + :h_amount,
               c_payment_cnt = c_payment_cnt+1
        WHERE    c_id = :c_id AND c_d_id = :c_d_id AND
               c_w_id = :c_w_id
      RETURNING rowid, 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
          INTO initpay.cust_rowid,: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;
        IF SQL%NOTFOUND THEN
          raise NO_DATA_FOUND;
        END IF;
--                                  insert into dummy values (rowidtochar(initpay.cust_rowid));

--      :c_data := '';

      IF :c_credit = 'BC' THEN
        UPDATE cust
                    SET c_data= substr ((to_char (:c_id) || ' ' ||
                         to_char (:c_d_id) || ' ' ||
                         to_char (:c_w_id) || ' ' ||
                         to_char (:d_id) || ' ' ||
                         to_char (:w_id) || ' ' ||
                         to_char (:h_amount, '9999.99') || ' | ')
                         || c_data, 1, 500)
          WHERE rowid = initpay.cust_rowid
      RETURNING substr(c_data,1, 200)
          INTO :c_data;

      END IF;

        UPDATE dist
          SET d_ytd = d_ytd + :h_amount
        WHERE d_id = :d_id
          AND d_w_id = :w_id
      RETURNING d_name, d_street_1, d_street_2, d_city,d_state, d_zip
          INTO initpay.dist_name,:d_street_1,:d_street_2,:d_city,:d_state,
               :d_zip;
       IF SQL%NOTFOUND THEN
        raise NO_DATA_FOUND;
       END IF;


      INSERT INTO hist  (h_c_id, h_c_d_id, h_c_w_id, h_d_id, h_w_id,
                  h_amount, h_date, h_data)
      VALUES
        (:c_id, :c_d_id, :c_w_id, :d_id, :w_id, :h_amount,
         :cr_date, initpay.ware_name || '    ' || initpay.dist_name);
--      COMMIT;
--      :h_date := to_char (:cr_date, 'DD-MM-YYYY.HH24:MI:SS');
      EXIT;

      EXCEPTION
        WHEN not_serializable OR deadlock OR snapshot_too_old THEN
          ROLLBACK;
          :retry := :retry + 1;
      END;

    END LOOP;
  END;
```

Appendix B Database Design

The source code for the process to define, create and populate the Oracle8 Enterprise Database Server v8.1.7.1 TPC-C database is included in this appendix.

B.1 Scripts addfile.sh

```
#!sh

date > step5addfile_$1.log

$SEQLPLUS tpcc/tpcc <<!
   spool step5addfile_$1.log
   set echo on
   alter tablespace $1 add datafile '$2' size $3 reuse;
   set echo off
   spool off
   exit ;
!

date >> step5addfile_$1.log
```

create_cust.sql

```
spool step11createcust.log;
set echo on;
drop table cust;
drop cluster custcluster including tables;
set timing on;
create cluster custcluster (
c_id    number(5,0)
,c_d_id    number(2,0)
,c_w_id    number(5,0)
  )
  single    table
  hashkeys    600000000
  hash is   (c_id * 200000 + c_w_id * 10 + c_d_id)
  size    850
  initrans    3
  pctfree    0
  storage ( buffer_pool recycle freelists 22 freelist groups 43 )
  tablespace    cust;
create table cust (
        c_id            number(5,0),
        c_d_id          number(2,0),
        c_w_id          number(5,0),
        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          varchar2(500)
)
cluster custcluster (c_id
,c_d_id
,c_w_id
);
spool off;
set echo off;
exit sql.sqlcode;
```

create_hist.sql

```
spool step12createhist.log;
set echo on;
drop table hist;
set timing on;
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)
)
  initrans    4
  pctfree    5
  storage ( freelists 22 freelist groups 43 )
  tablespace    hist;
spool off;
set echo off;
exit sql.sqlcode;
```

create_icust1.sql

```
spool step32createicust1.log;
set echo on;
drop index icust1;
set timing on;
create unique index icust1 on cust (c_w_id, c_d_id, c_id)
  initrans    3
  parallel    32
  pctfree    1
  storage ( freelists 22 freelist groups 43 )
  tablespace    icust1;
spool off;
set echo off;
exit sql.sqlcode;
```

create_icust2.sql

```
spool step33createicust2.log;
set echo on;
drop index icust2;
set timing on;
create unique index icust2 on cust (c_last, c_w_id, c_d_id, c_first, c_id)
```

```
  initrans    3
  parallel    32
  pctfree    1
  storage ( freelists 22 freelist groups 43 )
  tablespace    icust2;
spool off;
set echo off;
exit sql.sqlcode;
```

create_inord.sql

```
exit sql.sqlcode;
```

create_iord1.sql

```
spool step35createiordr1.log;
set echo on;
drop index iordr1;
set timing on;
create unique index iordr1 on ordr (o_w_id, o_d_id, o_id)
  initrans    3
  parallel    32
  pctfree    1
  storage ( freelists 22 freelist groups 43 )
  tablespace    iord1;
spool off;
set echo off;
exit sql.sqlcode;
```

create_iord2.sql

```
spool step36createiordr2.log;
set echo on;
drop index iordr2;
set timing on;
create unique index iordr2 on ordr (o_w_id, o_d_id, o_c_id, o_id)
  initrans    4
  parallel    32
  pctfree    25
  storage ( freelists 22 freelist groups 43 )
  tablespace    iord2;
spool off;
set echo off;
exit sql.sqlcode;
```

create_istok.sql

```
spool step34createistok.log;
set echo on;
drop index istok;
set timing on;
create unique index istok on stok (s_i_id, s_w_id)
  initrans    3
  parallel    32
  pctfree    1
  storage ( freelists 22 freelist groups 43 )
  tablespace    istk;
spool off;
set echo off;
exit sql.sqlcode;
```

create_nord.sql

```
exit sql.sqlcode;
```

create_ordr.sql

```
spool step13createordr.log;
set echo on;
drop table ordr;
set timing on;
create table ordr (
        o_id            number,
        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
)
  initrans    4
  pctfree    5
  storage ( freelists 22 freelist groups 43 )
  tablespace    ordr;
spool off;
set echo off;
exit sql.sqlcode;
```

create_ord1.sql

```
spool step15createordl.log;
set echo on;
drop table ordl;
set timing on;
create table ordl (
        ol_w_id         number,
        ol_d_id         number,
        ol_o_id         number,
        ol_number       number,
        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 iordl primary key (ol_w_id, ol_d_id, ol_o_id, ol_number)
)
  organization index
  initrans    4
  pctfree    5
  storage ( freelists 22 freelist groups 43 )
  tablespace    ordl;
spool off;
set echo off;
exit sql.sqlcode;
```

create_stok.sql

```
spool step16createstok.log;
set echo on;
drop table stok;
drop cluster stokcluster including tables;
set timing on;
create cluster stokcluster (
s_i_id    number(6,0)
,s_w_id    number(5,0)
 )
 single    table
 hashkeys    2000000000
 hash is   (s_i_id * 20000 + s_w_id)
 size    350
 initrans    3
 pctfree    0
 storage ( buffer_pool keep freelists 22 freelist groups 43 )
 tablespace    stok;
create table stok (
        s_i_id          number(6,0),
        s_w_id          number(5,0),
        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
);
spool off;
set echo off;
exit sql.sqlcode;
```

dml.sql

```
REM=============================================================+
REM       Copyright (c) 1996  Oracle Corp, Redwood Shores, CA      |
REM                  OPEN SYSTEMS PERFORMANCE GROUP                |
REM                       All Rights Reserved                      |
REM=============================================================+
REM FILENAME
REM     dml.sql
REM DESCRIPTION
REM     Disable table locks for TPC-C tables.
REM USAGE
REM     sqlplus tpcc/tpcc dml.sql
REM=============================================================
connect tpcc/tpcc;
set echo on;
   alter table ware disable table lock;
   alter table dist disable table lock;
   alter table cust disable table lock;
   alter table hist disable table lock;
   alter table item disable table lock;
   alter table stok disable table lock;
   alter table ordr disable table lock;
   alter table nord disable table lock;
   alter table ordl disable table lock;
set echo off;
connect internal/internal;
```

undml.sql

```
REM=============================================================+
REM       Copyright (c) 1996  Oracle Corp, Redwood Shores, CA      |
REM                  OPEN SYSTEMS PERFORMANCE GROUP                |
REM                       All Rights Reserved                      |
REM=============================================================+
REM FILENAME
REM     undml.sql
REM DESCRIPTION
REM     Enable table locks for TPC-C tables.
REM USAGE
REM     sqlplus tpcc/tpcc @undml
REM=============================================================*/

connect tpcc/tpcc;
spool undml.log;
set echo on;

   alter table ware enable table lock;
   alter table dist enable table lock;
   alter table cust enable table lock;
   alter table hist enable table lock;
   alter table item enable table lock;
   alter table stok enable table lock;
   alter table ordr enable table lock;
   alter table nord enable table lock;
   alter table ordl enable table lock;

set echo off;
spool off;
exit;
```

driver.sh

```
#!sh

STEP=1
START=0
END=0
CONTINUE=1
PROGNAME="driver.sh"
STOPFILE="stop"
TRACEFILE="log/trace.log"
JUNKFILE="junk"


# These are in step1
SQLDBA=svrmgrl
export SQLDBA
SEQLPLUS=sqlplus
export SEQLPLUS
# cp benchrun/bin/tpccload.exe .
TPCCLOAD=tpccload.exe
export TPCCLOAD
ORACLE_SID=tpcc
```

```
export ORACLE_SID
BUILDDIR=${ORACLE_HOME}/bench/tpc/tpcc/scripts/build20k
export SCRIPTS
SCRIPTS=${BUILDDIR}/scripts
export SCRIPTS
SQLDIR=${BUILDDIR}/sql
export SQLDIR
DB_SIZE=18000
export DB_SIZE
PATH=$PATH:${SCRIPTS}


usage()
{
  echo ""
  echo "Usage: $PROGNAME [<startstepno> <stopstepno>] [<startstepno>] [-step <stepno>]"
  echo "       [<startstepno> <stopstepno>] - allows user to run a specified"
  echo "                    range of steps."
  echo "       [<startstepno>]              - runs from step number <start> till"
  echo "                    the end of the script."
  echo "       [-step <stepno>]             - runs only step number <stepno> and"
  echo "                    then stops."
  echo ""
  echo "            STEP    FUNCTION"
  echo "-----------------------------------------------------------------"
  echo "            1       Create Database."
  echo "            2       Create Rollback Segments for Build."
  echo "            3       Shutdown Database."
  echo "            4       Startup Database for Build"
  echo "            5       Create User TPCC."
  echo "            6       Create Tablespaces."
  echo "            7       Assign Temporary Tablespace to user TPCC."
  echo "            8       Create Data Dictonary Views."
  echo "            9       Create Warehouse."
  echo "            10      Create District."
  echo "            11      Create Customer."
  echo "            12      Create History."
  echo "            13      Create Order."
  echo "            14      Create Neworder."
  echo "            15      Create Orderline."
  echo "            16      Create Stock."
  echo "            17      Create Item."
  echo "            18      Load Warehouse."
  echo "            19      Load District."
  echo "            20      Load Item."
  echo "            21      Load History"
  echo "            22      Load Neworder"
  echo "            23      Load Order/Orderline"
  echo "            24      Load Customer"
  echo "            25      Load Stock"
  echo "            26      Create Warehouse Index."
  echo "            27      Create District Index."
  echo "            28      Create Item Index."
  echo "            29      Create Customer1 Index."
  echo "            30      Create Customer2 Index."
  echo "            31      Create Stock Index."
  echo "            32      Create Orders1 Index."
  echo "            33      Create Orders2 Index."
  echo "            34      Create Neworder Index."
  echo "            35      Create Orderline Index."
  echo "            36      Analyze Tables/Clusters/Indexes."
  echo "            37      Create Statistics Tables."
  echo "            38      Load Stored Procedures."
  echo "            39      Create Rollback Segments for Runs."
  echo "            40      Generate Space Report."
  echo "            41      Misc."
  echo "            42      Offline Rollback segments for Build."
  echo "-----------------------------------------------------------------"

  exit 1;
}

torun()
{
  mv -f *.log* log > junk 2>&1
  rm -f $JUNKFILE*

  if test -f $STOPFILE
  then
    echo "An error has occured, please look into the $TRACEFILE file."
    echo "OR you need to remove the 'stop' file found in the current diretory."
    echo "The 'stop' file need to be removed after an error occurs and before resuming."
    exit 1;
  fi
  if test $STEP -ge $START
  then
    if test $STEP -le $END
    then
      STEP=`expr $STEP + 1`
      return 0
    else
      if test $CONTINUE -eq 0
      then
        STEP=`expr $STEP + 1`
        return 0
      fi
    fi
  fi
  STEP=`expr $STEP + 1`
  return 1
}

case $# in
        0)    usage;
              ;;
        1)    case $1 in
                    -h)   usage
                          ;;
                  [0-9]*)   START=$1
                            CONTINUE=0
                            ;;
                     *)   usage
                          ;;
              esac
              ;;
        2)    case $1 in
                  -step)  shift
                          case $1 in
                            [0-9]*) ;;
                                *) usage
                                   ;;
                          esac
                          START=$1
                          END=$1
                          CONTINUE=1
                          ;;
                [0-9]*)  START=$1
                          shift
                          case $1 in
                            [0-9]*) ;;
                                *) usage
                                   ;;
                          esac
                          END=$1
                          CONTINUE=1
                          ;;
                    *)  usage
                          ;;
              esac
              ;;
```

```
      *)   usage
           ;;
esac

if torun
then
  echo "Creating the Database ..."
  echo "Creating the Database ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step2createdb.sh
  if test $? -ne 0
  then
    echo "Creating the Database failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step2createdb.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Creating the Database failed ..."
  else
    echo "Creating the Database done." `date` "\n" >> $TRACEFILE
    echo "Creating the Database done ..."
  fi
fi

if torun
then
  echo "Creating the Rollback Segments ..."
  echo "Creating the Rollback Segments ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step3createrollback.sh
  if test $? -ne 0
  then
    echo "Creating the Rollback Segments failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step3createrollback.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Creating the Rollback Segments failed ..."
  else
    echo "Creating the Rollback Segments done." `date` "\n" >> $TRACEFILE
    echo "Creating the Rollback Segments done ..."
  fi
fi

if torun
then
  echo "Shutting down the Database ..."
  echo "Shutting down the Database ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/stepshut.sh
  if test $? -ne 0
  then
    echo "Shutting down the Database failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/stepshut.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Shutting down the Database failed ..."
  else
    echo "Shutting down the Database done." `date` "\n" >> $TRACEFILE
    echo "Shutting down the Database done ..."
  fi
fi

if torun
then
  echo "Start up Database for Build ..."
  echo "Start up Database for Build ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/stepstartb.sh
  if test $? -ne 0
  then
    echo "Start up Database for Build failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/stepstartb.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Start up Database for Build failed ..."
  else
    echo "Start up Database for Build done." `date` "\n" >> $TRACEFILE
    echo "Start up Database for Build done ..."
  fi
fi

if torun
then
  echo "Create User TPCC ..."
  echo "Create User TPCC ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/stepcreateuser.sh
  if test $? -ne 0
  then
    echo "Create User TPCC failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/stepcreateuser.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Create User TPCC failed ..."
  else
    echo "Create User TPCC  done." `date` "\n" >> $TRACEFILE
    echo "Create User TPCC done ..."
  fi
fi

if torun
then
  echo "Create Tablespaces ..."
  echo "Create Tablespaces ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step5createts.sh
  if test $? -ne 0
  then
    echo "Create Tablespaces failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step5createts*.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Create Tablespaces failed ..."
  else
    echo "Create Tablespaces done." `date` "\n" >> $TRACEFILE
    echo "Create Tablespaces done ..."
  fi
fi

if torun
then
  echo "Assign Temporary Tablespace to user TPCC ..."
  echo "Assign Temporary Tablespace to user TPCC ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/stepusertemp.sh
  if test $? -ne 0
  then
    echo "Assign Temporary Tablespace to user TPCC failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/stepusertemp.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Assign Temporary Tablespace to user TPCC failed ..."
  else
    echo "Assign Temporary Tablespace to user TPCC done." `date` "\n" >> $TRACEFILE
    echo "Assign Temporary Tablespace to user TPCC done ..."
  fi
fi

if torun
then
  echo "Create Data Dictionary views ..."
  echo "Create Data Dictionary views ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step6createddviews.sh
  if test $? -ne 0
  then
    echo "Create Data Dictionary views failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step6createddviews.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Create Data Dictionary views failed ..."
  else
    echo "Create Data Dictionary views done." `date` "\n" >> $TRACEFILE
    echo "Create Data Dictionary views done ..."
  fi
fi
```

```
if torun
then
  echo "Create Warehouse ..."
  echo "Create Warehouse ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step9createware.sh
  if test $? -ne 0
  then
    echo "Create Warehouse failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step9createware.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Create Warehouse failed ..."
  else
    echo "Create Warehouse  done." `date` "\n" >> $TRACEFILE
    echo "Create Warehouse  done ..."
  fi
fi

if torun
then
  echo "Create District ..."
  echo "Create District ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step10createdist.sh
  if test $? -ne 0
  then
    echo "Create District failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step10createdist.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Create District failed ..."
  else
    echo "Create District done." `date` "\n" >> $TRACEFILE
    echo "Create District done ..."
  fi
fi

if torun
then
  echo "Create Customer ..."
  echo "Create Customer ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step11createcust.sh
  if test $? -ne 0
  then
    echo "Create Customer failed.\n" `date` "\n" >> $TRACEFILE
    echo "Look at log/step11createcust.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Create Customer failed ..."
  else
    echo "Create Customer done." `date` "\n" >> $TRACEFILE
    echo "Create Customer done ..."
  fi
fi

if torun
then
  echo "Create History ..."
  echo "Create History ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step12createhist.sh
  if test $? -ne 0
  then
    echo "Create History failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step12createhist.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Create History failed ..."
  else
    echo "Create History done." `date` "\n" >> $TRACEFILE
    echo "Create History done ..."
  fi
fi

if torun
then
  echo "Create Order ..."
  echo "Create Order ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step13createordr.sh
  if test $? -ne 0
  then
    echo "Create Order failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step13createordr.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Create Order failed ..."
  else
    echo "Create Order done." `date` "\n" >> $TRACEFILE
    echo "Create Order done ..."
  fi
fi

if torun
then
  echo "Create Neworder ..."
  echo "Create Neworder ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step14createnord.sh
  if test $? -ne 0
  then
    echo "Create Neworder failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step14createnord.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Create Neworder failed ..."
  else
    echo "Create Neworder done." `date` "\n" >> $TRACEFILE
    echo "Create Neworder done ..."
  fi
fi

if torun
then
  echo "Create Orderline ..."
  echo "Create Orderline ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step15createordl.sh
  if test $? -ne 0
  then
    echo "Create Orderline failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step15createordl.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Create Orderline failed ..."
  else
    echo "Create Orderline done." `date` "\n" >> $TRACEFILE
    echo "Create Orderline done ..."
  fi
fi

if torun
then
  echo "Create Stock ..."
  echo "Create Stock ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step16createstok.sh
  if test $? -ne 0
  then
    echo "Create Stock failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step16createstok.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Create Stock failed ..."
  else
    echo "Create Stock done." `date` "\n" >> $TRACEFILE
    echo "Create Stock done ..."
  fi
fi

if torun
then
  echo "Create Item ..."
  echo "Create Item ..." `date` "\n" >> $TRACEFILE
```

```
  ${SCRIPTS}/step17createitem.sh
  if test $? -ne 0
  then
    echo "Create Item failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step17createitem.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Create Item failed ..."
  else
    echo "Create Item done." `date` "\n" >> $TRACEFILE
    echo "Create Item done ..."
  fi
fi

if torun
then
  echo "Load Warehouse ..."
  echo "Load Warehouse ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step20loadware.sh
  if test $? -ne 0
  then
    echo "Load Warehouse failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step20loadware.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Load Warehouse failed ..."
  else
    echo "Load Warehouse done." `date` "\n" >> $TRACEFILE
    echo "Load Warehouse done ..."
  fi
fi

if torun
then
  echo "Load District ..."
  echo "Load District ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step21loaddist.sh
  if test $? -ne 0
  then
    echo "Load District failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step21loaddist.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Load District failed ..."
  else
    echo "Load District done." `date` "\n" >> $TRACEFILE
    echo "Load District done ..."
  fi
fi

if torun
then
  echo "Load Item ..."
  echo "Load Item ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step22loaditem.sh
  if test $? -ne 0
  then
    echo "Load Item failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step22loaditem.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Load Item failed ..."
  else
    echo "Load Item done." `date` "\n" >> $TRACEFILE
    echo "Load Item done ..."
  fi
fi

if torun
then
  echo "Load History ..."
  echo "Load History ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step23loadhist.sh
  if test $? -ne 0
  then
    echo "Load History failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step23loadhist*.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Load History failed ..."
  else
    echo "Load History done." `date` "\n" >> $TRACEFILE
    echo "Load History done ..."
  fi
fi

if torun
then
  echo "Load Neworder ..."
  echo "Load Neworder ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step24loadnord.sh
  if test $? -ne 0
  then
    echo "Load Neworder failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step24loadnord*.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Load Neworder failed ..."
  else
    echo "Load Neworder done." `date` "\n" >> $TRACEFILE
    echo "Load Neworder done ..."
  fi
fi

if torun
then
  echo "Load Order/Orderline ..."
  echo "Load Order/Orderline ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step25loadordrordl.sh
  if test $? -ne 0
  then
    echo "Load Order/Orderline failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step25loadordrordl*.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Load Order/Orderline failed ..."
  else
    echo "Load Order/Orderline done." `date` "\n" >> $TRACEFILE
    echo "Load Order/Orderline done ..."
  fi
fi

if torun
then
  echo "Load Customer ..."
  echo "Load Customer ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step26loadcust.sh
  if test $? -ne 0
  then
    echo "Load Customer failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step26loadcust*.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Load Customer failed ..."
  else
    echo "Load Customer done." `date` "\n" >> $TRACEFILE
    echo "Load Customer done ..."
  fi
fi

if torun
then
  echo "Load Stock ..."
  echo "Load Stock ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step27loadstok.sh
  if test $? -ne 0
  then
    echo "Load Stock failed." `date` "\n" >> $TRACEFILE
```

```
    echo "Look at log/step27loadstok*.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Load Stock failed ..."
  else
    echo "Load Stock done." `date` "\n" >> $TRACEFILE
    echo "Load Stock done ..."
  fi
fi

if torun
then
  echo "Create Warehouse Index ..."
  echo "Create Warehouse Index ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step29createiware.sh
  if test $? -ne 0
  then
    echo "Create Warehouse Index failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step29createiware.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Create Warehouse Index failed ..."
  else
    echo "Create Warehouse Index done." `date` "\n" >> $TRACEFILE
    echo "Create Warehouse Index done ..."
  fi
fi

if torun
then
  echo "Create District Index ..."
  echo "Create District Index ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step30createidist.sh
  if test $? -ne 0
  then
    echo "Create District Index failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step30createidist.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Create District Index failed ..."
  else
    echo "Create District Index done." `date` "\n" >> $TRACEFILE
    echo "Create District Index done ..."
  fi
fi

if torun
then
  echo "Create Item Index ..."
  echo "Create Item Index ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step31createiitem.sh
  if test $? -ne 0
  then
    echo "Create Item Index failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step31createiitem.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Create Item Index failed ..."
  else
    echo "Create Item Index done." `date` "\n" >> $TRACEFILE
    echo "Create Item Index done ..."
  fi
fi

if torun
then
  echo "Create Customer1 Index ..."
  echo "Create Customer1 Index ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step32createicust1.sh
  if test $? -ne 0
  then
    echo "Create Customer1 Index failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step32createicust1.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Create Customer1 Index failed ..."
  else
    echo "Create Customer1 Index done." `date` "\n" >> $TRACEFILE
    echo "Create Customer1 Index done ..."
  fi
fi

if torun
then
  echo "Create Customer2 Index ..."
  echo "Create Customer2 Index ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step33createicust2.sh
  if test $? -ne 0
  then
    echo "Create Customer2 Index failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step33createicust2.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Create Customer2 Index failed ..."
  else
    echo "Create Customer2 Index done." `date` "\n" >> $TRACEFILE
    echo "Create Customer2 Index done ..."
  fi
fi

if torun
then
  echo "Create Stock Index ..."
  echo "Create Stock Index ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step34createistok.sh
  if test $? -ne 0
  then
    echo "Create Stock Index failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step34createistok.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Create Stock Index failed ..."
  else
    echo "Create Stock Index done." `date` "\n" >> $TRACEFILE
    echo "Create Stock Index done ..."
  fi
fi

if torun
then
  echo "Create Order1 Index ..."
  echo "Create Order1 Index ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step35createiordr1.sh
  if test $? -ne 0
  then
    echo "Create Order1 Index failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step35createiordr1.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Create Order1 Index failed ..."
  else
    echo "Create Order1 Index done." `date` "\n" >> $TRACEFILE
    echo "Create Order1 Index done ..."
  fi
fi

if torun
then
  echo "Create Order2 Index ..."
  echo "Create Order2 Index ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step36createiordr2.sh
  if test $? -ne 0
  then
    echo "Create Order2 Index failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step36createiordr2.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Create Order2 Index failed ..."
  else
```

```
    echo "Create Order2 Index done." `date` "\n" >> $TRACEFILE
    echo "Create Order2 Index done ..."
  fi
fi

if torun
then
  echo "Create Neworder Index ..."
  echo "Create Neworder Index ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step37createinord.sh
  if test $? -ne 0
  then
    echo "Create Neworder Index failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step37createinord.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Create Neworder Index failed ..."
  else
    echo "Create Neworder Index done." `date` "\n" >> $TRACEFILE
    echo "Create Neworder Index done ..."
  fi
fi

if torun
then
  echo "Create Orderline Index ..."
  echo "Create Orderline Index ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step38createiordl.sh
  if test $? -ne 0
  then
    echo "Create Orderline Index failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step38createiordl.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Create Orderline Index failed ..."
  else
    echo "Create Orderline Index done." `date` "\n" >> $TRACEFILE
    echo "Create Orderline Index done ..."
  fi
fi

if torun
then
  echo "Analyze Tables/Clusters/Indexes ..."
  echo "Analyze Tables/Clusters/Indexes ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step39analyze.sh
  if test $? -ne 0
  then
    echo "Analyze Tables/Clusters/Indexes failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step39analyze.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Analyze Tables/Clusters/Indexes failed ..."
  else
    echo "Analyze Tables/Clusters/Indexes done." `date` "\n" >> $TRACEFILE
    echo "Analyze Tables/Clusters/Indexes done ..."
  fi
fi

if torun
then
  echo "Create Statistics Tables ..."
  echo "Create Statistics Tables ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step40createstats.sh
  if test $? -ne 0
  then
    echo "Create Statistics Tables failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step40createstats.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Create Statistics Tables failed ..."
  else
    echo "Create Statistics Tables done." `date` "\n" >> $TRACEFILE
    echo "Create Statistics Tables done ..."
  fi
fi

if torun
then
  echo "Load Stored Procedures ..."
  echo "Load Stored Procedures ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step41createstoredprocs.sh
  if test $? -ne 0
  then
    echo "Load Stored Procedures failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step41createstoredprocs.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Load Stored Procedures failed ..."
  else
    echo "Load Stored Procedures done." `date` "\n" >> $TRACEFILE
    echo "Load Stored Procedures done ..."
  fi
fi

if torun
then
  echo "Create Rollback Segments for Runs ..."
  echo "Create Rollback Segments for Runs ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step18createrollsegs.sh
  if test $? -ne 0
  then
    echo "Create Rollback Segments for Runs failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step18createrollsegs.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Create Rollback Segments for Runs failed ..."
  else
    echo "Create Rollback Segments for Runs done." `date` "\n" >> $TRACEFILE
    echo "Create Rollback Segments for Runs done ..."
  fi
fi

if torun
then
  echo "Generate Space Reports ..."
  echo "Generate Space Reports ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step42createspacestats.sh
  if test $? -ne 0
  then
    echo "Generate Space Reports failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step42createspacestats.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Generate Space Reports failed ..."
  else
    echo "Generate Space Reports done." `date` "\n" >> $TRACEFILE
    echo "Generate Space Reports done ..."
  fi
fi

if torun
then
  echo "Misc ..."
  echo "Misc ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step43createmisc.sh
  if test $? -ne 0
  then
    echo "Misc failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step43createmisc.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Misc failed ..."
  else
    echo "Misc done." `date` "\n" >> $TRACEFILE
    echo "Misc done ..."
  fi
fi
```

```
if torun
then
  echo "Offline Rollback Segments for Build ..."
  echo "Offline Rollback Segments for Build ..." `date` "\n" >> $TRACEFILE
  ${SCRIPTS}/step47offlinerollsegs.sh
  if test $? -ne 0
  then
    echo "Offline Rollback Segments for Build failed." `date` "\n" >> $TRACEFILE
    echo "Look at log/step47offlinerollsegs.log for more details." `date` "\n" >> $TRACEFILE
    echo "Stopped" >> $STOPFILE
    echo "Offline Rollback Segments for Build failed ..."
  else
    echo "Offline Rollback Segments for Build done." `date` "\n" >> $TRACEFILE
    echo "Offline Rollback Segments for Build done ..."
  fi
fi

torun
```

runchk.sh

```
#!/bin/sh
#
# $Header: runchk.sh 01-jun-98.19:11:42 skareenh Exp $
#
# runchk.sh
#
#  Copyright (c) Oracle Corporation 1998. All Rights Reserved.
#
#    NAME
#      runchk.sh
#
#    DESCRIPTION
#                  Does spot checking after a TPC-C run.
#
#    NOTES
#                  runchk.sh [output_file]
#
#                  options:
#          -o <output file>         : name of output file
#          -h or -help              : print list of arguments
#          -m <max w_id>            : maximum warehouse id in database
#          -net "list of aliases"   : list of SQL*Net V2 connect string aliases
#          -wids "list of w_id's"   : list of warehouse ids for sampling
#          -bwids "list of w_id's"  : list of beginning ids of warehouse ranges
#          -ewids "list of w_id's"  : list of ending ids of warehouse ranges
#
#    MODIFIED   (MM/DD/YY)
#    skareenh    06/01/98 - Creation
#

#
# Defaults
#

OFILE="runchk.v1"
MULT=
SNET=
WIDS=
BWIDS=
EWIDS=

#
# Parse arguments
#
while [ "$#" != "0" ]
do
  case $1 in
    -o|-ofile)
      shift
      if [ "$1" != "" ]
      then
        OFILE=$1
        shift
      fi
      ;;
    -h|-help)
  echo "Options:"
  echo "  -o <output file>       : name of output file"
  echo "  -h or -help            : print list of arguments"
  echo "  -m <max w_id>          : maximum warehouse id in database"
  echo "  -net \"list of aliases\" : list of SQL*Net V2 connect string aliases"
  echo "  -wids \"list of w_id's\" : list of warehouse ids for sampling"
  echo "  -bwids \"list of w_id's\": list of beginning ids of warehouse ranges"
  echo "  -ewids \"list of w_id's\": list of ending ids of warehouse ranges"
      exit 0
      ;;
    -m|-mult)
      shift
      if [ "$1" != "" ]
      then
        MULT=$1
        shift
      fi
      ;;
    -net)
      shift
      if [ "$1" != "" ]
      then
        SNET=$1
        shift
      fi
      ;;
    -wids)
      shift
      if [ "$1" != "" ]
      then
        WIDS=$1
        shift
      fi
      ;;
    -bwids)
      shift
      if [ "$1" != "" ]
      then
        BWIDS=$1
        shift
      fi
      ;;
    -ewids)
      shift
      if [ "$1" != "" ]
      then
        EWIDS=$1
        shift
      fi
      ;;
    *)
      echo "Bad argument: $1"
      echo "Use -help option to see correct usage."
      exit 1
      ;;
  esac
done
```

```
#
# Check arguments
#

if [ "$OFILE" = "" ]
then
  echo "Error: output file is not specified"
  echo "Use -help option to see correct usage."
  exit 1
fi

NHOSTS=0
for HOST in $SNET
do
  NHOSTS=‘expr $NHOSTS + 1‘
done

NWIDS=0
for WID in $WIDS
do
  NWIDS=‘expr $NWIDS + 1‘
done

NBWIDS=0
for BWID in $BWIDS
do
  NBWIDS=‘expr $NBWIDS + 1‘
done

NEWIDS=0
for EWID in $EWIDS
do
  NEWIDS=‘expr $NEWIDS + 1‘
done

if [ $NBWIDS != $NEWIDS ]
then
  echo "Error: # of beginning w_id's != # of ending w_id's"
  echo "Use -help option to see correct usage."
  exit 1
fi

if [ $NHOSTS != 0 ]
then
  if [ $NWIDS != 0 -a $NHOSTS != $NWIDS ]
  then
    echo "Error: # of SQL*Net V2 aliases != # of samples"
    echo "Use -help option to see correct usage."
    exit 1
  fi
  if [ $NBWIDS != 0 -a $NHOSTS != $NBWIDS ]
  then
    echo "Error: # of SQL*Net V2 aliases != # of w_id ranges"
    echo "Use -help option to see correct usage."
    exit 1
  fi
else
  if [ $NWIDS != 0 -a $NBWIDS != 0 -a $NWIDS != $NBWIDS ]
  then
    echo "Error: # of samples != # of w_id ranges"
    echo "Use -help option to see correct usage."
    exit 1
  fi
fi

#
# By default, if no SQL*Net V2 string is specified, all checks are
# run on the local node.
#
#
# By default, if no w_id ranges are specified, then ranges will be
# generated automatically based on the total number of warehouse and
# the number of SQL*Net V2 strings or the number of w_id samples.
#
if [ $NBWIDS = 0 ]
then
  if [ "$MULT" = "" ]
  then
    echo "Error: max warehouse id in this database is not specified"
    echo "Use -help option to see correct usage."
    exit 1
  fi

  if [ $NHOSTS != 0 ]
  then
    NSAMPS=$NHOSTS
  elif [ $NWIDS != 0 ]
  then
    NSAMPS=$NWIDS
  elif [ $MULT -ge 4 ]
  then
    NSAMPS=4
  else
    NSAMPS=$MULT
  fi

  EVENW=‘expr $MULT % $NSAMPS‘
  if [ $EVENW != 0 ]
  then
    echo "Error: cannot evenly divide # of warehouses by # of nodes/samples"
    echo "       so cannot generate w_id ranges automatically"
    echo "Use -help option to see correct usage."
    exit 1
  fi

  WPERN=‘expr $MULT / $NSAMPS‘
  SW=1
  EW=$WPERN
  BWIDS="$SW"
  EWIDS="$EW"
  I=2
  while [ $I -le $NSAMPS ]
  do
    SW=‘expr $SW + $WPERN‘
    EW=‘expr $EW + $WPERN‘
    BWIDS="$BWIDS $SW"
    EWIDS="$EWIDS $EW"
    I=‘expr $I + 1‘
  done
  NBWIDS=$NSAMPS
  NEWIDS=$NSAMPS
fi

if [ $NWIDS = 0 ]
then
  WIDS=""
  NWIDS=$NBWIDS
  I=1
  while [ $I -le $NWIDS ]
  do
    J=1
    for DUMMY in $BWIDS
    do
      if [ $J = $I ]
      then
        SW=$DUMMY
        break;
      fi
      J=‘expr $J + 1‘
```

```
    done

    J=1
    for DUMMY in $EWIDS
    do
      if [ $J = $I ]
      then
        EW=$DUMMY
        break;
      fi
      J=`expr $J + 1`
    done

    if [ $I = 1 ]
    then
      WIDS="$SW"
    elif [ $I = $NWIDS ]
    then
      WIDS="$WIDS $EW"
    else
      TID=`expr $SW + $EW`
      TID=`expr $TID / 2`
      WIDS="$WIDS $TID"
    fi
    I=`expr $I + 1`
  done
fi


#
# audit directory
#
if [ "X$SRCHOME" = "X" -a  "X$ORACLE_HOME" != "X" ]
then
    SRCHOME=$ORACLE_HOME
fi
BENCH_HOME=$SRCHOME
TPCC_AUDIT=$BENCH_HOME/audit

#
# output directory
#
ODIR=${TPCC_AUDIT}/output
if [ ! -d $ODIR ]
then
    mkdir $ODIR
fi

#
# shell script directory
#
SDIR=${TPCC_AUDIT}/scripts

#
# SQL script directory
#
SQLDIR=${TPCC_AUDIT}/sql

#
# source directory
#
SRCDIR=${TPCC_AUDIT}/source

#
# run checks
#
date | tee ${ODIR}/${OFILE}
${SDIR}/swt_temp.sh temp

cat >> ${ODIR}/${OFILE} <<!

Number of Active Warehouses
---------------------------

!

sqlplus tpcc/tpcc > ${ODIR}/${OFILE}.0 2>&1 <<!
  set termout on
  set echo on
  set timing on

  select count(*) from ware;

  quit;
!

cat ${ODIR}/${OFILE}.0 >> ${ODIR}/${OFILE}
cat ${ODIR}/${OFILE}.0
rm -f ${ODIR}/${OFILE}.0

sqlplus tpcc/tpcc @${SQLDIR}/runchk $MULT > ${ODIR}/${OFILE}.0
cat ${ODIR}/${OFILE}.0 >> ${ODIR}/${OFILE}
rm -f ${ODIR}/${OFILE}.0

sqlplus tpcc/tpcc @${SQLDIR}/remote $MULT > ${ODIR}/${OFILE}.0 &

I=1
while [ $I -le $NWIDS ]
do
  NSWID=1
  for DUMSWID in $WIDS
  do
    if [ $NSWID = $I ]
    then
      SWID=$DUMSWID
      break;
    fi
    NSWID=`expr $NSWID + 1`
  done

  J=1
  for DUMMY in $BWIDS
  do
    if [ $J = $I ]
    then
      SW=$DUMMY
      break;
    fi
    J=`expr $J + 1`
  done

  J=1
  for DUMMY in $EWIDS
  do
    if [ $J = $I ]
    then
      EW=$DUMMY
      break;
    fi
    J=`expr $J + 1`
  done

  if [ $NHOSTS = 0 ]
  then
    sqlplus tpcc/tpcc @${SQLDIR}/runchk_parallel $SWID $SW $EW | \
          tee ${ODIR}/${OFILE}.$I &
  else
    NCSTR=1
```

```
    for DUMCSTR in $SNET
    do
      if [ $NCSTR = $I ]
      then
        CSTR=$DUMCSTR
        break;
      fi
      NCSTR=‘expr $NCSTR + 1‘
    done
    sqlplus tpcc/tpcc@$CSTR @${SQLDIR}/runchk_parallel $SWID $SW $EW | \
          tee ${ODIR}/${OFILE}.$I &
  fi
  I=‘expr $I + 1‘
done

wait

I=1
while [ $I -le $NWIDS ]
do
  cat >> ${ODIR}/${OFILE} <<!


Sample $I of Run Check
----------------------

!

  cat ${ODIR}/${OFILE}.$I >> ${ODIR}/${OFILE}
  rm -f ${ODIR}/${OFILE}.$I
  I=‘expr $I + 1‘
done

cat >>  ${ODIR}/${OFILE} <<!


Show unused warehouses: w_id > $MUL
-----------------------

!

cat ${ODIR}/${OFILE}.0 >> ${ODIR}/${OFILE}
rm -f ${ODIR}/${OFILE}.0

${SDIR}/swt_temp.sh system
date | tee -a ${ODIR}/${OFILE}
```

tpccenv.sh

```
#!sh
SQLDBA=svrmgrl
export SQLDBA
SEQLPLUS=sqlplus
export SEQLPLUS
# cp benchrun/bin/tpccload.exe .
TPCCLOAD=tpccload.exe
export TPCCLOAD
ORACLE_SID=tpcc
export ORACLE_SID
BUILDDIR=${ORACLE_HOME}/bench/tpc/tpcc/scripts/build20k
export SCRIPTS
SCRIPTS=${BUILDDIR}/scripts
export SCRIPTS
SQLDIR=${BUILDDIR}/sql
export SQLDIR
DB_SIZE=18000
export DB_SIZE
PATH=$PATH:${SCRIPTS}
```

p_build.ora

```
#
#
#=====================================================================+
#       Copyright (c) 1998  Oracle Corp, Redwood Shores, CA       |
#                  OPEN SYSTEMS PERFORMANCE GROUP                 |
#                       All Rights Reserved                       |
#=====================================================================+
# FILENAME
#      create.ora
# DESCRIPTION
#      Oracle parameter file for creating TPC-C database.
#=====================================================================
#

disk_asynch_io                  = TRUE
_discrete_transactions_enabled     = FALSE
log_archive_start               = FALSE

db_file_multiblock_read_count     = 64
distributed_transactions          = 0
hash_join_enabled                 = FALSE
lock_sga                        = TRUE
log_checkpoints_to_alert          = TRUE
log_checkpoint_interval           = 1000000000
cpu_count=64
_spin_count=20000
db_writer_processes               = 10
_db_writer_chunk_writes                 = 2000
_db_writer_max_writes           = 2000
_disable_incremental_checkpoints  = TRUE

compatible                                      = 8.1.5.0.0
control_files                                   = (?/dbs/tpcc_disks/control01, ?/dbs/tpcc_disks/control02)
sort_area_size                  = 30000000
parallel_max_servers              = 1000
recovery_parallelism              = 1000
db_name                         = tpcc
db_files                        = 400
db_block_buffers                  = 1200000
_db_block_hash_buckets            = 2400000
enqueue_resources                 = 60000
#dml_locks                        = 500
dml_locks                       = 2500
log_buffer                      = 33554432
_log_simultaneous_copies          = 128
_log_archive_buffer_size          = 32
max_rollback_segments             = 1100
open_cursors                    = 3000
processes                       = 2000
sessions                        = 3000
transactions                    = 10000
# transactions_per_rollback_segment = 2
# rollback_segments               = (t1,t2,t3,t4,t5,t6,t7,t8,t9,t10,t11,t12,t13,
# t14,t15,t16,t17,t18,t19,t20,t21,t22,t23,t24,t25,t26,t27,t28,t29,t30)
rollback_segments                 = (s1,s2,s3,s4,s5,s6,s7,s8,s9,
s10,s11,s12,s13,s14,s15,s16,s17,s18,s19,
s20,s21,s22,s23,s24,s25,s26,s27,s28,s29,
s30,s31,s32,s33,s34,s35,s36,s37,s38,s39,
s40,s41,s42,s43,s44,s45,s46,s47,s48,s49,
s50,s51,s52,s53,s54,s55,s56,s57,s58,s59,
s60,s61,s62,s63,s64,s65,s66,s67,s68,s69,
s70,s71,s72,s73,s74,s75,s76,s77,s78,s79,
```

```
s80,s81,s82,s83,s84,s85,s86,s87,s88,s89,
s90,s91,s92,s93,s94,s95,s96,s97,s98,s99,
s100,s101,s102,s103,s104,s105,s106,s107,s108,s109,
s110,s111,s112,s113,s114,s115,s116,s117,s118,s119,
s120,s121,s122,s123,s124,s125,s126,s127,s128,s129,
s130,s131,s132,s133,s134,s135,s136,s137,s138,s139,
s140,s141,s142,s143,s144,s145,s146,s147,s148,s149,
s150,s151,s152,s153,s154,s155,s156,s157,s158,s159,
s160,s161,s162,s163,s164,s165,s166,s167,s168,s169,
s170,s171,s172,s173,s174,s175,s176,s177,s178,s179,
s180,s181,s182,s183,s184,s185,s186,s187,s188,s189,
s190,s191,s192,s193,s194,s195,s196,s197,s198,s199,
s200)
rollback_segments          = (s201,s202,s203,s204,s205,s206,s207,s208,s209,
s210,s211,s212,s213,s214,s215,s216,s217,s218,s219,
s220,s221,s222,s223,s224,s225,s226,s227,s228,s229,
s230,s231,s232,s233,s234,s235,s236,s237,s238,s239,
s240,s241,s242,s243,s244,s245,s246,s247,s248,s249,
s250,s251,s252,s253,s254,s255,s256,s257,s258,s259,
s260,s261,s262,s263,s264,s265,s266,s267,s268,s269,
s270,s271,s272,s273,s274,s275,s276,s277,s278,s279,
s280,s281,s282,s283,s284,s285,s286,s287,s288,s289,
s290,s291,s292,s293,s294,s295,s296,s297,s298,s299,
s300,s301,s302,s303,s304,s305,s306,s307,s308,s309,
s310,s311,s312,s313,s314,s315,s316,s317,s318,s319,
s320,s321,s322,s323,s324,s325,s326,s327,s328,s329,
s330,s331,s332,s333,s334,s335,s336,s337,s338,s339,
s340,s341,s342,s343,s344,s345,s346,s347,s348,s349,
s350,s351,s352,s353,s354,s355,s356,s357,s358,s359,
s360,s361,s362,s363,s364,s365,s366,s367,s368,s369,
s370,s371,s372,s373,s374,s375,s376,s377,s378,s379,
s380,s381,s382,s383,s384,s385,s386,s387,s388,s389,
s390,s391,s392,s393,s394,s395,s396,s397,s398,s399,
s400)
rollback_segments          = (s401,s402,s403,s404,s405,s406,s407,s408,s409,
s410,s411,s412,s413,s414,s415,s416,s417,s418,s419,
s420,s421,s422,s423,s424,s425,s426,s427,s428,s429,
s430,s431,s432,s433,s434,s435,s436,s437,s438,s439,
s440,s441,s442,s443,s444,s445,s446,s447,s448,s449,
s450,s451,s452,s453,s454,s455,s456,s457,s458,s459,
s460,s461,s462,s463,s464,s465,s466,s467,s468,s469,
s470,s471,s472,s473,s474,s475,s476,s477,s478,s479,
s480,s481,s482,s483,s484,s485,s486,s487,s488,s489,
s490,s491,s492,s493,s494,s495,s496,s497,s498,s499,
s500,s501,s502,s503,s504,s505,s506,s507,s508,s509,
s510,s511,s512,s513,s514,s515,s516,s517,s518,s519,
s520,s521,s522,s523,s524,s525,s526,s527,s528,s529,
s530,s531,s532,s533,s534,s535,s536,s537,s538,s539,
s540,s541,s542,s543,s544,s545,s546,s547,s548,s549,
s550,s551,s552,s553,s554,s555,s556,s557,s558,s559,
s560,s561,s562,s563,s564,s565,s566,s567,s568,s569,
s570,s571,s572,s573,s574,s575,s576,s577,s578,s579,
s580,s581,s582,s583,s584,s585,s586,s587,s588,s589,
s590,s591,s592,s593,s594,s595,s596,s597,s598,s599,
s600)
rollback_segments          = (s601,s602,s603,s604,s605,s606,s607,s608,s609,
s610,s611,s612,s613,s614,s615,s616,s617,s618,s619,
s620,s621,s622,s623,s624,s625,s626,s627,s628,s629,
s630,s631,s632,s633,s634,s635,s636,s637,s638,s639,
s640,s641,s642,s643,s644,s645,s646,s647,s648,s649,
s650,s651,s652,s653,s654,s655,s656,s657,s658,s659,
s660,s661,s662,s663,s664,s665,s666,s667,s668,s669,
s670,s671,s672,s673,s674,s675,s676,s677,s678,s679,
s680,s681,s682,s683,s684,s685,s686,s687,s688,s689,
s690,s691,s692,s693,s694,s695,s696,s697,s698,s699,
s700,s701,s702,s703,s704,s705,s706,s707,s708,s709,
s710,s711,s712,s713,s714,s715,s716,s717,s718,s719,
s720,s721,s722,s723,s724,s725,s726,s727,s728,s729,
s730,s731,s732,s733,s734,s735,s736,s737,s738,s739,
s740,s741,s742,s743,s744,s745,s746,s747,s748,s749,
s750,s751,s752,s753,s754,s755,s756,s757,s758,s759,
s760,s761,s762,s763,s764,s765,s766,s767,s768,s769,
s770,s771,s772,s773,s774,s775,s776,s777,s778,s779,
s780,s781,s782,s783,s784,s785,s786,s787,s788,s789,
s790,s791,s792,s793,s794,s795,s796,s797,s798,s799,
s800)
rollback_segments          = (s801,s802,s803,s804,s805,s806,s807,s808,s809,
s810,s811,s812,s813,s814,s815,s816,s817,s818,s819,
s820,s821,s822,s823,s824,s825,s826,s827,s828,s829,
s830,s831,s832,s833,s834,s835,s836,s837,s838,s839,
s840,s841,s842,s843,s844,s845,s846,s847,s848,s849,
s850,s851,s852,s853,s854,s855,s856,s857,s858,s859,
s860,s861,s862,s863,s864,s865,s866,s867,s868,s869,
s870,s871,s872,s873,s874,s875,s876,s877,s878,s879,
s880,s881,s882,s883,s884,s885,s886,s887,s888,s889,
s890,s891,s892,s893,s894,s895,s896,s897,s898,s899,
s900,s901,s902,s903,s904,s905,s906,s907,s908,s909,
s910,s911,s912,s913,s914,s915,s916,s917,s918,s919,
s920,s921,s922,s923,s924,s925,s926,s927,s928,s929,
s930,s931,s932,s933,s934,s935,s936,s937,s938,s939,
s940,s941,s942,s943,s944,s945,s946,s947,s948,s949,
s950,s951,s952,s953,s954,s955,s956,s957,s958,s959,
s960,s961,s962,s963,s964,s965,s966,s967,s968,s969,
s970,s971,s972,s973,s974,s975,s976,s977,s978,s979,
s980,s981,s982,s983,s984,s985,s986,s987,s988,s989,
s990,s991,s992,s993,s994,s995,s996,s997,s998,s999)
shared_pool_size           = 800M
shared_pool_reserved_size  = 350M
cursor_space_for_time      = TRUE
gc_releasable_locks        = 0
transaction_auditing       = FALSE
replication_dependency_tracking   = FALSE
_db_block_cache_protect    = FALSE
db_block_checking          = FALSE
```

p_create.ora

```
compatible = 8.1.5.0.0
db_name = tpcc
control_files                    = (?/dbs/tpcc_disks/control01, ?/dbs/tpcc_disks/control02)
db_files = 400
db_block_buffers = 10000
dml_locks = 500
log_buffer = 1048576
processes =1471
db_block_size = 2048
```

addft.sh

```
#!/bin/ksh

TNAME=$1
FNAME=$2
SIZE=$3
NFILE=‘expr $4 + 1‘

I=2
while [ $I -le $NFILE ]
   do
   if [ $NFILE -gt 99 ]
                then
                N=‘printf "%03d" $I‘
   else
                N=‘printf "%02d" $I‘
```

```
    fi
    addfile.sh $TNAME ${FNAME}$N $SIZE &
    I=‘expr $I + 1‘
    done
wait
```

addtempfile.sh

```
#!sh

date > step5addfile_$1.log

$SEQLPLUS tpcc/tpcc <<!
   spool step5addfile_$1.log
   set echo on
   alter tablespace $1 add tempfile '$2' size $3 reuse;
   set echo off
   spool off
   exit ;
!

date >> step5addfile_$1.log
```

addtempft.sh

```
#!/bin/ksh

TNAME=$1
FNAME=$2
SIZE=$3
NFILE=‘expr $4 + 1‘

I=2
while [ $I -le $NFILE ]
do
N=‘printf "%02d" $I‘
addtempfile.sh $TNAME ${FNAME}$N $SIZE &
I=‘expr $I + 1‘
done
wait
```

addtemfts.sh

```
#!sh

date > step5createts_$1.log

$SEQLPLUS tpcc/tpcc <<!
   spool step5createts_$1.log
   set echo on
   drop tablespace $1 including contents;
   create temporary tablespace $1 tempfile '$2' size $3 reuse extent management local uniform size $4;
   set echo off
   spool off
   exit ;
!

date >> step5createts_$1.log
```

addts.sh

```
#!sh

date > step5createts_$1.log

$SEQLPLUS tpcc/tpcc <<!
   spool step5createts_$1.log
   set echo on
   drop tablespace $1 including contents;
   create tablespace $1 datafile '$2' size $3 reuse extent management local uniform size $4 nologging ;
   set echo off
   spool off
   exit ;
!

date >> step5createts_$1.log
```

loadware.sh

```
#!sh
$TPCCLOAD -M ${DB_SIZE} -w > step20loadware.log 2>&1

if test $? -ne 0
then
  exit 1;
else
  exit 0;
fi
wait
```

loaddist.sh

```
#!sh
$TPCCLOAD -M ${DB_SIZE} -d > step21loaddist.log 2>&1

if test $? -ne 0
then
  exit 1;
else
  exit 0;
fi
wait
```

loaditem.sh

```
#!sh
$TPCCLOAD -M ${DB_SIZE} -i > step22loaditem.log 2>&1

if test $? -ne 0
then
  exit 1;
else
  exit 0;
fi
wait
```

loadhist.sh

```
#!sh
I=1
SW=1
EW=180
INC=180
while [ $I -le 100 ]
do
  $TPCCLOAD -M ${DB_SIZE} -h -b $SW -e $EW > step23loadhist.log${I} 2>&1 &
  I=‘expr $I + 1‘
  SW=‘expr $SW + $INC‘
  EW=‘expr $EW + $INC‘
done
wait
```

loadnord.sh

```
#!sh
I=1
SW=1
EW=180
INC=180
while [ $I -le 100 ]
do
  $TPCCLOAD -M ${DB_SIZE} -n -b $SW -e $EW >step24loadnord.log${I} 2>&1 &
  I=‘expr $I + 1‘
  SW=‘expr $SW + $INC‘
  EW=‘expr $EW + $INC‘
done
wait
```

loadordrordll.sh

```
#!sh
I=1
SW=1
EW=180
INC=180
while [ $I -le 100 ]
do
  $TPCCLOAD -M ${DB_SIZE} -o ?/dbs/tpcc_disks/dummy${I}.dat -b $SW -e $EW >step25loadordrordl.log${I} 2>&1 &
  I=‘expr $I + 1‘
  SW=‘expr $SW + $INC‘
  EW=‘expr $EW + $INC‘
done
wait

loadordrordl.sh
```

loadcust.sh

```
#!sh
I=1
SW=1
EW=360
INC=360
while [ $I -le 25 ]
do
  $TPCCLOAD -M ${DB_SIZE} -c -b $SW -e $EW >step26loadcust.log${I} 2>&1 &
  I=‘expr $I + 1‘
  SW=‘expr $SW + $INC‘
  EW=‘expr $EW + $INC‘
done
wait
```

loadstok.

```
#!sh
I=1
SI=1
EI=2000
INC=2000
while [ $I -le 50 ]
do
  $TPCCLOAD -M ${DB_SIZE} -S -j $SI -k $EI >step27loadstok.log${I} 2>&1 &
  I=‘expr $I + 1‘
  SI=‘expr $SI + $INC‘
  EI=‘expr $EI + $INC‘
done
wait
```

Createts.sh

```
#!sh

# addtempts.sh temp   \?/dbs/${ORACLE_SID}_disks/temp01   8001M  1000M &
addts.sh     stok   \?/dbs/${ORACLE_SID}_disks/stock001 8001M  1000M &
addts.sh     cust   \?/dbs/${ORACLE_SID}_disks/cust01   8001M  1000M &
addts.sh     ordl   \?/dbs/${ORACLE_SID}_disks/ordl01   8001M  1000M &
addts.sh     nord   \?/dbs/${ORACLE_SID}_disks/nord01   5001M  1000M &
addts.sh     ordr   \?/dbs/${ORACLE_SID}_disks/ordr01   8001M  1000M &
addts.sh     hist   \?/dbs/${ORACLE_SID}_disks/hist01   8001M  1000M &
addts.sh     istk   \?/dbs/${ORACLE_SID}_disks/istk01   8001M   500M &
addts.sh     icust1 \?/dbs/${ORACLE_SID}_disks/icust101 8001M   500M &
addts.sh     icust2 \?/dbs/${ORACLE_SID}_disks/icust201 8001M   500M &
addts.sh     iord1  \?/dbs/${ORACLE_SID}_disks/iord101  8001M   500M &
addts.sh     iord2  \?/dbs/${ORACLE_SID}_disks/iord201  8001M   500M &

# Rollback segment tablespace is created in step18
# addts.sh     roll   \?/dbs/${ORACLE_SID}_disks/roll01  401M       40K  &
# addft.sh     roll   \?/dbs/${ORACLE_SID}_disks/roll    400M  1 &

wait

addft.sh     stok   \?/dbs/${ORACLE_SID}_disks/stock  8001M 102 &
addft.sh     cust   \?/dbs/${ORACLE_SID}_disks/cust   8001M  79 &
addft.sh     hist   \?/dbs/${ORACLE_SID}_disks/hist   8001M   7 &
addft.sh     istk   \?/dbs/${ORACLE_SID}_disks/istk   8001M   9 &
addft.sh     icust1 \?/dbs/${ORACLE_SID}_disks/icust1 8001M   3 &
addft.sh     icust2 \?/dbs/${ORACLE_SID}_disks/icust2 8001M   5 &
addft.sh     ordr   \?/dbs/${ORACLE_SID}_disks/ordr   8001M   3 &
addft.sh     iord1  \?/dbs/${ORACLE_SID}_disks/iord1  8001M   3 &
addft.sh     iord2  \?/dbs/${ORACLE_SID}_disks/iord2  8001M   5 &
addft.sh     ordl   \?/dbs/${ORACLE_SID}_disks/ordl   8001M  87 &
# addtempft.sh temp   \?/dbs/${ORACLE_SID}_disks/temp   8001M  39 &

wait
```

Chkpt.sh

```
#!sh

$SEQLPLUS internal/internal @${SQLDIR}/stepchkpt
wait
```

Create_user.sh

```
#!sh

$SEQLPLUS  internal/internal @${SQLDIR}/stepcreateuser > junk 2>&1

if test $? -ne 0
then
  exit 1;
else
  exit 0;
fi
wait
```

create_cache_views.sql

```
rem This script creates four views that when queried will return
rem the total number of buffers in the buffer cache and the total
rem number of cloned buffers from each of the database's tablespaces.
rem
rem This assumes that each table and index is in its own tablespace.
rem If this is not the case, another query can be used which uses the
rem database's object tables to decipher the different objects.  However,
rem this query is slower.
rem
rem This script assumes 7.3.x.  If you are using V7.2.x or below, please
rem replace svrmgrl with sqldba lmode=y.
rem
rem Modification History:
rem
rem wbattist      16-Jun-1996     Create two additional views to keep
rem                               track of the number of clones in each
rem                               tablespace.
rem
rem wbattist      24-May-1995     Add the state check for the cbf view
rem                               to ensure that cloned blocks are not
rem                               counted.
rem
connect internal/internal;
set echo on;
drop view cbf;
create view cbf as
 select distinct(dbarfil) file#, count(1) blocks
 from x$bh
   where dbarfil > 0 and state <> 3
 group by dbarfil;
drop view cbt;
create view cbt as
  select ts$.name name,sum(cbf.blocks) buffers
  from cbf, file$, ts$
    where cbf.file#=file$.file# and file$.ts#=ts$.ts#
  group by file$.ts#, ts$.name;
drop view cbfcln;
create view cbfcln as
 select distinct(dbarfil) file#, count(1) blocks
 from x$bh
   where dbarfil > 0
 group by dbarfil;
drop view cbtcln;
create view cbtcln as
  select ts$.name name,sum(cbfcln.blocks) buffers
  from cbfcln, file$, ts$
    where cbfcln.file#=file$.file# and file$.ts#=ts$.ts#
  group by file$.ts#, ts$.name;
set echo off;
```

extent.sql

```
REM=============================================================+
REM           Copyright (c) 1994  Oracle Corp, Belmont, CA      |
REM                OPEN SYSTEMS PERFORMANCE GROUP               |
REM                   All Rights Reserved                       |
REM=============================================================+
REM FILENAME
REM       extent.sql
REM DESCRIPTION
REM       List all extents in all the TPCC tablespaces.
REM
REM  Usage: sqlplus internal/internal @extent [<block size in bytes>]
REM=============================================================*/
      set space 2
      set pagesize 2000
      set echo off
      set termout off
      set verify off
      set feedback off
      spool extent.rpt
      select substr(tablespace_name,1,8) tspace,
        substr(segment_name,1,11) segment, substr(segment_type,1,15) type,
        substr(extent_id,1,5) eid, substr(file_id,1,5) fid, blocks, blocks * &&1 / 1048576 size_MB
      from   dba_extents
      where  owner = 'TPCC' AND ( segment_type = 'INDEX' OR
        segment_type = 'INDEX PARTITION' OR segment_type = 'CLUSTER'
        OR segment_type = 'TABLE' OR segment_type = 'TABLE PARTITION')
        AND tablespace_name <> 'SYSTEM'
      order by tablespace_name, segment_name, extent_id, file_id;
      select substr(tablespace_name,1,8) tspace,
        substr(segment_name,1,11) segment,
        sum(blocks) tot_blk, sum(blocks) * &&1 / 1048576 size_MB
      from   dba_extents
      where  owner = 'TPCC' AND ( segment_type = 'INDEX' OR
        segment_type = 'INDEX PARTITION' OR segment_type = 'CLUSTER'
        OR segment_type = 'TABLE' OR segment_type = 'TABLE PARTITION')
        AND tablespace_name <> 'SYSTEM'
      group by tablespace_name, segment_name
      order by tablespace_name, segment_name;
      spool off;
```

Initnew.sql

```
-- The initnew package for storing variables used in the
-- New Order anonymous block
CREATE OR REPLACE PACKAGE initnew
AS
 TYPE intarray IS TABLE OF INTEGER index by binary_integer;
 TYPE distarray IS TABLE OF VARCHAR(24) index by binary_integer;
 nulldate       DATE;
 s_dist                                          distarray;
 idx1arr                        intarray;
 s_remote                       intarray;
 PROCEDURE new_init(idxarr intarray);
END initnew;
/
show errors;
CREATE OR REPLACE PACKAGE BODY initnew AS
  PROCEDURE new_init (idxarr  intarray)
  IS
  BEGIN
       -- initialize null date
   nulldate := TO_DATE('01-01-1811', 'MM-DD-YYYY');
    idx1arr := idxarr;
  END new_init;
END initnew;
/
show errors
```

Initpay.sql

```
CREATE OR REPLACE PACKAGE initpay
AS
 TYPE rowidarray IS TABLE OF ROWID INDEX BY BINARY_INTEGER;
 row_id                 rowidarray;
 cust_rowid              ROWID;
 dist_name              VARCHAR2(11);
 ware_name               VARCHAR2(11);
 c_num                  BINARY_INTEGER;
 PROCEDURE pay_init;
END initpay;
/
show errors;
CREATE OR REPLACE PACKAGE BODY initpay AS
  PROCEDURE pay_init IS
  BEGIN
    NULL;
  END pay_init;
END initpay;
/
show errors;
```

Plsql_mon.sql

```
rem
rem ================================================================+
rem       Copyright (c) 1995  Oracle Corp, Redwood Shores, CA      |
rem                OPEN SYSTEMS PERFORMANCE GROUP                  |
rem                    All Rights Reserved                         |
rem ================================================================+
rem  FILENAME
rem       plsql_mon.sql
rem  DESCRIPTION
rem       SQL script to create a stored package for PL/SQL stored
rem       procedures to dump messages.
rem ================================================================
rem
rem Usage:   sqlplus tpcc/tpcc @plsql_mon
rem
connect tpcc/tpcc;
set echo on;
CREATE OR REPLACE PACKAGE plsql_mon_pack
IS
  PROCEDURE print
  (
    info        VARCHAR2
  );
END;
/
show errors;
CREATE OR REPLACE PACKAGE BODY plsql_mon_pack
IS
  PROCEDURE print
  (
    info        VARCHAR2
  )
  IS
    s           NUMBER;
  BEGIN
    dbms_pipe.pack_message (info);
    s := dbms_pipe.send_message ('plsql_mon');
    IF (s <> 0) THEN
      raise_application_error (-20000, 'Error:' || to_char(s) ||
                        'sending on pipe');
    END IF;
  END;
END;
/
show errors;
set echo off;
```

Pst_c.sql

```
rem
rem
rem ================================================================+
rem          Copyright (c) 1992  Oracle Corp, Belmont, CA          |
rem                OPEN SYSTEMS PERFORMANCE GROUP                  |
rem                    All Rights Reserved                         |
rem ================================================================+
rem  FILENAME
rem       pst_c.sql
rem  DESCRIPTION
rem       Create Table for OS Specific Process Stats
rem ================================================================*/
rem
rem  Tables for Unix-specific process statistics
rem
rem  Usage: sqlplus internal/internal @pst_c
rem
       connect tpcc/tpcc;
       set echo on;
       DROP TABLE proc_resource;
       DROP TABLE os_stat;
rem
rem  Resource usage for a process.
rem
```

```
    CREATE TABLE proc_resource
    (
       config        VARCHAR2(10),
       run           NUMBER,
       proc          NUMBER,
       child         NUMBER,
       user_cpu_ms   NUMBER,
       system_cpu_ms NUMBER,
       maxrss        NUMBER,
       pagein        NUMBER,
       reclaim       NUMBER,
       zerofill      NUMBER,
       pffincr       NUMBER,
       pffdecr       NUMBER,
       swap          NUMBER,
       syscall       NUMBER,
       volcsw        NUMBER,
       involcsw      NUMBER,
       signal        NUMBER,
       lread         NUMBER,
       lwrite        NUMBER,
       bread         NUMBER,
       bwrite        NUMBER,
       phread        NUMBER,
       phwrite       NUMBER
    );
rem
rem  OS statistics.
rem  These results are from the measurement interval only.
rem
    CREATE TABLE os_stat
    (
       config          VARCHAR2(10),
       run             NUMBER,
       hid             NUMBER,
       syscall         NUMBER,
       intr            NUMBER,
       cswitch         NUMBER,
       pagefault       NUMBER,
       usr             NUMBER,
       sys             NUMBER,
       idl             NUMBER,
       wio             NUMBER
    );
    set echo off;
```

Space_get.sql

```
REM=============================================================+
REM        Copyright (c) 1995  Oracle Corp, Redwood Shores, CA     |
REM                  OPEN SYSTEMS PERFORMANCE GROUP                |
REM                       All Rights Reserved                      |
REM=============================================================+
REM FILENAME
REM       space_get.sql
REM DESCRIPTION
REM       Get sizes of tables, indexes and tablespaces.
REM  Usage: sqlplus internal/internal @space_get [<tpm> <# of warehouses>]
REM=============================================================*/
  set echo on;
  delete from tpcc_data;
  delete from tpcc_space;
  delete from tpcc_totspace;
insert into tpcc_data
select substr(segment_name,1,11), substr(segment_type,1,15),
       sum(blocks),
       round(sum(blocks) * 0.05), 0,
       sum(blocks) + round(sum(blocks) * 0.05)
from   dba_extents
where  owner = 'TPCC' AND ( segment_type = 'INDEX' OR
       segment_type = 'INDEX PARTITION' OR segment_type = 'CLUSTER'
       OR segment_type = 'TABLE' OR segment_type = 'TABLE PARTITION')
       AND tablespace_name <> 'SYSTEM'
group by segment_name, segment_type;
insert into tpcc_data
  select 'SYSTEM', 'SYS', sum(blocks), 0, 0, sum(blocks)
  from   dba_data_files
  where  tablespace_name = 'SYSTEM';
insert into tpcc_data
  select 'ROLL_SEG', 'SYS',
         sum(blocks), 0, 0, sum(blocks)
  from   dba_data_files
  where  tablespace_name like 'ROLL%'
  group by tablespace_name;
update tpcc_data
  set five_pct = 0,
      daily_grow = round(blocks * &&1 / 62.5 / &&2),
      total = blocks + round(blocks * &&1 / 62.5 / &&2)
  where segment = 'HIST' OR segment = 'ORDR' OR
        segment = 'IORDL';
insert into tpcc_space
select substr(ex$.name,1,11), sum(sp$.sz_blocks), 0, 0, 0, 0
from
 (select tablespace_name , sum(blocks) sz_blocks
  from dba_data_files
  where tablespace_name <> 'SYSTEM'
  group by tablespace_name
 ) sp$,
 (select distinct tablespace_name, segment_name name
  from dba_extents
  where owner = 'TPCC'
    and (segment_type = 'CLUSTER' or segment_type = 'TABLE'
      or segment_type = 'TABLE PARTITION' or segment_type = 'INDEX'
      or segment_type = 'INDEX PARTITION')
    and tablespace_name <> 'SYSTEM'
 ) ex$
where sp$.tablespace_name = ex$.tablespace_name
group by ex$.name;
insert into tpcc_space
select substr(tablespace_name,1,11), sum(blocks), 0, 0, 0, 0
from dba_data_files
where tablespace_name = 'SYSTEM'
group by tablespace_name;
update tpcc_space
  set required =
  (
    select sum(total)
    from   tpcc_data
    where  tpcc_data.segment = tpcc_space.segment
  )
  where segment in
  (
    select segment from tpcc_data
  );
update tpcc_space
  set static =
  (
    select sum(total)
    from   tpcc_data
    where  tpcc_data.segment = tpcc_space.segment
  )
  where segment in
  (
```

```
      select segment from tpcc_data
    );
  update tpcc_space
    set static = 0,
        dynamic =
    (
      select sum(blocks)
      from   tpcc_data
      where  tpcc_data.segment = tpcc_space.segment
    )
    where segment in ('HIST', 'ORDR', 'IORDL');
  update tpcc_space
    set oversize = blocks - required;
  insert into tpcc_totspace
    select &&1, &&2, sum(static), sum(dynamic), sum(oversize), 0, 0, 0
    from   tpcc_space;
  update tpcc_totspace
    set daily_grow =
    (
      select sum(daily_grow)
      from   tpcc_data
    );
  update tpcc_totspace
    set space180 = static + 180 * daily_grow;
  set echo off;
```

Space_init.sql

```
REM=============================================================+
REM FILENAME
REM       space_init.sql
REM DESCRIPTION
REM       Create tables for space calculations.
REM  Usage: sqlplus internal/internal @space_init.sql
REM=============================================================*/
  set echo on;
  drop table tpcc_data;
  drop table tpcc_space;
  drop table tpcc_totspace;
  create table tpcc_data (
    segment      varchar2(11),
    type         varchar2(15),
    blocks       number,
    five_pct     number,
    daily_grow   number,
    total        number
  );
  create table tpcc_space (
    segment      varchar2(11),
    blocks       number,
    required     number,
    static       number,
    dynamic      number,
    oversize     number
  );
  create table tpcc_totspace (
    tpm          number,
    nware        number,
    static       number,
    dynamic      number,
    oversize     number,
    daily_grow   number,
    daily_spre   number,
    space180     number
  );
  create unique index itpcc_data on tpcc_data (segment);
  create unique index itpcc_space on tpcc_space (segment);
  set echo off;
```

Space_rpt.sql

```
REM=============================================================+
REM       Copyright (c) 1995  Oracle Corp, Redwood Shores, CA    |
REM                 OPEN SYSTEMS PERFORMANCE GROUP               |
REM                    All Rights Reserved                       |
REM=============================================================+
REM FILENAME
REM       space_rpt.sql
REM DESCRIPTION
REM       Generate space report and save it in space.rpt
REM  Usage: sqlplus internal/internal @space_rpt.sql
REM=============================================================*/
  set space 2
  set pagesize 2000
  set echo off
  set termout off
  set verify off
  set feedback off
  spool space.rpt
  select tpm, nware from tpcc_totspace;
  select * from tpcc_data order by segment;
  select * from tpcc_space order by segment;
  select static, dynamic, oversize, daily_grow, daily_spre, space180
    from tpcc_totspace;
  spool off;
```

Create_dist.sql

```
spool step10createdist.log;
set echo on;
drop table dist;
drop cluster distcluster including tables;
set timing on;
create cluster distcluster (
                                d_w_id          number(5,0),
                                d_id            number(2,0)
                )
                single                          table
                hashkeys        180000
                hash is                         (d_w_id - 1) * 10 + d_id
                size                            1536
                initrans        3
                pctfree                         0
        tablespace              system;
create table dist (
        d_id            number(2,0),
                d_w_id          number(5,0),
        d_ytd           number,
        d_tax           number,
        d_next_o_id     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_w_id, d_id);
spool off;
set echo off;
exit sql.sqlcode;
```

Create_item.sql

```
spool step17createitem.log;
set echo on;
drop table item;
drop cluster itemcluster including tables;
set timing on;
create cluster itemcluster (
i_id    number(6,0)
  )
  single    table
  hashkeys    100000
  hash is    (i_id + 1)
  size    120
  initrans    3
  pctfree    0
  storage ( buffer_pool keep freelists 22 freelist groups 43 )
  tablespace    system;
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
);
spool off;
set echo off;
exit sql.sqlcode;
```

Create_rollsegs.sql

```
set echo on
alter rollback segment s1 offline;
alter rollback segment s2 offline;
alter rollback segment s3 offline;
alter rollback segment s4 offline;
alter rollback segment s5 offline;
alter rollback segment s6 offline;
alter rollback segment s7 offline;
alter rollback segment s8 offline;
alter rollback segment s9 offline;
alter rollback segment s10 offline;
alter rollback segment s11 offline;
alter rollback segment s12 offline;
alter rollback segment s13 offline;
alter rollback segment s14 offline;
alter rollback segment s15 offline;
alter rollback segment s16 offline;
alter rollback segment s17 offline;
alter rollback segment s18 offline;
alter rollback segment s19 offline;
alter rollback segment s20 offline;
alter rollback segment s21 offline;
alter rollback segment s22 offline;
alter rollback segment s23 offline;
alter rollback segment s24 offline;
alter rollback segment s25 offline;
alter rollback segment s26 offline;
alter rollback segment s27 offline;
alter rollback segment s28 offline;
alter rollback segment s29 offline;
alter rollback segment s30 offline;
alter rollback segment s31 offline;
alter rollback segment s32 offline;
alter rollback segment s33 offline;
alter rollback segment s34 offline;
alter rollback segment s35 offline;
alter rollback segment s36 offline;
alter rollback segment s37 offline;
alter rollback segment s38 offline;
alter rollback segment s39 offline;
alter rollback segment s40 offline;
alter rollback segment s41 offline;
alter rollback segment s42 offline;
alter rollback segment s43 offline;
alter rollback segment s44 offline;
alter rollback segment s45 offline;
alter rollback segment s46 offline;
alter rollback segment s47 offline;
alter rollback segment s48 offline;
alter rollback segment s49 offline;
alter rollback segment s50 offline;
alter rollback segment s51 offline;
alter rollback segment s52 offline;
alter rollback segment s53 offline;
alter rollback segment s54 offline;
alter rollback segment s55 offline;
alter rollback segment s56 offline;
alter rollback segment s57 offline;
alter rollback segment s58 offline;
alter rollback segment s59 offline;
alter rollback segment s60 offline;
alter rollback segment s61 offline;
alter rollback segment s62 offline;
alter rollback segment s63 offline;
alter rollback segment s64 offline;
alter rollback segment s65 offline;
alter rollback segment s66 offline;
alter rollback segment s67 offline;
alter rollback segment s68 offline;
alter rollback segment s69 offline;
alter rollback segment s70 offline;
alter rollback segment s71 offline;
alter rollback segment s72 offline;
alter rollback segment s73 offline;
alter rollback segment s74 offline;
alter rollback segment s75 offline;
alter rollback segment s76 offline;
alter rollback segment s77 offline;
alter rollback segment s78 offline;
alter rollback segment s79 offline;
alter rollback segment s80 offline;
alter rollback segment s81 offline;
alter rollback segment s82 offline;
alter rollback segment s83 offline;
alter rollback segment s84 offline;
alter rollback segment s85 offline;
alter rollback segment s86 offline;
alter rollback segment s87 offline;
alter rollback segment s88 offline;
alter rollback segment s89 offline;
alter rollback segment s90 offline;
alter rollback segment s91 offline;
alter rollback segment s92 offline;
alter rollback segment s93 offline;
alter rollback segment s94 offline;
alter rollback segment s95 offline;
alter rollback segment s96 offline;
alter rollback segment s97 offline;
alter rollback segment s98 offline;
alter rollback segment s99 offline;
```

```
alter rollback segment s100 offline;
alter rollback segment s101 offline;
alter rollback segment s102 offline;
alter rollback segment s103 offline;
alter rollback segment s104 offline;
alter rollback segment s105 offline;
alter rollback segment s106 offline;
alter rollback segment s107 offline;
alter rollback segment s108 offline;
alter rollback segment s109 offline;
alter rollback segment s110 offline;
alter rollback segment s111 offline;
alter rollback segment s112 offline;
alter rollback segment s113 offline;
alter rollback segment s114 offline;
alter rollback segment s115 offline;
alter rollback segment s116 offline;
alter rollback segment s117 offline;
alter rollback segment s118 offline;
alter rollback segment s119 offline;
alter rollback segment s120 offline;
alter rollback segment s121 offline;
alter rollback segment s122 offline;
alter rollback segment s123 offline;
alter rollback segment s124 offline;
alter rollback segment s125 offline;
alter rollback segment s126 offline;
alter rollback segment s127 offline;
alter rollback segment s128 offline;
alter rollback segment s129 offline;
alter rollback segment s130 offline;
alter rollback segment s131 offline;
alter rollback segment s132 offline;
alter rollback segment s133 offline;
alter rollback segment s134 offline;
alter rollback segment s135 offline;
alter rollback segment s136 offline;
alter rollback segment s137 offline;
alter rollback segment s138 offline;
alter rollback segment s139 offline;
alter rollback segment s140 offline;
alter rollback segment s141 offline;
alter rollback segment s142 offline;
alter rollback segment s143 offline;
alter rollback segment s144 offline;
alter rollback segment s145 offline;
alter rollback segment s146 offline;
alter rollback segment s147 offline;
alter rollback segment s148 offline;
alter rollback segment s149 offline;
alter rollback segment s150 offline;
alter rollback segment s151 offline;
alter rollback segment s152 offline;
alter rollback segment s153 offline;
alter rollback segment s154 offline;
alter rollback segment s155 offline;
alter rollback segment s156 offline;
alter rollback segment s157 offline;
alter rollback segment s158 offline;
alter rollback segment s159 offline;
alter rollback segment s160 offline;
alter rollback segment s161 offline;
alter rollback segment s162 offline;
alter rollback segment s163 offline;
alter rollback segment s164 offline;
alter rollback segment s165 offline;
alter rollback segment s166 offline;
alter rollback segment s167 offline;
alter rollback segment s168 offline;
alter rollback segment s169 offline;
alter rollback segment s170 offline;
alter rollback segment s171 offline;
alter rollback segment s172 offline;
alter rollback segment s173 offline;
alter rollback segment s174 offline;
alter rollback segment s175 offline;
alter rollback segment s176 offline;
alter rollback segment s177 offline;
alter rollback segment s178 offline;
alter rollback segment s179 offline;
alter rollback segment s180 offline;
alter rollback segment s181 offline;
alter rollback segment s182 offline;
alter rollback segment s183 offline;
alter rollback segment s184 offline;
alter rollback segment s185 offline;
alter rollback segment s186 offline;
alter rollback segment s187 offline;
alter rollback segment s188 offline;
alter rollback segment s189 offline;
alter rollback segment s190 offline;
alter rollback segment s191 offline;
alter rollback segment s192 offline;
alter rollback segment s193 offline;
alter rollback segment s194 offline;
alter rollback segment s195 offline;
alter rollback segment s196 offline;
alter rollback segment s197 offline;
alter rollback segment s198 offline;
alter rollback segment s199 offline;
alter rollback segment s200 offline;
alter rollback segment s201 offline;
alter rollback segment s202 offline;
alter rollback segment s203 offline;
alter rollback segment s204 offline;
alter rollback segment s205 offline;
alter rollback segment s206 offline;
alter rollback segment s207 offline;
alter rollback segment s208 offline;
alter rollback segment s209 offline;
alter rollback segment s210 offline;
alter rollback segment s211 offline;
alter rollback segment s212 offline;
alter rollback segment s213 offline;
alter rollback segment s214 offline;
alter rollback segment s215 offline;
alter rollback segment s216 offline;
alter rollback segment s217 offline;
alter rollback segment s218 offline;
alter rollback segment s219 offline;
alter rollback segment s220 offline;
alter rollback segment s221 offline;
alter rollback segment s222 offline;
alter rollback segment s223 offline;
alter rollback segment s224 offline;
alter rollback segment s225 offline;
alter rollback segment s226 offline;
alter rollback segment s227 offline;
alter rollback segment s228 offline;
alter rollback segment s229 offline;
alter rollback segment s230 offline;
alter rollback segment s231 offline;
alter rollback segment s232 offline;
alter rollback segment s233 offline;
alter rollback segment s234 offline;
alter rollback segment s235 offline;
alter rollback segment s236 offline;
alter rollback segment s237 offline;
alter rollback segment s238 offline;
alter rollback segment s239 offline;
```

```
alter rollback segment s240 offline;
alter rollback segment s241 offline;
alter rollback segment s242 offline;
alter rollback segment s243 offline;
alter rollback segment s244 offline;
alter rollback segment s245 offline;
alter rollback segment s246 offline;
alter rollback segment s247 offline;
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create rollback segment s635 tablespace roll_0;
create rollback segment s636 tablespace roll_0;
create rollback segment s637 tablespace roll_0;
create rollback segment s638 tablespace roll_0;
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create rollback segment s639 tablespace roll_0;
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create rollback segment s642 tablespace roll_0;
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create rollback segment s663 tablespace roll_0;
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create rollback segment s667 tablespace roll_0;
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create rollback segment s669 tablespace roll_0;
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create rollback segment s681 tablespace roll_0;
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create rollback segment s767 tablespace roll_0;
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create rollback segment s771 tablespace roll_0;
create rollback segment s772 tablespace roll_0;
create rollback segment s773 tablespace roll_0;
create rollback segment s774 tablespace roll_0;
create rollback segment s775 tablespace roll_0;
create rollback segment s776 tablespace roll_0;
create rollback segment s777 tablespace roll_0;
create rollback segment s778 tablespace roll_0;
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create rollback segment s779 tablespace roll_0;
create rollback segment s780 tablespace roll_0;
create rollback segment s781 tablespace roll_0;
create rollback segment s782 tablespace roll_0;
create rollback segment s783 tablespace roll_0;
create rollback segment s784 tablespace roll_0;
create rollback segment s785 tablespace roll_0;
create rollback segment s786 tablespace roll_0;
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create rollback segment s789 tablespace roll_0;
create rollback segment s790 tablespace roll_0;
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create rollback segment s824 tablespace roll_0;
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create rollback segment s826 tablespace roll_0;
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create rollback segment s913 tablespace roll_0;
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create rollback segment s915 tablespace roll_0;
create rollback segment s916 tablespace roll_0;
create rollback segment s917 tablespace roll_0;
create rollback segment s918 tablespace roll_0;
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create rollback segment s919 tablespace roll_0;
create rollback segment s920 tablespace roll_0;
create rollback segment s921 tablespace roll_0;
create rollback segment s922 tablespace roll_0;
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create rollback segment s975 tablespace roll_0;
create rollback segment s976 tablespace roll_0;
create rollback segment s977 tablespace roll_0;
create rollback segment s978 tablespace roll_0;
create rollback segment s979 tablespace roll_0;
create rollback segment s980 tablespace roll_0;
create rollback segment s981 tablespace roll_0;
create rollback segment s982 tablespace roll_0;
create rollback segment s983 tablespace roll_0;
create rollback segment s984 tablespace roll_0;
create rollback segment s985 tablespace roll_0;
create rollback segment s986 tablespace roll_0;
create rollback segment s987 tablespace roll_0;
create rollback segment s988 tablespace roll_0;
create rollback segment s989 tablespace roll_0;
create rollback segment s990 tablespace roll_0;
create rollback segment s991 tablespace roll_0;
create rollback segment s992 tablespace roll_0;
create rollback segment s993 tablespace roll_0;
create rollback segment s994 tablespace roll_0;
create rollback segment s995 tablespace roll_0;
create rollback segment s996 tablespace roll_0;
create rollback segment s997 tablespace roll_0;
create rollback segment s998 tablespace roll_0;
create rollback segment s999 tablespace roll_0;
spool off
set echo off
exit sql.sqlcode
```

Create_iware.sql

```
spool step29createiware.log;
set echo on;
drop index iware;
set timing on;
create unique index iware on ware (w_id)
  initrans    3
  pctfree    1
  storage ( freelists 22 freelist groups 43 )
  tablespace    system;
spool off;
set echo off;
exit sql.sqlcode;
```

Create_db.sql

```
spool step2createdb.log
set echo on
startup pfile=admin/p_create.ora nomount
create database tpcc
  controlfile reuse
  maxdatafiles 500
  maxinstances 1
  datafile '?/dbs/tpcc_disks/sys01' size 801M reuse
  logfile '?/dbs/tpcc_disks/tmplog01' size 10000M reuse,
    '?/dbs/tpcc_disks/tmplog02' size 10000M reuse;
spool off
set echo off
exit sql.sqlcode
```

Create_idist.sql

```
spool step10createdist.log;
set echo on;
drop table dist;
drop cluster distcluster including tables;
set timing on;
create cluster distcluster (
                                d_w_id          number(5,0),
                                d_id            number(2,0)
                )
                single                          table
```

```
                hashkeys        180000
                hash is                         (d_w_id - 1) * 10 + d_id
                size                            1536
                initrans        3
                pctfree                         0
        tablespace                      system;
create table dist (
        d_id            number(2,0),
                d_w_id          number(5,0),
        d_ytd           number,
        d_tax           number,
        d_next_o_id     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_w_id, d_id);
spool off;
set echo off;
exit sql.sqlcode;
```

Create_iitem.sql

```
spool step31createiitem.log;
set echo on;
drop index iitem;
set timing on;
create unique index iitem on item (i_id)
  initrans    4
  pctfree    5
  storage ( freelists 22 freelist groups 43 )
  tablespace     system;
spool off;
set echo off;
exit sql.sqlcode;
```

Analyze.sql

```
spool step39analyze.log;
set echo on;
analyze cluster warecluster estimate statistics;
analyze table ware compute statistics;
analyze cluster distcluster estimate statistics;
analyze table dist compute statistics;
analyze cluster stokcluster estimate statistics;
analyze table stok estimate statistics;
analyze index istok estimate statistics;
analyze cluster itemcluster estimate statistics;
analyze table item estimate statistics;
analyze index iordl estimate statistics;
analyze table ordl estimate statistics;
analyze index iordr1 estimate statistics;
analyze index iordr2 estimate statistics;
analyze index inord estimate statistics;
analyze table nord estimate statistics;
analyze table ordr estimate statistics;
analyze table hist estimate statistics;
analyze index iitem estimate statistics;
analyze index iware compute statistics;
analyze index icust1 estimate statistics;
analyze index icust2 estimate statistics;
analyze index idist compute statistics;
analyze cluster custcluster estimate statistics;
analyze table cust estimate statistics;
set echo off;
spool off;
exit sql.sqlcode;
```

Create_rollback.sql

```
spool step3createrollback.log
set echo on
alter rollback segment t1 offline;
drop public rollback segment t1;
create public rollback segment t1
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t1 online;
alter rollback segment t2 offline;
drop public rollback segment t2;
create public rollback segment t2
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t2 online;
alter rollback segment t3 offline;
drop public rollback segment t3;
create public rollback segment t3
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t3 online;
alter rollback segment t4 offline;
drop public rollback segment t4;
create public rollback segment t4
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t4 online;
alter rollback segment t5 offline;
drop public rollback segment t5;
create public rollback segment t5
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t5 online;
alter rollback segment t6 offline;
drop public rollback segment t6;
create public rollback segment t6
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t6 online;
alter rollback segment t7 offline;
drop public rollback segment t7;
create public rollback segment t7
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t7 online;
alter rollback segment t8 offline;
drop public rollback segment t8;
create public rollback segment t8
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t8 online;
alter rollback segment t9 offline;
drop public rollback segment t9;
create public rollback segment t9
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t9 online;
alter rollback segment t10 offline;
drop public rollback segment t10;
create public rollback segment t10
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t10 online;
alter rollback segment t11 offline;
drop public rollback segment t11;
create public rollback segment t11
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t11 online;
alter rollback segment t12 offline;
```

```
drop public rollback segment t12;
create public rollback segment t12
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t12 online;
alter rollback segment t13 offline;
drop public rollback segment t13;
create public rollback segment t13
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t13 online;
alter rollback segment t14 offline;
drop public rollback segment t14;
create public rollback segment t14
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t14 online;
alter rollback segment t15 offline;
drop public rollback segment t15;
create public rollback segment t15
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t15 online;
alter rollback segment t16 offline;
drop public rollback segment t16;
create public rollback segment t16
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t16 online;
alter rollback segment t17 offline;
drop public rollback segment t17;
create public rollback segment t17
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t17 online;
alter rollback segment t18 offline;
drop public rollback segment t18;
create public rollback segment t18
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t18 online;
alter rollback segment t19 offline;
drop public rollback segment t19;
create public rollback segment t19
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t19 online;
alter rollback segment t20 offline;
drop public rollback segment t20;
create public rollback segment t20
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t20 online;
alter rollback segment t21 offline;
drop public rollback segment t21;
create public rollback segment t21
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t21 online;
alter rollback segment t22 offline;
drop public rollback segment t22;
create public rollback segment t22
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t22 online;
alter rollback segment t23 offline;
drop public rollback segment t23;
create public rollback segment t23
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t23 online;
alter rollback segment t24 offline;
drop public rollback segment t24;
create public rollback segment t24
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t24 online;
alter rollback segment t25 offline;
drop public rollback segment t25;
create public rollback segment t25
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t25 online;
alter rollback segment t26 offline;
drop public rollback segment t26;
create public rollback segment t26
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t26 online;
alter rollback segment t27 offline;
drop public rollback segment t27;
create public rollback segment t27
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t27 online;
alter rollback segment t28 offline;
drop public rollback segment t28;
create public rollback segment t28
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t28 online;
alter rollback segment t29 offline;
drop public rollback segment t29;
create public rollback segment t29
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t29 online;
alter rollback segment t30 offline;
drop public rollback segment t30;
create public rollback segment t30
      storage (initial 200K minextents 2 next 200K);
alter rollback segment t30 online;
spool off
set echo off
exit sql.sqlcode
```

Create_storedprocs.sql

```
spool step41createstoredprocs.log
@sql/initpay
@sql/initnew
spool off
exit sql.sqlcode;
```

Create_spacesats.sql

```
spool step42createspacestats.log
@sql/space_init
@sql/space_get 225000 18000
@sql/space_rpt
spool off
exit sql.sqlcode;
```

Create_misc.sql

```
spool step43createmisc.log
set echo on;
alter user tpcc temporary tablespace system;
grant execute on dbms_lock to public;
grant execute on dbms_pipe to public;
grant select on v_$parameter to public;
@sql/plsql_mon
@sql/cre_tab
@sql/create_cache_views
@sql/views
@sql/dml
@sql/extent 2048
@sql/freeext 2048
spool off
```

```
exit sql.sqlcode;
```

Offlinerollsegs.sql

```
spool step47offlinerollsegs.log
set echo on
alter rollback segment t1 offline;
alter rollback segment t2 offline;
alter rollback segment t3 offline;
alter rollback segment t4 offline;
alter rollback segment t5 offline;
alter rollback segment t6 offline;
alter rollback segment t7 offline;
alter rollback segment t8 offline;
alter rollback segment t9 offline;
alter rollback segment t10 offline;
alter rollback segment t11 offline;
alter rollback segment t12 offline;
alter rollback segment t13 offline;
alter rollback segment t14 offline;
alter rollback segment t15 offline;
alter rollback segment t16 offline;
alter rollback segment t17 offline;
alter rollback segment t18 offline;
alter rollback segment t19 offline;
alter rollback segment t20 offline;
alter rollback segment t21 offline;
alter rollback segment t22 offline;
alter rollback segment t23 offline;
alter rollback segment t24 offline;
alter rollback segment t25 offline;
alter rollback segment t26 offline;
alter rollback segment t27 offline;
alter rollback segment t28 offline;
alter rollback segment t29 offline;
alter rollback segment t30 offline;
spool off
set echo off
exit sql.sqlcode
```

Create_ddviews.sql

```
spool step6createddviews.log
connect sys/change_on_install
@$ORACLE_HOME/rdbms/admin/catalog
@$ORACLE_HOME/rdbms/admin/catproc
connect system/manager
@$ORACLE_HOME/sqlplus/admin/pupbld
spool off
exit sql.sqlcode;
```

Create_ware.sql

```
spool step9createware.log;
set echo on;
drop table ware;
drop cluster warecluster including tables;
set timing on;
create cluster warecluster (
                w_id                    number(5,0)
        )
                single                                  table
                hashkeys                18000
                hash is                                 w_id
                size                                    1536
                initrans                3
                pctfree                                 0
        tablespace              system;
create table ware(
        w_id            number(5,0),
        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);
spool off;
set echo off;
exit sql.sqlcode;
```

Chkpt.sql

```
spool stepchkpt.log;
set echo on;
alter system switch logfile;
alter system switch logfile;
set echo off;
spool off;
exit ;
```

Create_user.sql

```
spool stepcreateuser.log;
set echo on;
create user tpcc identified by tpcc;
grant dba to tpcc;
set echo off;
spool off;
exit ;
```

Shut.sql

```
spool stepshut.log;
set echo on;
alter system switch logfile;
alter system switch logfile;
shutdown immediate;
set echo off;
spool off;
exit ;
```

Startb.sql

```
spool stepstartb.log;
```

```
set echo on;
startup pfile=admin/p_build.ora open;
set echo off;
spool off;
exit ;
```

Usertemp.sql

```
spool stepusertemp.log;
set echo on;
alter user tpcc temporary tablespace temp;
set echo off;
spool off;
exit ;
```

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
 |                       -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)
 |                       -g  generate rows to standard output
 +=================================================================*/

#include <stdio.h>
#include <stdlib.h>
#include <string.h>
/* #include <unistd.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. disctrict id            */
#define CUSTFAC 3000                    /* max. cust id*/
#define STOCFAC 100000                  /* max. stok id*/
#define ITEMFAC 100000                  /* max. item id                                 */
#define HISTFAC 30000           /* hist / ware  */
#define ORDEFAC 3000             /* order / dist     */
#define NEWOFAC 900              /* new order / dist */

#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 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 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 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_CNT,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_CNT,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)"

ldadef tpclda;
csrdef curw, curd, curc, curh, curs, curi, curo1, curo2, curol1, curol2, curno;
unsigned long tpchda[256];

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();


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\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-g :\tgenerate rows to standard output\n");
   fprintf (stderr, "\n");
   exit(1);
}


void errrpt (lda, cur)

csrdef *lda;
csrdef *cur;

{

   text msg[2048];

   if (cur->rc) {
      oerhms (lda, cur->rc, msg, 2048);
      fprintf (stderr, "TPC-C load error: %s\n", msg);
   }

}


void quit ()

{

   if (oclose (&curw))
      errrpt (&tpclda, &curw);

   if (oclose (&curd))
      errrpt (&tpclda, &curd);

   if (oclose (&curc))
      errrpt (&tpclda, &curc);

   if (oclose (&curh))
      errrpt (&tpclda, &curh);

   if (oclose (&curs))
      errrpt (&tpclda, &curs);

   if (oclose (&curi))
      errrpt (&tpclda, &curi);

   if (oclose (&curo1))
      errrpt (&tpclda, &curo1);

   if (oclose (&curo2))
      errrpt (&tpclda, &curo2);

   if (oclose (&curol1))
      errrpt (&tpclda, &curol1);

   if (oclose (&curol2))
      errrpt (&tpclda, &curol2);

   if (oclose (&curno))
      errrpt (&tpclda, &curno);

   if (ologof (&tpclda))
      fprintf (stderr, "TPC-C load error: Error in logging off\n");

}


void main (argc, argv)

int argc;
```

```
char *argv[];

{

  char *uid="tpcc/tpcc";
  text sqlbuf[1024];
  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 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_i_id[100];
  int s_w_id[100];
  int s_quantity[100];
  char s_dist_01[100][24];
  char s_dist_02[100][24];
  char s_dist_03[100][24];
  char s_dist_04[100][24];
  char s_dist_05[100][24];
  char s_dist_06[100][24];
  char s_dist_07[100][24];
  char s_dist_08[100][24];
  char s_dist_09[100][24];
  char s_dist_10[100][24];
  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[15];
  int ol_d_id[15];
  int ol_w_id[15];
  int ol_number[15];
  int ol_i_id[15];
  int ol_supply_w_id[15];
  int ol_amount[15];
  char ol_dist_info[15][24];

  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:AwdcisShno:b:e:j:k:g";
  int do_A=0;
  int do_w=0;
  int do_d=0;
  int do_i=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;

  FILE *olfp=NULL;
  char olfname[100];
#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 '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 '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 '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 '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_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_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 stok table around s_w_id or s_i_id?\n");
    myusage ();
  }
```

```
  if (eware <= 0)
    eware = scale;
  if (eitem <= 0)
    eitem = STOCFAC;

  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 ((bware  < 1) || (bware > scale)) {
    fprintf (stderr, "Invalid beginning ware number: %d\n", bware);
    myusage ();
  }

  if ((eware  < bware) || (eware > scale)) {
    fprintf (stderr, "Invalid ending ware 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 */

    if (orlon (&tpclda, (ub1 *) tpchda, (text *) uid, -1, (text *) 0, -1, 0)) {
      fprintf (stderr, "TPC-C load error: Error in logging on\n");
      errrpt (&tpclda, &tpclda);
      exit (1);
    }

    fprintf (stderr, "\nConnected to Oracle userid %s'.\n", uid);

    /* turn off auto-commit */

    if (ocof (&tpclda)) {
      errrpt (&tpclda, &tpclda);
      ologof (&tpclda);
      exit (1);
    }

    /* open cursors */

    if (oopen (&curw, &tpclda, (text *) 0, -1, -1, (text *) uid, -1)) {
      errrpt (&tpclda, &curw);
      ologof (&tpclda);
      exit (1);
    }

    if (oopen (&curd, &tpclda, (text *) 0, -1, -1, (text *) uid, -1)) {
      errrpt (&tpclda, &curd);
      oclose (&curw);
      ologof (&tpclda);
      exit (1);
    }

    if (oopen (&curc, &tpclda, (text *) 0, -1, -1, (text *) uid, -1)) {
      errrpt (&tpclda, &curc);
      oclose (&curw);
      oclose (&curd);
      ologof (&tpclda);
      exit (1);
    }

    if (oopen (&curh, &tpclda, (text *) 0, -1, -1, (text *) uid, -1)) {
      errrpt (&tpclda, &curh);
      oclose (&curw);
      oclose (&curd);
      oclose (&curc);
      ologof (&tpclda);
      exit (1);
    }

    if (oopen (&curs, &tpclda, (text *) 0, -1, -1, (text *) uid, -1)) {
      errrpt (&tpclda, &curs);
      oclose (&curw);
      oclose (&curd);
      oclose (&curc);
      oclose (&curh);
      ologof (&tpclda);
      exit (1);
    }

    if (oopen (&curi, &tpclda, (text *) 0, -1, -1, (text *) uid, -1)) {
      errrpt (&tpclda, &curi);
      oclose (&curw);
      oclose (&curd);
      oclose (&curc);
      oclose (&curh);
      oclose (&curs);
      ologof (&tpclda);
      exit (1);
    }

    if (oopen (&curo1, &tpclda, (text *) 0, -1, -1, (text *) uid, -1)) {
      errrpt (&tpclda, &curo1);
      oclose (&curw);
      oclose (&curd);
      oclose (&curc);
      oclose (&curh);
      oclose (&curs);
      oclose (&curi);
      ologof (&tpclda);
      exit (1);
    }

    if (oopen (&curo2, &tpclda, (text *) 0, -1, -1, (text *) uid, -1)) {
      errrpt (&tpclda, &curo2);
      oclose (&curw);
      oclose (&curd);
      oclose (&curc);
      oclose (&curh);
      oclose (&curs);
      oclose (&curi);
      oclose (&curo1);
      ologof (&tpclda);
      exit (1);
    }

    if (oopen (&curol1, &tpclda, (text *) 0, -1, -1, (text *) uid, -1)) {
      errrpt (&tpclda, &curol1);
      oclose (&curw);
```

```
    oclose (&curd);
    oclose (&curc);
    oclose (&curh);
    oclose (&curs);
    oclose (&curi);
    oclose (&curo1);
    oclose (&curo2);
    ologof (&tpclda);
    exit (1);
  }

  if (oopen (&curol2, &tpclda, (text *) 0, -1, -1, (text *) uid, -1)) {
    errrpt (&tpclda, &curol2);
    oclose (&curw);
    oclose (&curd);
    oclose (&curc);
    oclose (&curh);
    oclose (&curs);
    oclose (&curi);
    oclose (&curo1);
    oclose (&curo2);
    oclose (&curol1);
    ologof (&tpclda);
    exit (1);
  }

  if (oopen (&curno, &tpclda, (text *) 0, -1, -1, (text *) uid, -1)) {
    errrpt (&tpclda, &curno);
    oclose (&curw);
    oclose (&curd);
    oclose (&curc);
    oclose (&curh);
    oclose (&curs);
    oclose (&curi);
    oclose (&curo1);
    oclose (&curo2);
    oclose (&curol1);
    oclose (&curol2);
    ologof (&tpclda);
    exit (1);
  }

  /* parse statements */


  sprintf ((char *) sqlbuf, SQLTXTW);
  if (oparse (&curw, sqlbuf, -1, 0, 1)) {
    errrpt (&tpclda, &curw);
    quit ();
    exit (1);
  }

  sprintf ((char *) sqlbuf, SQLTXTD);
  if (oparse (&curd, sqlbuf, -1, 0, 1)) {
    errrpt (&tpclda, &curd);
    quit ();
    exit (1);
  }

  sprintf ((char *) sqlbuf, SQLTXTC);
  if (oparse (&curc, sqlbuf, -1, 0, 1)) {
    errrpt (&tpclda, &curc);
    quit ();
    exit (1);
  }

  sprintf ((char *) sqlbuf, SQLTXTH);
  if (oparse (&curh, sqlbuf, -1, 0, 1)) {
    errrpt (&tpclda, &curh);
    quit ();
    exit (1);
  }

  sprintf ((char *) sqlbuf, SQLTXTS);
  if (oparse (&curs, sqlbuf, -1, 0, 1)) {
    errrpt (&tpclda, &curs);
    quit ();
    exit (1);
  }

  sprintf ((char *) sqlbuf, SQLTXTI);
  if (oparse (&curi, sqlbuf, -1, 0, 1)) {
    errrpt (&tpclda, &curi);
    quit ();
    exit (1);
  }

  sprintf ((char *) sqlbuf, SQLTXTO1);
  if (oparse (&curo1, sqlbuf, -1, 0, 1)) {
    errrpt (&tpclda, &curo1);
    quit ();
    exit (1);
  }

  sprintf ((char *) sqlbuf, SQLTXTO2);
  if (oparse (&curo2, sqlbuf, -1, 0, 1)) {
    errrpt (&tpclda, &curo2);
    quit ();
    exit (1);
  }

  sprintf ((char *) sqlbuf, SQLTXTOL1);
  if (oparse (&curol1, sqlbuf, -1, 0, 1)) {
    errrpt (&tpclda, &curol1);
    quit ();
    exit (1);
  }

  sprintf ((char *) sqlbuf, SQLTXTOL2);
  if (oparse (&curol2, sqlbuf, -1, 0, 1)) {
    errrpt (&tpclda, &curol2);
    quit ();
    exit (1);
  }

  sprintf ((char *) sqlbuf, SQLTXTNO);
  if (oparse (&curno, sqlbuf, -1, 0, 1)) {
    errrpt (&tpclda, &curno);
    quit ();
    exit (1);
  }

  /* bind variables */

  /* ware */

  if (obndrv (&curw, (text *) ":w_id", -1, (ub1 *) &w_id, sizeof (w_id),
          SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
    errrpt (&tpclda, &curw);
    quit ();
    exit (1);
  }

  if (obndrv (&curw, (text *) ":w_name", -1, (ub1 *) w_name, 11,
          SQLT_STR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
    errrpt (&tpclda, &curw);
    quit ();
    exit (1);
  }
```

```
if (obndrv (&curw, (text *) ":w_street_1", -1, (ub1 *) w_street_1, 21,
        SQLT_STR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curw);
  quit ();
  exit (1);
}

if (obndrv (&curw, (text *) ":w_street_2", -1, (ub1 *) w_street_2, 21,
        SQLT_STR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curw);
  quit ();
  exit (1);
}

if (obndrv (&curw, (text *) ":w_city", -1, (ub1 *) w_city, 21,
        SQLT_STR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curw);
  quit ();
  exit (1);
}

if (obndrv (&curw, (text *) ":w_state", -1, (ub1 *) w_state, 2,
        SQLT_CHR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curw);
  quit ();
  exit (1);
}

if (obndrv (&curw, (text *) ":w_zip", -1, (ub1 *) w_zip, 9,
        SQLT_CHR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curw);
  quit ();
  exit (1);
}

if (obndrv (&curw, (text *) ":w_tax", -1, (ub1 *) &w_tax, sizeof (w_tax),
        SQLT_FLT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curw);
  quit ();
  exit (1);
}

/* dist */

if (obndrv (&curd, (text *) ":d_id", -1, (ub1 *) d_id, sizeof (int),
        SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curd);
  quit ();
  exit (1);
}

if (obndrv (&curd, (text *) ":d_w_id", -1, (ub1 *) d_w_id, sizeof (int),
        SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curd);
  quit ();
  exit (1);
}

if (obndrv (&curd, (text *) ":d_name", -1, (ub1 *) d_name, 11,
        SQLT_STR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curd);
  quit ();
  exit (1);
}

if (obndrv (&curd, (text *) ":d_street_1", -1, (ub1 *) d_street_1, 21,
        SQLT_STR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curd);
  quit ();
  exit (1);
}

if (obndrv (&curd, (text *) ":d_street_2", -1, (ub1 *) d_street_2, 21,
        SQLT_STR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curd);
  quit ();
  exit (1);
}

if (obndrv (&curd, (text *) ":d_city", -1, (ub1 *) d_city, 21,
        SQLT_STR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curd);
  quit ();
  exit (1);
}

if (obndrv (&curd, (text *) ":d_state", -1, (ub1 *) d_state, 2,
        SQLT_CHR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curd);
  quit ();
  exit (1);
}

if (obndrv (&curd, (text *) ":d_zip", -1, (ub1 *) d_zip, 9,
        SQLT_CHR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curd);
  quit ();
  exit (1);
}

if (obndrv (&curd, (text *) ":d_tax", -1, (ub1 *) d_tax, sizeof (float),
        SQLT_FLT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curd);
  quit ();
  exit (1);
}

/* cust */

if (obndrv (&curc, (text *) ":c_id", -1, (ub1 *) c_id, sizeof (int),
        SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curc);
  quit ();
  exit (1);
}

if (obndrv (&curc, (text *) ":c_d_id", -1, (ub1 *) c_d_id, sizeof (int),
        SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curc);
  quit ();
  exit (1);
}

if (obndrv (&curc, (text *) ":c_w_id", -1, (ub1 *) c_w_id, sizeof (int),
        SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curc);
  quit ();
  exit (1);
}

if (obndrv (&curc, (text *) ":c_first", -1, (ub1 *) c_first, 17,
        SQLT_STR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curc);
  quit ();
  exit (1);
}

if (obndrv (&curc, (text *) ":c_last", -1, (ub1 *) c_last, 17,
        SQLT_STR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curc);
```

```
  quit ();
  exit (1);
}

if (obndrv (&curc, (text *) ":c_street_1", -1, (ub1 *) c_street_1, 21,
        SQLT_STR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curc);
  quit ();
  exit (1);
}

if (obndrv (&curc, (text *) ":c_street_2", -1, (ub1 *) c_street_2, 21,
        SQLT_STR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curc);
  quit ();
  exit (1);
}

if (obndrv (&curc, (text *) ":c_city", -1, (ub1 *) c_city, 21,
        SQLT_STR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curc);
  quit ();
  exit (1);
}

if (obndrv (&curc, (text *) ":c_state", -1, (ub1 *) c_state, 2,
        SQLT_CHR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curc);
  quit ();
  exit (1);
}

if (obndrv (&curc, (text *) ":c_zip", -1, (ub1 *) c_zip, 9,
        SQLT_CHR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curc);
  quit ();
  exit (1);
}

if (obndrv (&curc, (text *) ":c_phone", -1, (ub1 *) c_phone, 16,
        SQLT_CHR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curc);
  quit ();
  exit (1);
}

if (obndrv (&curc, (text *) ":c_credit", -1, (ub1 *) c_credit, 2,
        SQLT_CHR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curc);
  quit ();
  exit (1);
}

if (obndrv (&curc, (text *) ":c_discount", -1, (ub1 *) c_discount,
        sizeof (float), SQLT_FLT, -1, (sb2 *) 0, (text *) 0, -1,
        -1)) {
  errrpt (&tpclda, &curc);
  quit ();
  exit (1);
}

if (obndrv (&curc, (text *) ":c_data", -1, (ub1 *) c_data, 501,
        SQLT_STR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curc);
  quit ();
  exit (1);
}

/* item */

if (obndrv (&curi, (text *) ":i_id", -1, (ub1 *) i_id, sizeof (int),
        SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curi);
  quit ();
  exit (1);
}

if (obndrv (&curi, (text *) ":i_im_id", -1, (ub1 *) i_im_id, sizeof (int),
        SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curi);
  quit ();
  exit (1);
}

if (obndrv (&curi, (text *) ":i_name", -1, (ub1 *) i_name, 25,
        SQLT_STR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curi);
  quit ();
  exit (1);
}

if (obndrv (&curi, (text *) ":i_price", -1, (ub1 *) i_price,
        sizeof (int), SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1,
        -1)) {
  errrpt (&tpclda, &curi);
  quit ();
  exit (1);
}

if (obndrv (&curi, (text *) ":i_data", -1, (ub1 *) i_data, 51,
        SQLT_STR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curi);
  quit ();
  exit (1);
}

/* stok */

if (obndrv (&curs, (text *) ":s_i_id", -1, (ub1 *) s_i_id, sizeof (int),
        SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curs);
  quit ();
  exit (1);
}

if (obndrv (&curs, (text *) ":s_w_id", -1, (ub1 *) s_w_id, sizeof (int),
        SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curs);
  quit ();
  exit (1);
}

if (obndrv (&curs, (text *) ":s_quantity", -1, (ub1 *) s_quantity,
        sizeof (int), SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curs);
  quit ();
  exit (1);
}

if (obndrv (&curs, (text *) ":s_dist_01", -1, (ub1 *) s_dist_01, 24,
        SQLT_CHR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curs);
  quit ();
  exit (1);
}

if (obndrv (&curs, (text *) ":s_dist_02", -1, (ub1 *) s_dist_02, 24,
        SQLT_CHR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curs);
  quit ();
```

```
  exit (1);
}

if (obndrv (&curs, (text *) ":s_dist_03", -1, (ub1 *) s_dist_03, 24,
        SQLT_CHR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curs);
  quit ();
  exit (1);
}

if (obndrv (&curs, (text *) ":s_dist_04", -1, (ub1 *) s_dist_04, 24,
        SQLT_CHR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curs);
  quit ();
  exit (1);
}

if (obndrv (&curs, (text *) ":s_dist_05", -1, (ub1 *) s_dist_05, 24,
        SQLT_CHR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curs);
  quit ();
  exit (1);
}

if (obndrv (&curs, (text *) ":s_dist_06", -1, (ub1 *) s_dist_06, 24,
        SQLT_CHR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curs);
  quit ();
  exit (1);
}

if (obndrv (&curs, (text *) ":s_dist_07", -1, (ub1 *) s_dist_07, 24,
        SQLT_CHR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curs);
  quit ();
  exit (1);
}

if (obndrv (&curs, (text *) ":s_dist_08", -1, (ub1 *) s_dist_08, 24,
        SQLT_CHR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curs);
  quit ();
  exit (1);
}

if (obndrv (&curs, (text *) ":s_dist_09", -1, (ub1 *) s_dist_09, 24,
        SQLT_CHR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curs);
  quit ();
  exit (1);
}

if (obndrv (&curs, (text *) ":s_dist_10", -1, (ub1 *) s_dist_10, 24,
        SQLT_CHR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curs);
  quit ();
  exit (1);
}

if (obndrv (&curs, (text *) ":s_data", -1, (ub1 *) s_data, 51,
        SQLT_STR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curs);
  quit ();
  exit (1);
}

/* hist */

if (obndrv (&curh, (text *) ":h_c_id", -1, (ub1 *) h_c_id, sizeof (int),
        SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curh);
  quit ();
  exit (1);
}

if (obndrv (&curh, (text *) ":h_c_d_id", -1, (ub1 *) h_d_id, sizeof (int),
        SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curh);
  quit ();
  exit (1);
}

if (obndrv (&curh, (text *) ":h_c_w_id", -1, (ub1 *) h_w_id, sizeof (int),
        SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curh);
  quit ();
  exit (1);
}

if (obndrv (&curh, (text *) ":h_d_id", -1, (ub1 *) h_d_id, sizeof (int),
        SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curh);
  quit ();
  exit (1);
}

if (obndrv (&curh, (text *) ":h_w_id", -1, (ub1 *) h_w_id, sizeof (int),
        SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curh);
  quit ();
  exit (1);
}

if (obndrv (&curh, (text *) ":h_data", -1, (ub1 *) h_data, 25,
        SQLT_STR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curh);
  quit ();
  exit (1);
}

/* ordl (delivered) */

if (obndrv (&curol1, (text *) ":ol_o_id", -1, (ub1 *) ol_o_id,
        sizeof (int), SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curol1);
  quit ();
  exit (1);
}

if (obndrv (&curol1, (text *) ":ol_d_id", -1, (ub1 *) ol_d_id,
        sizeof (int), SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curol1);
  quit ();
  exit (1);
}

if (obndrv (&curol1, (text *) ":ol_w_id", -1, (ub1 *) ol_w_id,
        sizeof (int), SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curol1);
  quit ();
  exit (1);
}

if (obndrv (&curol1, (text *) ":ol_number", -1, (ub1 *) ol_number,
    sizeof (int), SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curol1);
  quit ();
  exit (1);
}
```

```
if (obndrv (&curol1, (text *) ":ol_i_id", -1, (ub1 *) ol_i_id,
    sizeof (int), SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curol1);
  quit ();
  exit (1);
}

if (obndrv (&curol1, (text *) ":ol_supply_w_id", -1,
          (ub1 *) ol_supply_w_id, sizeof (int), SQLT_INT, -1,
          (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curol1);
  quit ();
  exit (1);
}

if (obndrv (&curol1, (text *) ":ol_dist_info", -1, (ub1 *) ol_dist_info,
          24, SQLT_CHR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curol1);
  quit ();
  exit (1);
}

/* ordl (not delivered) */

if (obndrv (&curol2, (text *) ":ol_o_id", -1, (ub1 *) ol_o_id,
          sizeof (int), SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curol2);
  quit ();
  exit (1);
}

if (obndrv (&curol2, (text *) ":ol_d_id", -1, (ub1 *) ol_d_id,
          sizeof (int), SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curol2);
  quit ();
  exit (1);
}

if (obndrv (&curol2, (text *) ":ol_w_id", -1, (ub1 *) ol_w_id,
          sizeof (int), SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curol2);
  quit ();
  exit (1);
}

if (obndrv (&curol2, (text *) ":ol_number", -1, (ub1 *) ol_number,
    sizeof (int), SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curol2);
  quit ();
  exit (1);
}

if (obndrv (&curol2, (text *) ":ol_i_id", -1, (ub1 *) ol_i_id,
    sizeof (int), SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curol2);
  quit ();
  exit (1);
}

if (obndrv (&curol2, (text *) ":ol_supply_w_id", -1,
          (ub1 *) ol_supply_w_id, sizeof (int), SQLT_INT, -1,
          (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curol2);
  quit ();
  exit (1);
}

if (obndrv (&curol2, (text *) ":ol_amount", -1, (ub1 *) ol_amount,
    sizeof (int), SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curol2);
  quit ();
  exit (1);
}

if (obndrv (&curol2, (text *) ":ol_dist_info", -1, (ub1 *) ol_dist_info,
          24, SQLT_CHR, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curol2);
  quit ();
  exit (1);
}

/* ordr (delivered) */

if (obndrv (&curo1, (text *) ":o_id", -1, (ub1 *) o_id, sizeof (int),
          SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curo1);
  quit ();
  exit (1);
}

if (obndrv (&curo1, (text *) ":o_d_id", -1, (ub1 *) o_d_id, sizeof (int),
          SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curo1);
  quit ();
  exit (1);
}

if (obndrv (&curo1, (text *) ":o_w_id", -1, (ub1 *) o_w_id, sizeof (int),
          SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curo1);
  quit ();
  exit (1);
}

if (obndrv (&curo1, (text *) ":o_c_id", -1, (ub1 *) o_c_id, sizeof (int),
          SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curo1);
  quit ();
  exit (1);
}

if (obndrv (&curo1, (text *) ":o_carrier_id", -1, (ub1 *) o_carrier_id,
    sizeof (int), SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curo1);
  quit ();
  exit (1);
}

if (obndrv (&curo1, (text *) ":o_ol_cnt", -1, (ub1 *) o_ol_cnt,
    sizeof (int), SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curo1);
  quit ();
  exit (1);
}

/* ordr (not delivered) */

if (obndrv (&curo2, (text *) ":o_id", -1, (ub1 *) o_id, sizeof (int),
          SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curo2);
  quit ();
  exit (1);
}

if (obndrv (&curo2, (text *) ":o_d_id", -1, (ub1 *) o_d_id, sizeof (int),
          SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
  errrpt (&tpclda, &curo2);
  quit ();
  exit (1);
}
```

```
    if (obndrv (&curo2, (text *) ":o_w_id", -1, (ub1 *) o_w_id, sizeof (int),
            SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
      errrpt (&tpclda, &curo2);
      quit ();
      exit (1);
    }

    if (obndrv (&curo2, (text *) ":o_c_id", -1, (ub1 *) o_c_id, sizeof (int),
            SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
      errrpt (&tpclda, &curo2);
      quit ();
      exit (1);
    }

    if (obndrv (&curo2, (text *) ":o_ol_cnt", -1, (ub1 *) o_ol_cnt,
            sizeof (int), SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
      errrpt (&tpclda, &curo2);
      quit ();
      exit (1);
    }

    /* new order */

    if (obndrv (&curno, (text *) ":no_o_id", -1, (ub1 *) no_o_id,
            sizeof (int), SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
      errrpt (&tpclda, &curno);
      quit ();
      exit (1);
    }

    if (obndrv (&curno, (text *) ":no_d_id", -1, (ub1 *) no_d_id,
            sizeof (int), SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
      errrpt (&tpclda, &curno);
      quit ();
      exit (1);
    }

    if (obndrv (&curno, (text *) ":no_w_id", -1, (ub1 *) no_w_id,
            sizeof (int), SQLT_INT, -1, (sb2 *) 0, (text *) 0, -1, -1)) {
      errrpt (&tpclda, &curno);
      quit ();
      exit (1);
    }
  }

/*---------------------------------------------------------------+
 | 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 ware: 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 %f %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);

        if (oexec (&curw)) {
          errrpt (&tpclda, &curw);
          orol (&tpclda);
          fprintf (stderr, "Aborted at ware %d\n", loop);
          quit ();
          exit (1);
        }
        else if (ocom (&tpclda)) {
          errrpt (&tpclda, &tpclda);
          orol (&tpclda);
          fprintf (stderr, "Aborted at ware %d\n", loop);
          quit ();
          exit (1);
        }
      }
    }

    end_time = gettime ();
    end_cpu = getcpu ();
    fprintf (stderr, "Done.  %d rows loaded/generated in %10d sec. (%10d 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 dist: 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 %s %s %s %s %s %s %d 30000.0 3001\n",
              i + 1, dwid, d_name[i], d_street_1[i], d_street_2[i],
              d_city[i], str2, num9, d_tax[i]); */
                                /* Reordered columns */
        printf ("%d %d 3000000 %f 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 {
      if (oexn (&curd, DISTARR, 0)) {
        errrpt (&tpclda, &curd);
        orol (&tpclda);
        fprintf (stderr, "Aborted at ware %d, dist 1\n", dwid);
        quit ();
        exit (1);
      }
      else if (ocom (&tpclda)) {
        errrpt (&tpclda, &tpclda);
        orol (&tpclda);
        fprintf (stderr, "Aborted at ware %d, dist 1\n", dwid);
        quit ();
        exit (1);
      }
    }
  }

  end_time = gettime ();
  end_cpu = getcpu ();
  fprintf (stderr, "Done.  %d rows loaded/generated in %10d sec. (%10d 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 cust: 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 < CUSTARR; 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 %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 {
      if (oexn (&curc, CUSTARR, 0)) {
        errrpt (&tpclda, &curc);
        orol (&tpclda);
        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]);
        quit ();
        exit (1);
      }
      else if (ocom (&tpclda)) {
        errrpt (&tpclda, &tpclda);
        orol (&tpclda);
        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]);
        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 %10d sec. (%10d cpu)\n\n",
            nrows, end_time - begin_time, end_cpu - begin_cpu);
  }


/*-------------------------------------------------------------+
 | 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 {
        if (oexn (&curi, ITEMARR, 0)) {
          errrpt (&tpclda, &curi);
          orol (&tpclda);
          fprintf (stderr, "Aborted at i_id %d\n", i_id[0]);
          quit ();
          exit (1);
        }
        else if (ocom (&tpclda)) {
          errrpt (&tpclda, &tpclda);
          orol (&tpclda);
          fprintf (stderr, "Aborted at i_id %d\n", i_id[0]);
          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 %10d sec. (%10d 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 stok: w%d - w%d (%d rows)\n   ",
            bware, eware, nrows);

    begin_time = gettime ();
    begin_cpu = getcpu ();

    sid = 0;
    swid = bware;
    loopcount = 0;

    for (row = 0; row < nrows; ) {
      for (i = 0; i < STOCARR; i++, row++) {
        if (++sid > STOCFAC) {        /* cheap mod */
          sid = 1;
          swid++;
        }
        s_quantity[i] = (lrand48 () % 91) + 10;
        randstr (str24[0], 24, 24);
        randstr (str24[1], 24, 24);
        randstr (str24[2], 24, 24);
        randstr (str24[3], 24, 24);
        randstr (str24[4], 24, 24);
        randstr (str24[5], 24, 24);
        randstr (str24[6], 24, 24);
        randstr (str24[7], 24, 24);
        randstr (str24[8], 24, 24);
        randstr (str24[9], 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], str24[0], str24[1], str24[2],
                  str24[3], str24[4], str24[5], str24[6], str24[7],
                  str24[8], str24[9], s_data[i]);
        }
        else {
          s_i_id[i] = sid;
          s_w_id[i] = swid;
          strncpy (s_dist_01[i], str24[0], 24);
          strncpy (s_dist_02[i], str24[1], 24);
          strncpy (s_dist_03[i], str24[2], 24);
          strncpy (s_dist_04[i], str24[3], 24);
          strncpy (s_dist_05[i], str24[4], 24);
          strncpy (s_dist_06[i], str24[5], 24);
          strncpy (s_dist_07[i], str24[6], 24);
          strncpy (s_dist_08[i], str24[7], 24);
          strncpy (s_dist_09[i], str24[8], 24);
          strncpy (s_dist_10[i], str24[9], 24);
        }
      }

      if (gen) {
        fflush (stdout);
      }
      else {
        if (oexn (&curs, STOCARR, 0)) {
          errrpt (&tpclda, &curs);
          orol (&tpclda);
          fprintf (stderr, "Aborted at w_id %d, s_i_id %d\n", s_w_id[0],
                  s_i_id[0]);
          quit ();
          exit (1);
        }
```

```
            else if (ocom (&tpclda)) {
              errrpt (&tpclda, &tpclda);
              orol (&tpclda);
              fprintf (stderr, "Aborted at w_id %d, s_i_id %d\n", s_w_id[0],
                       s_i_id[0]);
              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 %10d sec. (%10d cpu)\n\n",
                 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 stok: i%d - i%d, w%d - w%d (%d rows)\n   ",
                 bitem, eitem, bware, eware, nrows);

        begin_time = gettime ();
        begin_cpu = getcpu ();

        sid = bitem;
        swid = bware - 1;
        loopcount = 0;

        for (row = 0; row < nrows; ) {
          for (i = 0; i < STOCARR; i++, row++) {
            if (++swid > eware) {          /* cheap mod */
              swid = bware;
              sid++;
            }
            s_quantity[i] = (lrand48 () % 91) + 10;
            randstr (str24[0], 24, 24);
            randstr (str24[1], 24, 24);
            randstr (str24[2], 24, 24);
            randstr (str24[3], 24, 24);
            randstr (str24[4], 24, 24);
            randstr (str24[5], 24, 24);
            randstr (str24[6], 24, 24);
            randstr (str24[7], 24, 24);
            randstr (str24[8], 24, 24);
            randstr (str24[9], 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], str24[0], str24[1], str24[2],
                      str24[3], str24[4], str24[5], str24[6], str24[7],
                      str24[8], str24[9], s_data[i]);
            }
            else {
              s_i_id[i] = sid;
              s_w_id[i] = swid;
              strncpy (s_dist_01[i], str24[0], 24);
              strncpy (s_dist_02[i], str24[1], 24);
              strncpy (s_dist_03[i], str24[2], 24);
              strncpy (s_dist_04[i], str24[3], 24);
              strncpy (s_dist_05[i], str24[4], 24);
              strncpy (s_dist_06[i], str24[5], 24);
              strncpy (s_dist_07[i], str24[6], 24);
              strncpy (s_dist_08[i], str24[7], 24);
              strncpy (s_dist_09[i], str24[8], 24);
              strncpy (s_dist_10[i], str24[9], 24);
            }
          }

          if (gen) {
            fflush (stdout);
          }
          else {
            if (oexn (&curs, STOCARR, 0)) {
              errrpt (&tpclda, &curs);
              orol (&tpclda);
              fprintf (stderr, "Aborted at w_id %d, s_i_id %d\n", s_w_id[0],
                       s_i_id[0]);
              quit ();
              exit (1);
            }
            else if (ocom (&tpclda)) {
              errrpt (&tpclda, &tpclda);
              orol (&tpclda);
              fprintf (stderr, "Aborted at w_id %d, s_i_id %d\n", s_w_id[0],
                       s_i_id[0]);
              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 %10d sec. (%10d cpu)\n\n",
                 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 hist: 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 dist cycle */
              if (cdid > DISTFAC) {
```

```
            cdid = 1;
            cwid++;             /* shift ware 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 %s 1000 %s\n", cid, cdid, cwid, cdid,
                  cwid, sdate, h_data[i]);
        }
      }

      if (gen) {
        fflush (stdout);
      }
      else {
        if (oexn (&curh, HISTARR, 0)) {
          errrpt (&tpclda, &curh);
          orol (&tpclda);
          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]);
          quit ();
          exit (1);
        }
        else if (ocom (&tpclda)) {
          errrpt (&tpclda, &tpclda);
          orol (&tpclda);
          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]);
          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 %10d sec. (%10d cpu)\n\n",
             nrows, end_time - begin_time, end_cpu - begin_cpu);
  }

/*---------------------------------------------------------------+
 | Load the ORDERS and ORDER-LINE table.                         |
 +---------------------------------------------------------------*/

  if (do_A || do_o) {
    nrows = (eware - bware + 1) * ORDEFAC * DISTFAC;

    fprintf (stderr, "Loading/generating ordr 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; ) {
      for (i = 0; i < ORDEARR; i++, row++) {
        cid++;
        if (cid > ORDEFAC) {        /* cycle cust id */
          cid = 1;                  /* cheap mod */
          cdid++;                   /* shift dist cycle */
          if (cdid > DISTFAC) {
            cdid = 1;
            cwid++;                 /* shift ware 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];
        }

        for (j = 0; j < o_ol_cnt[i]; j++) {
          ol_i_id[j] = sid = lrand48 () % 100000 + 1;
          if (cid < 2101)
            ol_amount[j] = 0;
          else
            ol_amount[j] = (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[j], cwid,
                       ol_amount[j], 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[j], cwid,
                       ol_amount[j], str24[j]);
            }
          }
          else {
            ol_o_id[j] = cid;
            ol_d_id[j] = cdid;
            ol_w_id[j] = cwid;
            ol_number[j] = j + 1;
            ol_supply_w_id[j] = cwid;
            strncpy (ol_dist_info[j], str24[j], 24);
          }
        }

        if (gen) {
          fflush (olfp);
        }
        else {
          if (cid < 2101) {
            if (oexn (&curol1, olcnt, 0)) {
              errrpt (&tpclda, &curol1);
              orol (&tpclda);
              fprintf (stderr, "Aborted at w_id %d, d_id %d, o_id %d\n",
                       cwid, cdid, cid);
```

```
            quit ();
            exit (1);
          }
          else if (ocom (&tpclda)) {
            errrpt (&tpclda, &tpclda);
            orol (&tpclda);
            fprintf (stderr, "Aborted at w_id %d, d_id %d, o_id %d\n",
                  cwid, cdid, cid);
            quit ();
            exit (1);
          }
        }
        else {
          if (oexn (&curol2, olcnt, 0)) {
            errrpt (&tpclda, &curol2);
            orol (&tpclda);
            fprintf (stderr, "Aborted at w_id %d, d_id %d, o_id %d\n",
                   cwid, cdid, cid);
            quit ();
            exit (1);
          }
          else if (ocom (&tpclda)) {
            errrpt (&tpclda, &tpclda);
            orol (&tpclda);
            fprintf (stderr, "Aborted at w_id %d, d_id %d, o_id %d\n",
                  cwid, cdid, cid);
            quit ();
            exit (1);
          }
        }
      }
    }

    if (gen) {
      fflush (stdout);
    }
    else {
      if (cid < 2101) {
        if (oexn (&curo1, ORDEARR, 0)) {
          errrpt (&tpclda, &curo1);
          orol (&tpclda);
          fprintf (stderr, "Aborted at w_id %d, d_id %d, o_id %d\n   ",
                cwid, cdid, cid);
          quit ();
          exit (1);
        }
        else if (ocom (&tpclda)) {
          errrpt (&tpclda, &tpclda);
          orol (&tpclda);
          fprintf (stderr, "Aborted at w_id %d, d_id %d, o_id %d\n   ",
                cwid, cdid, cid);
          quit ();
          exit (1);
        }
      }
      else {
        if (oexn (&curo2, ORDEARR, 0)) {
          errrpt (&tpclda, &curo2);
          orol (&tpclda);
          fprintf (stderr, "Aborted at w_id %d, d_id %d, o_id %d\n   ",
                cwid, cdid, cid);
          quit ();
          exit (1);
        }
        else if (ocom (&tpclda)) {
          errrpt (&tpclda, &tpclda);
          orol (&tpclda);
          fprintf (stderr, "Aborted at w_id %d, d_id %d, o_id %d\n   ",
                cwid, cdid, cid);
          quit ();
```

```
            exit (1);
          }
        }
      }

      if ((++loopcount) % 50)
        fprintf (stderr, ".");
      else
        fprintf (stderr, " %d ordr committed\n   ", row);
    }

    end_time = gettime ();
    end_cpu = getcpu ();
    fprintf (stderr, "Done.  %d ordr loaded/generated in %10d sec. (%10d 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 {
        if (oexn (&curno, NEWOARR, 0)) {
          errrpt (&tpclda, &curno);
          orol (&tpclda);
          fprintf (stderr, "Aborted at w_id %d, d_id %d, o_id %d\n   ",
                cwid, cdid, cid + 2100);
          quit ();
          exit (1);
        }
        else if (ocom (&tpclda)) {
```

```
            errrpt (&tpclda, &tpclda);
            orol (&tpclda);
            fprintf (stderr, "Aborted at w_id %d, d_id %d, o_id %d\n   ",
                  cwid, cdid, cid + 2100);
            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 %10d sec. (%10d 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);

}
```

views.sql

```
connect tpcc/tpcc;
set echo on;
create or replace view wh_cust
(w_id, w_tax, c_id, c_d_id, c_w_id, c_discount, c_last, c_credit)
as select w.w_id, w.w_tax,
        c.c_id, c.c_d_id, c.c_w_id, c.c_discount, c.c_last, c.c_credit
   from cust c, ware w
   where w.w_id = c.c_w_id;
create or replace view wh_dist
(w_id, d_id, d_tax, d_next_o_id, w_tax )
as select w.w_id, d.d_id, d.d_tax, d.d_next_o_id, w.w_tax
   from dist d, ware w
   where w.w_id = d.d_w_id;
create  or replace view stock_item
(i_id, s_w_id, i_price, i_name, i_data, s_data, s_quantity,
 s_order_cnt, s_ytd, s_remote_cnt,
 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)
as
 select i.i_id, s_w_id, i.i_price, i.i_name, i.i_data, s_data, s_quantity,
 s_order_cnt, s_ytd, s_remote_cnt,
 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
  from stok s, item i
 where i.i_id = s.s_i_id;
set echo off;
```

initpay.sql

```
CREATE OR REPLACE PACKAGE initpay
AS
 TYPE rowidarray IS TABLE OF ROWID INDEX BY BINARY_INTEGER;
 row_id              rowidarray;
 cust_rowid           ROWID;
 dist_name           VARCHAR2(11);
 ware_name            VARCHAR2(11);
 c_num               BINARY_INTEGER;
 PROCEDURE pay_init;
END initpay;
/
CREATE OR REPLACE PACKAGE BODY initpay AS
  PROCEDURE pay_init IS
  BEGIN
    NULL;
  END pay_init;
END initpay;
/

exit;
```

pay.sql

```
CREATE OR REPLACE PACKAGE pay
AS
 TYPE rowidarray IS TABLE OF ROWID INDEX BY BINARY_INTEGER;
 row_id              rowidarray;
 cust_rowid           ROWID;
 dist_name           VARCHAR2(11);
 ware_name            VARCHAR2(11);
 c_num               BINARY_INTEGER;
 PROCEDURE pay_init;
END pay;
/
CREATE OR REPLACE PACKAGE BODY pay AS
  PROCEDURE pay_init IS
  BEGIN
    NULL;
  END pay_init;
END pay;
/
```

Appendix C Tunable Parameters

The HP-UX operating system tunable parameters employed to generate the kernel for the HP 9000 Superdome Enterprise Server and the 40 HP 9000 Model C3600 clients are listed below. Included as well are the Oracle8 Enterprise Database Server v8.1.7.1 and TUXEDO 6.4 parameters.

C.1 HP-UX Configuration - Clients

Config/Client2/ostune.ver

```
* Drivers and Subsystems

DlkmDrv
GSCtoPCI
PCItoPCI
SCentIf
arp
asio0
asp
audio
beep
btlan3
btlan5
btlan6
c720
cb
cdfs
clone
core
diag1
diag2
dlkm
dlpi
dmem
echo
fc_arp
ffs
foreign
framebuf
hcd
hid
hpstreams
hub
inet
ip
ite
klog
lasi
lba
ldterm
lv
lvm
maclan
netdiag1
netqa
nfs_core
nfs_server
nms
nuls
pa_generic_psm
pa_psm
pat_psm
pci
pckt
pipedev
pipemod
ptem
ptm
pts
rawip
sad
sapic
sba
sc
sctl
sdisk
side
stcpmap
strlog
strpty_included
strtelnet_included
superio
tcp
telm
tels
timod
tirdwr
tlclts
tlcots
tlcotsod
tun
udp
ufs
uipc
usbd
vxbase
wsio
asyncdsk


* Kernel Device info

dump lvol

* Tunable parameters

STRMSGSZ        65535
bufpages        1024
create_fastlinks 1
dbc_max_pct     25
default_disk_ir 1
fs_async        1
maxdsiz         2063806464
maxfiles        2048
maxfiles_lim    2048
maxssiz         0X8000000
maxswapchunks   16384
maxtsiz         (1024*1024*1024)
maxuprc         (8*MAXUSERS)
maxusers        1000
msgmap          (MSGSEG)
msgmax          32768
msgmnb          (MSGMAX*2)
msgmni          (NPROC)
msgseg          (MSGMNI*2)
msgssz          512
msgtql          (NPROC)
```

```
nfile          36000
nflocks         6000
ninode          36000
nproc           (20+8*MAXUSERS)
npty            512
nstrpty         200
semmni          (NPROC)
*semmns         (SEMMNI)
semmns          (SEMMNI*2)
semmnu          (SEMMNS)
*semvmx         32768
semvmx          40960
shmmax          1073741824
shmmni          1024
shmseg          16
swapmem_on      0
timezone        480
unlockable_mem  1
```

C.2 HP-UX Configurtion – Server

Config/Server/ostune.ver

```
*****************************************
* Source: /ux/core/kern/filesets.info/CORE-KRN/generic
* @(#) vw: ph_ic19_i80    selectors: 'cupi80_ic19base_pb(23-May-00.19:02:49)' 'BE11.11_IC19'
*
*****************************************
* Additional drivers required in every machine-type to create a complete
* system file during cold install.  This list is every driver that the
* master.d/ files do not force on the system or is not identifiable by
* ioscan.
* Other CPU-type specific files can exist for their special cases.
* see create_sysfile (1m).
*****************************************
*
* Drivers/Subsystems
sba
lba
asio0
c720
sdisk
sctl
cdfs
* cxperf
olar_psm
olar_psm_if
dev_olar
hd_fabric
diag0
diag1
* diag2
dmem
dev_config
nfs_core
nfs_client
nfs_server
btlan
maclan
dlpi
token_arp
inet
uipc
tun
telm
tels
netdiag1
nms
hpstreams
clone
strlog
sad
echo
sc
timod
tirdwr
pipedev
pipemod
ffs
ldterm
ptem
pts
ptm
pckt
gelan
vxfs
vxportal
lvm
lv
nfsm
rpcmod
autofsc
cachefsc
* cifs
* prm
td
dump lvol

asyncdsk
* coke
*
STRMSGSZ                65535
nstrpty         60
maxfiles        2048
maxfiles_lim    2048
nflocks         2048
fs_async        0
bufpages        250000
eqmemsize       100000
maxusers        1024
maxuprc         2048
max_async_ports 6000
nproc           6000
nhtbl_scale     1
maxswapchunks   16384
swchunk         16384
nfile           500000
ninode          25000
npty            10
shmmni          104
semmni          10240
semmns          20480
semmnu          2548
semvmx          32768
shmmax          0x4000000000
shmseg          16
maxssiz         0x10000000
maxdsiz         0x30000000
timezone        480
maxvgs          64
msgmax          32768
msgmnb          32768
msgmni          50
msgseg          7168
```

```
msgssz          8
msgtql          256
unlockable_mem  1
swapmem_on      0
```

C.3 Oracle8 Enterprise Database Server v8.1.7.1 Parameters

Config/Server/dbtune.ver

```
#
# $Header: p_run.ora 7030100.2 96/05/02 19:22:28 plai Generic<base> $ Copyr (c) 1993 Oracle
#
#===============================================================+
#       Copyright (c) 1996  Oracle Corp, Redwood Shores, CA     |
#              OPEN SYSTEMS PERFORMANCE GROUP                   |
#                 All Rights Reserved                           |
#===============================================================+
# FILENAME
#     p_run.ora
# DESCRIPTION
#     Oracle parameter file for running TPC-C.
#================================================================

control_files                           = (?/dbs/tpcc_disks/control01, ?/dbs/tpcc_disks/control02)
_lgwr_async_io=FALSE
db_writer_processes             = 8
cpu_count                                                       = 48
disk_asynch_io                  = TRUE
lock_sga                        = TRUE
db_block_lru_latches            = 160
_spin_count                     = 40000
parallel_max_servers            = 1000
recovery_parallelism            = 1000
compatible                      = 8.1.5.0.0
db_name                         = tpcc
db_files                        = 400
db_file_multiblock_read_count   = 32
db_block_buffers                = 110000000
_db_block_hash_buckets          = 220000000
buffer_pool_recycle  = ( buffers:1000000, lru_latches:32 )
buffer_pool_keep     = ( buffers:70000000, lru_latches:80 )
db_block_max_dirty_target       = 75000000
fast_start_io_target            = 0
_disable_incremental_checkpoints  = TRUE
_db_aging_hot_criteria          = 2
_db_aging_stay_count            = 1
_db_writer_chunk_writes                 = 1000
_db_writer_max_writes                   = 1000
dml_locks                       = 500
enqueue_resources               = 600000
hash_join_enabled               = FALSE
log_archive_start               = FALSE
_log_archive_buffer_size        = 32
log_checkpoint_timeout          = 0
log_checkpoint_interval         = 1000000000
log_checkpoints_to_alert        = TRUE
log_buffer                      = 33554432
_log_simultaneous_copies        = 256
open_cursors                    = 1800
processes                       = 1625
sessions                        = 1625
transactions                    = 4000
distributed_transactions        = 0
transactions_per_rollback_segment = 1
max_rollback_segments           = 1100
rollback_segments               = (s1,s2,s3,s4,s5,s6,s7,s8,s9,
s10,s11,s12,s13,s14,s15,s16,s17,s18,s19,
s20,s21,s22,s23,s24,s25,s26,s27,s28,s29,
s30,s31,s32,s33,s34,s35,s36,s37,s38,s39,
s40,s41,s42,s43,s44,s45,s46,s47,s48,s49,
s50,s51,s52,s53,s54,s55,s56,s57,s58,s59,
s60,s61,s62,s63,s64,s65,s66,s67,s68,s69,
s70,s71,s72,s73,s74,s75,s76,s77,s78,s79,
s80,s81,s82,s83,s84,s85,s86,s87,s88,s89,
s90,s91,s92,s93,s94,s95,s96,s97,s98,s99,
s100,s101,s102,s103,s104,s105,s106,s107,s108,s109,
s110,s111,s112,s113,s114,s115,s116,s117,s118,s119,
s120,s121,s122,s123,s124,s125,s126,s127,s128,s129,
s130,s131,s132,s133,s134,s135,s136,s137,s138,s139,
s140,s141,s142,s143,s144,s145,s146,s147,s148,s149,
s150,s151,s152,s153,s154,s155,s156,s157,s158,s159,
s160,s161,s162,s163,s164,s165,s166,s167,s168,s169,
s170,s171,s172,s173,s174,s175,s176,s177,s178,s179,
s180,s181,s182,s183,s184,s185,s186,s187,s188,s189,
s190,s191,s192,s193,s194,s195,s196,s197,s198,s199,
s200)
rollback_segments               = (s201,s202,s203,s204,s205,s206,s207,s208,s209,
s210,s211,s212,s213,s214,s215,s216,s217,s218,s219,
s220,s221,s222,s223,s224,s225,s226,s227,s228,s229,
s230,s231,s232,s233,s234,s235,s236,s237,s238,s239,
s240,s241,s242,s243,s244,s245,s246,s247,s248,s249,
s250,s251,s252,s253,s254,s255,s256,s257,s258,s259,
s260,s261,s262,s263,s264,s265,s266,s267,s268,s269,
s270,s271,s272,s273,s274,s275,s276,s277,s278,s279,
s280,s281,s282,s283,s284,s285,s286,s287,s288,s289,
s290,s291,s292,s293,s294,s295,s296,s297,s298,s299,
s300,s301,s302,s303,s304,s305,s306,s307,s308,s309,
s310,s311,s312,s313,s314,s315,s316,s317,s318,s319,
s320,s321,s322,s323,s324,s325,s326,s327,s328,s329,
s330,s331,s332,s333,s334,s335,s336,s337,s338,s339,
s340,s341,s342,s343,s344,s345,s346,s347,s348,s349,
s350,s351,s352,s353,s354,s355,s356,s357,s358,s359,
s360,s361,s362,s363,s364,s365,s366,s367,s368,s369,
s370,s371,s372,s373,s374,s375,s376,s377,s378,s379,
s380,s381,s382,s383,s384,s385,s386,s387,s388,s389,
s390,s391,s392,s393,s394,s395,s396,s397,s398,s399,
s400)
rollback_segments               = (s401,s402,s403,s404,s405,s406,s407,s408,s409,
s410,s411,s412,s413,s414,s415,s416,s417,s418,s419,
s420,s421,s422,s423,s424,s425,s426,s427,s428,s429,
s430,s431,s432,s433,s434,s435,s436,s437,s438,s439,
s440,s441,s442,s443,s444,s445,s446,s447,s448,s449,
s450,s451,s452,s453,s454,s455,s456,s457,s458,s459,
s460,s461,s462,s463,s464,s465,s466,s467,s468,s469,
s470,s471,s472,s473,s474,s475,s476,s477,s478,s479,
s480,s481,s482,s483,s484,s485,s486,s487,s488,s489,
s490,s491,s492,s493,s494,s495,s496,s497,s498,s499,
s500,s501,s502,s503,s504,s505,s506,s507,s508,s509,
s510,s511,s512,s513,s514,s515,s516,s517,s518,s519,
s520,s521,s522,s523,s524,s525,s526,s527,s528,s529,
s530,s531,s532,s533,s534,s535,s536,s537,s538,s539,
s540,s541,s542,s543,s544,s545,s546,s547,s548,s549,
s550,s551,s552,s553,s554,s555,s556,s557,s558,s559,
s560,s561,s562,s563,s564,s565,s566,s567,s568,s569,
s570,s571,s572,s573,s574,s575,s576,s577,s578,s579,
s580,s581,s582,s583,s584,s585,s586,s587,s588,s589,
s590,s591,s592,s593,s594,s595,s596,s597,s598,s599,
s600)
rollback_segments               = (s601,s602,s603,s604,s605,s606,s607,s608,s609,
s610,s611,s612,s613,s614,s615,s616,s617,s618,s619,
s620,s621,s622,s623,s624,s625,s626,s627,s628,s629,
```

```
s630,s631,s632,s633,s634,s635,s636,s637,s638,s639,
s640,s641,s642,s643,s644,s645,s646,s647,s648,s649,
s650,s651,s652,s653,s654,s655,s656,s657,s658,s659,
s660,s661,s662,s663,s664,s665,s666,s667,s668,s669,
s670,s671,s672,s673,s674,s675,s676,s677,s678,s679,
s680,s681,s682,s683,s684,s685,s686,s687,s688,s689,
s690,s691,s692,s693,s694,s695,s696,s697,s698,s699,
s700,s701,s702,s703,s704,s705,s706,s707,s708,s709,
s710,s711,s712,s713,s714,s715,s716,s717,s718,s719,
s720,s721,s722,s723,s724,s725,s726,s727,s728,s729,
s730,s731,s732,s733,s734,s735,s736,s737,s738,s739,
s740,s741,s742,s743,s744,s745,s746,s747,s748,s749,
s750,s751,s752,s753,s754,s755,s756,s757,s758,s759,
s760,s761,s762,s763,s764,s765,s766,s767,s768,s769,
s770,s771,s772,s773,s774,s775,s776,s777,s778,s779,
s780,s781,s782,s783,s784,s785,s786,s787,s788,s789,
s790,s791,s792,s793,s794,s795,s796,s797,s798,s799,
s800)
rollback_segments          = (s801,s802,s803,s804,s805,s806,s807,s808,s809,
s810,s811,s812,s813,s814,s815,s816,s817,s818,s819,
s820,s821,s822,s823,s824,s825,s826,s827,s828,s829,
s830,s831,s832,s833,s834,s835,s836,s837,s838,s839,
s840,s841,s842,s843,s844,s845,s846,s847,s848,s849,
s850,s851,s852,s853,s854,s855,s856,s857,s858,s859,
s860,s861,s862,s863,s864,s865,s866,s867,s868,s869,
s870,s871,s872,s873,s874,s875,s876,s877,s878,s879,
s880,s881,s882,s883,s884,s885,s886,s887,s888,s889,
s890,s891,s892,s893,s894,s895,s896,s897,s898,s899,
s900,s901,s902,s903,s904,s905,s906,s907,s908,s909,
s910,s911,s912,s913,s914,s915,s916,s917,s918,s919,
s920,s921,s922,s923,s924,s925,s926,s927,s928,s929,
s930,s931,s932,s933,s934,s935,s936,s937,s938,s939,
s940,s941,s942,s943,s944,s945,s946,s947,s948,s949,
s950,s951,s952,s953,s954,s955,s956,s957,s958,s959,
s960,s961,s962,s963,s964,s965,s966,s967,s968,s969,
s970,s971,s972,s973,s974,s975,s976,s977,s978,s979,
s980,s981,s982,s983,s984,s985,s986,s987,s988,s989,
s990,s991,s992,s993,s994,s995,s996,s997,s998,s999)
shared_pool_size           = 165000000
shared_pool_reserved_size  = 30000000
_discrete_transactions_enabled  = FALSE
cursor_space_for_time      = TRUE
sort_area_size                     = 524288
gc_releasable_locks                = 0
transaction_auditing       = FALSE
replication_dependency_tracking  = FALSE
_db_block_cache_protect    = FALSE
db_block_checking          = FALSE
max_dump_file_size         = 10K
```

C.4 Tuxedo UBBconfig

Config/Client2/tmcfg.ver

```
# This is a UBBconfig for a client1-server configuration.
#
# This UBBconfig requires settings for:
# SERVER_NAME CLIENT_NAME MASTER_NAME SERVER_ADDR CLIENT_ADDR NODE_NAMES
# TLISTEN_PORT TBRIDGE_PORT
# In addition, it requires setting the things all UBBconfig.gens need:
#       IPCKEY              some decent IPCKEY, should be different for each config
#       ROOTDIR
#       TUXCONFIG
#       APPDIR
#       ULOGDIR
#
#---------------------------------------------------------------
*RESOURCES
#---------------------------------------------------------------
        IPCKEY      40001
        PERM        0666
        MASTER      client2

  MAXACCESSERS      4050        # 1024 or more
  MAXGTT    1024
  MAXSERVERS        25
  MAXSERVICES       110   # MAXSERVERS * #-of-services-each-server + 10( for BBL)
  MODEL     SHM
  LDBAL     Y

# During benchmark, don't want to scan too often.  In particular, while
# the client1s are stabilizing in virtual memory, we don't want to sanity
# scan; and if we do sanity scan, we want large timeouts, since the BRIDGE
# the BBL, the DBBL, and the client1s aren't getting much CPU time during that
# period.  Current settings:
#       *  scan servers every 5 minutes (maximum allowed by TUXEDO);
#       *  wait 1 minute for sanity  responses (maximum allowed by TUXEDO);
#       *  scan all the BBLs from DBBL every 30 minutes (want one scan in the
#          audited results);
#       *  timeout a blocking call after 5 minutes (the maximum).
        SCANUNIT    60
        SANITYSCAN          5
        DBBLWAIT    1
        BBLQUERY    30
        BLOCKTIME   5
#
#---------------------------------------------------------------
*MACHINES
#---------------------------------------------------------------
DEFAULT:
        TUXCONFIG="/project/iti/confs/TUXconfig.client2"
                ROOTDIR="/project/iti"
                APPDIR="/project/tpcc/bin"
                ULOGPFX="/tmp/TUXEDO_LOG"

# for debugging, put both into the same log on the same machine
#               ULOGPFX="/home/iti/confs/tpcc/ULOG"
# but for a big run, need some space, and want them local to the
# machine rather than across the net.

# Leave TUXCONFIG alone on the MASTER machine; over-ride for each
# other machine?
client2         LMID=client2
    TUXCONFIG="/project/iti/confs/TUXconfig.client2"
#---------------------------------------------------------------
*GROUPS
#---------------------------------------------------------------
group1          LMID=client2
            GRPNO=1
group2          LMID=client2
            GRPNO=2
group3          LMID=client2
            GRPNO=3
group4          LMID=client2
            GRPNO=4

#---------------------------------------------------------------
#---------------------------------------------------------------

#---------------------------------------------------------------
*SERVERS
#---------------------------------------------------------------
#
# "--" is application-specific arguments to be passed to server
```

```
# "-n" is designed to specify server-id

service SRVGRP=group1
                CLOPT="-s NEWO_SVC -s PMT_SVC -s ORDS_SVC -s STKL_SVC -s DVRY_SVC -- -n1"
        RQADDR=tpcc_1 SRVID=1

service SRVGRP=group1
                CLOPT="-s NEWO_SVC -s PMT_SVC -s ORDS_SVC -s STKL_SVC -s DVRY_SVC -- -n2"
        RQADDR=tpcc_2 SRVID=2

service SRVGRP=group1
                CLOPT="-s NEWO_SVC -s PMT_SVC -s ORDS_SVC -s STKL_SVC -s DVRY_SVC -- -n3"
        RQADDR=tpcc_3 SRVID=3

service SRVGRP=group1
                CLOPT="-s NEWO_SVC -s PMT_SVC -s ORDS_SVC -s STKL_SVC -s DVRY_SVC -- -n4"
        RQADDR=tpcc_4 SRVID=4

service SRVGRP=group1
                CLOPT="-s NEWO_SVC -s PMT_SVC -s ORDS_SVC -s STKL_SVC -s DVRY_SVC -- -n5"
        RQADDR=tpcc_5 SRVID=5

service SRVGRP=group2
                CLOPT="-s NEWO_SVC -s PMT_SVC -s ORDS_SVC -s STKL_SVC -s DVRY_SVC -- -n6"
        RQADDR=tpcc_6 SRVID=6

service SRVGRP=group2
                CLOPT="-s NEWO_SVC -s PMT_SVC -s ORDS_SVC -s STKL_SVC -s DVRY_SVC -- -n7"
        RQADDR=tpcc_7 SRVID=7

service SRVGRP=group2
                CLOPT="-s NEWO_SVC -s PMT_SVC -s ORDS_SVC -s STKL_SVC -s DVRY_SVC -- -n8"
        RQADDR=tpcc_8 SRVID=8

service SRVGRP=group2
                CLOPT="-s NEWO_SVC -s PMT_SVC -s ORDS_SVC -s STKL_SVC -s DVRY_SVC -- -n9"
        RQADDR=tpcc_9 SRVID=9

service SRVGRP=group2
                CLOPT="-s NEWO_SVC -s PMT_SVC -s ORDS_SVC -s STKL_SVC -s DVRY_SVC -- -n10"
        RQADDR=tpcc_10 SRVID=10

service SRVGRP=group3
                CLOPT="-s NEWO_SVC -s PMT_SVC -s ORDS_SVC -s STKL_SVC -s DVRY_SVC -- -n11"
        RQADDR=tpcc_11 SRVID=11

service SRVGRP=group3
                CLOPT="-s NEWO_SVC -s PMT_SVC -s ORDS_SVC -s STKL_SVC -s DVRY_SVC -- -n12"
        RQADDR=tpcc_12 SRVID=12

service SRVGRP=group3
                CLOPT="-s NEWO_SVC -s PMT_SVC -s ORDS_SVC -s STKL_SVC -s DVRY_SVC -- -n13"
        RQADDR=tpcc_13 SRVID=13

service SRVGRP=group3
                CLOPT="-s NEWO_SVC -s PMT_SVC -s ORDS_SVC -s STKL_SVC -s DVRY_SVC -- -n14"
        RQADDR=tpcc_14 SRVID=14

service SRVGRP=group3
                CLOPT="-s NEWO_SVC -s PMT_SVC -s ORDS_SVC -s STKL_SVC -s DVRY_SVC -- -n15"
        RQADDR=tpcc_15 SRVID=15

service SRVGRP=group4
                CLOPT="-s NEWO_SVC -s PMT_SVC -s ORDS_SVC -s STKL_SVC -s DVRY_SVC -- -n16"
        RQADDR=tpcc_16 SRVID=16

service SRVGRP=group4
                CLOPT="-s NEWO_SVC -s PMT_SVC -s ORDS_SVC -s STKL_SVC -s DVRY_SVC -- -n17"
        RQADDR=tpcc_17 SRVID=17

service SRVGRP=group4
                CLOPT="-s NEWO_SVC -s PMT_SVC -s ORDS_SVC -s STKL_SVC -s DVRY_SVC -- -n18"
        RQADDR=tpcc_18 SRVID=18

service SRVGRP=group4
                CLOPT="-s NEWO_SVC -s PMT_SVC -s ORDS_SVC -s STKL_SVC -s DVRY_SVC -- -n19"
        RQADDR=tpcc_19 SRVID=19

service SRVGRP=group4
                CLOPT="-s NEWO_SVC -s PMT_SVC -s ORDS_SVC -s STKL_SVC -s DVRY_SVC -- -n20"
        RQADDR=tpcc_20 SRVID=20
#------------------------------------------------------------------------
*SERVICES
#------------------------------------------------------------------------
*ROUTING
#------------------------------------------------------------------------
```

Appendix D RTE Configuration

This appendix lists RTE input parameters and code fragments used to generate each transaction input file, to demonstrate the RTE was configured to generate transaction input data as specified in *Clause 2* of the specification.

D.1 RTE Parameters

Run1/TESTENV

```
################################################################################
# Environment variables for running TPC-C
################################################################################
#setenv NO_STDERR 1
unset NO_STDERR
unset ABORT
#setenv TPCC_SQL_TRACE 1

setenv COMMENT   "halfdome, 16000-WH DB, Oracle 8.1.6, Giagabit Ethernet connection; 22 drivers"
setenv DATABASE   "oracle"       # name of the database used to run the test
                  # can be either "oracle", "sybase", or
                  # "sqlserver"
setenv OPS          0      # Set to 1 if using OPS
setenv ccNUMA       0      # Set to 1 if running on a ccNUMA system
setenv NT           0      # Set to 1 if using NT
setenv BATCH_TPCC   0      # Set to 1 for "batch_tpcc" with the
                  # RUNME interface, 0 for c/s TPC-C.
setenv TPCC_SUCCESS_FILE /project/tpcc/results/TPCC_SUCCESS_FILE
setenv TESTROOT     results
setenv TRANS_TIME   170    # Total time to run the test for (in minutes)
setenv QUALIFY_PARAMS "-s 50 -e 162"
setenv RESULTS_NAME audit          # Directory name of RESULTS (put in root of
                  # ~tpcc).  So actual directory is
                  # ~tpcc/${TESTROOT}

setenv SWITCHLOG          1              # Force a switchlog at the begining and end of the run
setenv CHKPNT_INTERVAL   600             # Seconds to wait before forcing a checkpoint
setenv CHKPNT_INTERVAL2  1680  #25'# Seconds to wait before forcing the second
                                                                    # checkpoint
                  # For Sybase and Sqlserver, this is the # of
                  # seconds after the first checkpoint til the
                  # 2nd checkpoint.

setenv DB_SIZE        16000   # Database size on SUT (<= size actually built)
                  # value in warehouses

setenv SERVER     "sut2"      # The SUT (Database Server)

setenv CLIENT     "client"    # NOTE:  the client name needs to have a
                  # suffix of 1,2,3,4,.. etc starting with
                  # 1 and going to the number of clients.  The
                  # actual client names will be client1,
                  # client2, client3, etc.  You need to put
                  # the base client name here.
setenv NR_CLIENT   "40"         # number of clients

setenv DRIVER     "driver"    # NOTE:  the driver name needs to have a
                  # suffix of 1,2,3,4,.. etc starting with
                  # 1 and going to the number of drivers.  The
                  # actual driver names will be driver1,
                  # driver2, driver3, etc.  You need to put
                  # the base driver name here.
setenv NR_DRIVER       "20"     # number of drivers
setenv NR_HOSES        "1"      # For multiple lans between client and server
# setenv NR_LAN        "1"      # For multiple lans between driver and client

#
# statistics, should probably all be off during your audit runs (performance
# runs).
#
setenv DATABASE_SNAP    1      # collect database statistics
setenv NUMPROC                  0      # monitor processes on all the system

setenv SERVER_STATS     0      # turn on statistics on the server(1)
setenv CLIENT_STATS     1      # turn on statistics on the client(1)
setenv SAR_STATS        1      # turn on SAR (1)
setenv VM_STATS         1    # turn on vmstat (1)
setenv VPS_STATS        23  # collect VPS statistics (11)
setenv TUSC_STATS       0  # collect tusc statistics (11)
setenv CUDA_STATS       26                # turn on cuda (PCX-W)
setenv FULL_CUDA        0     # go for the full, 25-minute cuda counts
setenv ONYXE_STATS      0                 # turn on onyxe (PCX-U)
setenv FULL_ONYXE       0     # go for the full, 25-minute onyxe counts
setenv KERNEL_STATS     23     # turn on kernel gprof (20)
setenv KERNEL_TIME      12                # collection time
setenv SPIN_STATS       24 # turn on spinwatcher (18)
setenv SPIN_TIME        60   # collection time
setenv CPI_STATS        0     # turn on cpi measurement (cyclemeter) (14)
setenv NET_STATS        1      # turn on netstat (1)
setenv SAMPLER_STATS    25     # turn on KI sampler (12)
setenv SAMPLER_TIME     60     # collection time
setenv DATABASE_STATS   0                 # collect database statistics (16)
setenv DATABASE_TIME    10     # collection time in _SECONDS_
setenv PMON_STATS       0      # collect pmon statistics (22)
setenv PMON_SECONDS     5      # collection time >>in seconds<<.  Note that
                                                    # pmon makes 13 passes, each this long


setenv PEPSI_STATS      0     # turn on pepsi (T5xx)
setenv JOLT_STATS       0     # turn on JOLT counters (Jade) (12)
setenv JOLT_TIME        0     # collection time in seconds for _EACH_ sample
setenv TORNADO_STATS    0     # turn on tornade (PCX-T')
setenv LOGIC_ANALYZER   0      # turn on the logic analyzer
setenv LOG_ANAL_WAIT    0     # wait time in _MINUTES_
setenv LOG_ANAL_TIME    0     # collection time in _MINUTES_

#
# Audit related stuff + misc
#
setenv RUNCHECK         1
setenv CONSISTENCY      1      # run consistency checks before/after run
                  # this should be 1 when doing your final
                  # performance runs.
setenv OUTPUT_LEVEL     3      # minimum level - 3
                  # maximum level - 1
                  # need to set to 1 for durability tests

setenv REMOVE_OUTPUT    0      # set to 1 to compress "success" and
                  # "deliv_results" files after each run
setenv COMPRESS_OUTPUT  1      # set to 1 to compress "success" and
                  # "deliv_results" files after each run

setenv CLEAR_LOGS       1      # set to 1 to do a dumptrans after the run

setenv CONFIG_FILE  /O/bench/tpc/tpcc/admin/p_run.ora  # database configuration file

################################################################################
# The lines below should really not be modified much (if at all)
```

```
#########################################################################
# For ODBC
# setenv SHLIB_PATH /opt/odbc/drivers:/opt/odbc/lib
setenv TRANS_NUM   1300000000      # Total number of transactions to run

setenv DELIVERY_LOGS  logs       # Directory name for logfiles

setenv RPT_WINDOW_SIZE   30      # Reporting window size in number of
                                        # RPT_GRANULARITY; for example,
                                        # window size is 10 minutes if
                                        # RPT_GRANULARITY=30 and RPT_WINDOW_SIZE=20

setenv TRANS_TYPE       0       # 0=all, 1=new-order, 2=payment,
                                # 3=order_status, 4=delivery, 5=stock_level


#
# For TPC-C rev 3.1 and later the difference between the LOAD value of
# CLAST_CONST_C and the run value needs to be within 65-119 inclusive
# but can't be 96 or 112
#
setenv CLAST_CONST_C     86    # a run-time constant chosen within [0..255]
setenv CID_CONST_C       498   # a run-time constant chosen within [0..1023]
setenv IID_CONST_C       3415  # a run-time constant chosen within [0..8191]

setenv COPY_ENV                  1          # 1 = Copy TESTENV to other Drivers.
                                        # 0 = DO NOT copy. It is the tester's
                                                #     responsibility to make TESTENVs on all
                                                #     the other drivers.

setenv COMM_ADJUST_NEWO             0.00  # new-order comm delay, Convert TELNET to DTCs
setenv COMM_ADJUST_PMT              0.00  # payment comm delay
setenv COMM_ADJUST_ORDS             0.00  # order-status comm delay
setenv COMM_ADJUST_DVRY             0.00          # delivery comm delay
setenv COMM_ADJUST_STKL             0.00          # stock-level comm delay

setenv NEWO_MENU        0.00   # new order menu RTE delay
setenv PMT_MENU         0.00   # payment menu RTE delay
setenv OS_MENU          0.00   # order status menu RTE delay
setenv DVRY_MENU        0.00   # delivery menu RTE delay
setenv STKL_MENU        0.00   # stock menu RTE delay

#
# Keying times  Don't change these unless doing special tests.  They need
# to be float values.
#
setenv NEWO_KEY         18.01   # new order keying time (18.0)
setenv PMT_KEY          3.01   # payment keying time (3.0)
setenv OS_KEY           2.01   # order status key time (2.0)
setenv DVRY_KEY         2.01   # delivery key time (2.0)
setenv STKL_KEY         2.01   # stock level key time (2.0)

#
# Think times.  Twiddle these as needed.  They need to be float values.
#
setenv NEWO_THINK       12.12   # new order keying time (12.20)
setenv PMT_THINK        12.05   # payment keying time (12.20)
setenv OS_THINK         10.10   # os keying time (10.25)
setenv DVRY_THINK       5.05   # delivery keying time (5.20)
setenv STKL_THINK       5.05   # stock level keying time (5.20)

setenv RANDOMIZE_OUTPUT     1   # Specifies the percentage of users that should
                        # output full terminal data (the works) even
                        # if the OUTPUT_LEVEL is not at 1
```

D.2 Field Value Generation

Source/src/driver/generate.c

```
/*********************************************************************
 @(#) Version: A.10.10 $Date: 97/12/15 13:53:51 $

 (c) Copyright 1996, Hewlett-Packard Company, all rights reserved.
*********************************************************************/

#include <stdio.h>
#include <values.h>
#include <unistd.h>
#include <time.h>
#include <sys/types.h>
#include <sys/ipc.h>
#include <fcntl.h>
#include <signal.h>
#include <math.h>

#include "shm_lookup.h"
#include "random.h"

#include <time.h>

int CLAST_CONST_C = 208;
int CID_CONST_C =  37;
int IID_CONST_C = 75;

int trans_type = 0;   /* type of transaction 0 == all */

extern ID warehouse;
extern ID district;

extern int no_warehouse;
extern int no_item;
extern int no_dist_pw;
extern int no_cust_pd;
extern int no_ord_pd;
extern int no_new_pd;
extern int tpcc_load_seed;

neworder_gen(t)
   neworder_trans *t;
   {
   int i;

   t->W_ID = warehouse;

   t->D_ID = RandomNumber(1, no_dist_pw);
   t->C_ID = NURandomNumber( 1023, 1, no_cust_pd, CID_CONST_C);

   t->O_OL_CNT = RandomNumber(5, 15);

   for (i=0; i<t->O_OL_CNT; i++)
      {
      t->item[i].OL_I_ID = NURandomNumber(8191, 1, no_item, IID_CONST_C);
      t->item[i].OL_SUPPLY_W_ID = RandomWarehouse(warehouse, scale, 1);
      t->item[i].OL_QUANTITY = RandomNumber(1, 10);
      }

   /* 1% of transactions roll back. Give the last order line a bad item */
   if (RandomNumber(1, 100) == 1)
```

```
        t->item[t->O_OL_CNT - 1].OL_I_ID = -1;
    }

payment_gen(t)
    payment_trans *t;
    {

    /* home warehouse is fixed */
    t->W_ID = warehouse;

    /* Random district */
    t->D_ID = RandomNumber(1, no_dist_pw);

    /* Customer is from remote warehouse and district 15% of the time */
    t->C_W_ID = RandomWarehouse(warehouse, scale, 15);
    if (t->C_W_ID == t->W_ID)
        t->C_D_ID = t->D_ID;
    else
        t->C_D_ID = RandomNumber(1, no_dist_pw);

    /* by name 60% of the time */
    t->byname = RandomNumber(1, 100) <= 60;
    if (t->byname)
        LastName(NURandomNumber(255, 0, no_cust_pd/3 - 1, CLAST_CONST_C),
                                        t->C_LAST);
    else
        t->C_ID = NURandomNumber(1023, 1, no_cust_pd, CID_CONST_C);

    /* amount is random from [1.00..5,000.00] */
    t->H_AMOUNT = RandomNumber(100, 500000);

    }

ordstat_gen(t)
    ordstat_trans *t;
    {

    /* home warehouse is fixed */
    t->W_ID = warehouse;

    /* district is randomly selected from warehouse */
    t->D_ID = RandomNumber(1, no_dist_pw);

    /* by name 60% of the time */
    t->byname = RandomNumber(1, 100) <= 60;
    if (t->byname)
        LastName(NURandomNumber(255, 0, no_cust_pd/3 - 1, CLAST_CONST_C),
                                        t->C_LAST);
    else
        t->C_ID = NURandomNumber(1023, 1, no_cust_pd, CID_CONST_C);
    }

delivery_gen(t)
    delivery_trans *t;
    {
    t->W_ID = warehouse;
    t->O_CARRIER_ID = RandomNumber(1,10);
    }

stocklev_gen(t)
    stocklev_trans *t;
    {
    t->W_ID = warehouse;
    t->D_ID = district;
    t->threshold = RandomNumber(10, 20);
    }

int get_trans_type()
/*****************************************************************************
 * get_trans_type selects a transaction according to the weighted average
 * For TPC-C rev 3.0 and less and TPC-C rev 3.2 this is:
 *       new-order :  ???
 *       payment   : 43.0%
 *       order stat:  4.0%
 *       delivery  :  4.0%
 *       stock     :  4.0%
 *****************************************************************************/
    {
    static double weight[] = { 0.0,  0.0, .4305, .0405, .0405, .0405};
    double drand48();
    int type;
    double r;

    /* choose a random number between 0.0 and 1.0 */
    if (trans_type == 0) {
#ifdef USE_DRAND48
        r = drand48();
#else
        r = randy();
#endif

        /*
         * select one of STOCKLEV, DELIVERY, ORDSTAT and PAYMENT
         * based on weight
         */
        for (type = STOCKLEV;  type > NEWORDER;  type--) {
            r -= weight[type];
            if (r < 0) break;
        }
    } else {
                /* user wants only a certain type (say all stocklevel) so do that
          instead */
                type = trans_type;
    }
    /* return the value of the selected card, or NEWORDER if none selected */
    return type;
    }
```

Appendix E Disk Storage

The calculations used to determine the storage requirements for the 8 hours logical log and the 180-day space calculations are contained in this appendix.

TPC-C 180 Day Space Requirements

TPM 197024.17
Warehouses 18000

SEGMENT	TYPE	TSPACE	BLOCKS	FIVE_PCT	DAILY_GROW	TOTAL
CUSTCLUSTER	CLUSTER	cust	300,032,000	15,001,600	0	315,033,600
HIST	TABLE	HIST	16,896,000	0	2,959,040	19,855,040
ICUST1	INDEX	ICUST1	8,192,000	409,600	0	8,601,600
ICUST2	INDEX	ICUST2	16,384,000	819,200	0	17,203,200
INORD	INDEX	INORD	1,536,000	76,800	0	1,612,800
IORDL	INDEX	IORDL	218,112,000	0	38,198,521	256,310,521
IORDR1	INDEX	IORDR1	8,192,000	409,600	0	8,601,600
IORDR2	INDEX	IORDR2	16,384,000	819,200	0	17,203,200
ISTOK	INDEX	ISTOK	24,576,000	1,228,800	0	25,804,800
ORDR	TABLE	ORDR	11,776,000	0	2,062,361	13,838,361
ROLL_SEG	SYS	ROLL_SEG	1,024,512	0	0	1,024,512
STOKCLUSTER	CLUSTER	STOKCLUSTER	400,384,000	20,019,200	0	420,403,200
SYSTEM	SYS	SYSTEM	410,112	0	0	410,112
Total			1,023,898,624	38,784,000	43,219,922	1,105,902,546

Dynamic space	246,784,000	Initial Blocks for (History+Orders+Order_Line)
Static space	815,898,624	Initial Blocks + 5% - Dynamic
Daily Growth	43,219,922	Total Dynamic [(calc. as (Initial Blocks)*tpmC/(WHS*62.5)]
Daily Spread	0	Oracle may be configured so that daily spread is 0
180-day space (blk.)	8,595,484,584	Static + 180*(Daily Growth+Daily Spread)
Block size (bytes)	2,048	
180-day (GB)	16,394.59	Excludes OS, Paging and RDBMS Logs
Log block size (bytes)	1,024	
Log blocks/min/tpmC	14.96	Number of log blocks used per minute per tpmC
8-hour log (GB)	1,348.90	RDBMS Logs *4 Log disks*
Server swap (GB)	256.00	OS: Paging
Server OS (GB)	16.00	OS: UNIX File System
Total Space Needed	18,015.49	GB

Priced-Sytem Configuration	**Size in MB (see Note**	**Quantity**	**Total (GB)**
FC60 with 60 18.2 GB disk drives in RAID 1 mode	519,793	4	2,030.44
FC60 with 60 18.2 GB disk drives in RAID 0 mode	1,039,586	17	17,258.76
Total Storage in Priced System (GB) (Note 1:The sizes given in MB are after RAID 1 redundency)			19,289.20

TSPACE NAME	BLOCKS ALLOCATED	INITIAL STATIC	INITIAL DYNAMIC	8-HOUR REQUIRED	OVERSIZE (BLOCKS)
CUSTCLU	327,720,960	315,033,600	0	315,033,600	12,687,360
HIST	32,772,096	0	16,896,000	19,855,040	12,917,056
ICUST1	16,386,048	8,601,600	0	8,601,600	7,784,448
ICUST2	24,579,072	17,203,200	0	17,203,200	7,375,872
INORD	2,560,512	1,612,800	0	1,612,800	947,712
IORDL	360,493,056	0	218,112,000	256,310,521	104,182,535
IORDR1	16,386,048	8,601,600	0	8,601,600	7,784,448
IORDR2	24,579,072	17,203,200	0	17,203,200	7,375,872
ISTOK	40,965,120	25,804,800	0	25,804,800	15,160,320
ORDR	16,386,048	0	11,776,000	13,838,361	2,547,687
STOKCLU	421,940,736	420,403,200	0	420,403,200	1,537,536
SYSTEM	410,112	410,112	0	410,112	0

Appendix F Price Quotes

The following pages contain the price quotes for the hardware included in this FDR.

Andreas Hotea
HP
Cupertino, CA 95014

November 30, 2001

HP Unix Sales Development
19111 Pruneridge Aveune
Cupertino, CA 95014
(408) 447-2320

HP 9000 Superdome Enterprise Server

TPC-C Rev 5

Report Date: November 30, 2001

Description	Part Number	Brand	Price Key	Unit Price	Qty	Price	3 Year Main.Price
Server Hardware							
Super Dome left chassis	A5201A, Opt. 101		1	317,429	1	317,429	147,264
Super Dome right chassis	A5202A, Opt. 101		1	235,655	1	235,655	
Memory module - 2 GB	A5198A, Opt. 0D1		1	14,000	128	1,792,000	
I/O enclosures	A4856A, Opt. 0D1		1	14,805	4	59,220	
PDCA Redundant Power Source	A5800A, Opt. 0D1		1	578	2	1,156	
Cell Board with 4 PA-8600 552MHz Processors	A5206A, Opt. 0D1		1	14,600	16	233,600	
ICOD right to use processor	A6161A, Opt 104		1	21,806	48	1,046,688	267,264
ICOD right to access processor	A6162A		1	4,000	16	64,000	
Super Dome PCI Core I/O card	A5210A, Opt. 0D1		1	1,045	1	1,045	
PCI Dual FWD SCSI-2 Card	A5159A, Opt 0D1		1	1,245	1	1,245	
PCI 1000BT Lan Adapter	A4926A, Opt. 0D1		1	2,135	1	2,135	
PCI Fibre Channel 2X	A5158A, Opt 0D1		1	2,240	42	94,080	
Rack Installation Kit	A5170A, Opt. 0D1		1	410	1	410	
HP Smart 2U Storage Enclosure	C4317A		1	450	1	450	
DVD-ROM	C4318SZ		1	3,738	1	3,738	
(includes SCSI-2 card, cables, enclosures)							
HP9000 A500 Support Management Station	A5570B		1	11,780	1	11,780	
(includes memory,CPU,lan card,disk,OS, etc)							
.5m 68pin SCSI Terminator	Opt. 001		1	99	1	99	
WSE 68pin SCSI Teminator	Opt. 835		1	46	1	46	
HP-UX 11.i Sys Media, CD-ROM	B3920EA, Opt. AAF		1	520	1	520	
8kW 12kVA UPS 230V	A6585A		1	10,999	8	87,992	4,382
5M Ultra SCSI Cable	A5277A, Opt. 861		1	190	1	190	
SureStore E Disk Array FC60	A5277A		1	5,160	21	108,360	179,046
HP Rack System/E33 Inc. Rear & Foot	A4901A		1	2,240	21	47,040	
Dual Controllers	A5277A, Opt 204		1	32,080	21	673,680	
SureStore E Disk System SC10	A5294A		1	6,400	127	812,800	
16m Fibre Channel Cable	A5277A, Opt AFY		1	160	42	6,720	
18GB 10K RPM Disk Drive	A6262A		1	1,600	1260	2,016,000	
				Subtotal		**7,618,077**	**597,956**
Client Hardware							
Hewlett Packard Model C3600 Workstation	A5992A		1	11,500	40	460,000	155,240
1 GB Memory Moudle	A6016A, Opt. OD1		1	1,395	80	111,600	
512MB Memory Module	A4995A, Opt. OD1		1	695	40	27,800	
700/96 Console	C1064GX		1	550	1	550	
18 GB LVD 10K RPM Disk	A4998A, Opt. OD1		1	595	40	23,800	
				Subtotal		**623,750**	**155,240**
Client Software							
HP C/ANSI C Compiler	B3901BA, Option AH0		1	1,600	1	1,600	170
				Subtotal		**1,600**	**170**
User Connectivity							
HP ProCurve Switch 4000M	J4121A		1	2379	1	2,379	588
HP ProCurve Switch Gigabit-SX Module	J4113A		1	1189	1	1,189	
				Subtotal		**3,568**	**588**
	Large Configuration Discoun and Support Payment					($4,302,698)	($251,505)
				Total		**3,944,298**	**502,449**

All the components in the price list are currently available. Maintenance support price is for 24 hours, 7 days with 4 hour response time.

November 30, 2001

Ms. Lucille Boushey
TPC-C Performance Project Manager
Hewlett Packard
408 447 7364
408 447 5958 FAX

Dear Ms. Boushey:

Per your request I am enclosing the pricing information regarding TUXEDO 6.4 that you requested. This pricing applies to Tuxedo 6.4, 6.5, 7.1, and 8.0. Please note that Tuxedo 8.0 is our most recent version of Tuxedo. Core functionality services pricing is appropriate for your activities. As per the table below HP PA-RISC systems are classified as either a Tier 1, 2, 3, 4 or 5 systems depending on the performance and CPU capacity of the system. This quote is valid for 60 days from the date of this letter.

10.1.1 Tuxedo Core Functionality Services (CFS) Program Product Pricing and Description

TUX-CFS provides a basic level of middleware support for distributed computing, and is best used by organizations with substantial resources and knowledge for advanced distributed computing implementations.

TUX-CFS prices are server only and are based on the overall performance characteristics of the server and uses the same five tier computer classification as TUXEDO 6.4, 6.5, 7.1, and 8.0. Prices range from $3,000 for Tier 1 to $250,000 for Tier 5. Under this pricing option EVERY system running TUX-CFS at the user site must have a TUXEDO license installed and pay the appropriate per server license fees. Note that a 10% discount will apply to total list price license purchases greater than $100,000, but less than $250,000 (for instance 40 Tier 1 servers; C3600 Workstations – 40 * 3,000 = $120,000 - would be eligible for a 10% discount). Support is not discountable.

Very Truly Yours,

Rob Gieringer,
Worldwide Pricing Manager

10.1.1.1 BEA Tux/CFS Unlimited User License Fees Per Server

Unlimited User License fees per server	Number of Users	Dollar Amount	Maintenance (5 x 8) per year	Maintenance (7 x 24) per year
Tier 1 -- PC Servers with 1 or 2 CPUs, entry level RISC Uni-processor workstations and servers	**Unlimited**	**$3,000.00**	**$480.00**	**$690.00**
Tier 2 - PC Servers with 3 or 4 CPUs, Midrange RISC Uni-processor servers and workstations with up to 2 CPUs	**Unlimited**	**$12,000.00**	**$1,920.00**	**$2,760.00**
Tier 3 - Midrange Multiprocessors, up to 8 CPUs per system capacity	**Unlimited**	**$30,000.00**	**$4,800.00**	**$6,900.00**
Tier 4 - Large (more than 8, less than 32 CPUs)	**Unlimited**	**$100,000.00**	**$16,000.00**	**$23,000.00**
Tier 5 - Massively Parallel Systems, > 32 processors	**Unlimited**	**$250,000.00**	**$40,000.00**	**$57,500.00**

	Tier 1	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5
Operating System						
HP/UX 9.X;10.X	**Uni-processor Workstation** **B Class - 132/180/2000** **C Class (3000/3600 / 3700)**	**9000/E25** **9000/E35** **9000/E45** **9000/E55** **9000/G30** **9000/G40** **9000/A180** **9000/A180C** **9000 /A400**	**9000/G50** **9000/G60** **Multi-Processor Workstations** **J Class (J282/J2240/J5600/J6000/J6700)** **9000/R380,390** **9000/D200,210** **220/30/50/60/80** **D310/20/30** **D350/60/70/80** **9000 /A500** **9000 – L1000** **9000 – R Class**	**9000/H20, 30** **9000/H40, 50** **9000/I30, 40** **9000/K1XX** **9000 – L2000/L3000** **9000/I50,60** **9000/H60** **9000/G70** **9000/H70** **9000/I70** **9000/K2XX** **9000/K3XX** **9000/K4XX** **9000/K5XX** **N4xxx Series**	**9000/T500, T520,T600** **1-16 CPUs** **S-Class**	**9000/V series all models** **X-Class** **9000 Series - Superdome**