E-BUSINESS APPLICATIONS 11*i* (11.5.10) BENCHMARK -USING ORACLE10*g* ON HEWLETT-PACKARD PROLIANT & BLADE SERVERS

As a global leader in e-business applications, Oracle is committed to delivering high performance solutions that meet our customers' expectations. Business software must deliver rich functionality with robust performance. This performance must be maintained at volumes that are representative of customer environments.

Oracle benchmarks demonstrate our software's performance characteristics for a range of processing volumes in a specific configuration. Customers and prospects can use this information to determine the software, hardware, and network configurations necessary to support their processing volumes.

The primary objective of our benchmarking effort is to provide as many data points as possible to support this important decision.

SUMMARY OF RESULTS

Online Workload			
Number of Users		**Avg. Resp. (Sec)**	**90th Percentile Response Time (Sec)**
800 Concurrent Users		0.746	1.413
Batch Workload			
Order-to-Cash Batch		**Time (Min)**	**Hourly Order Line Throughput**
10,000 Order/Inv. Lines		40.93	14,659 Lines/Hour
Payroll Batch		**Time (Min)**	**Hourly Employee Throughput**
5,000 Employees		20.99	14,292 Checks/Hour

Note that the online users and the two batch workloads were running simultaneously and the hourly throughput numbers mentioned above are linear extrapolations. Many factors can influence performance and your results may differ.

BENCHMARK PROFILE

In February and March 2006, Oracle and Hewlett-Packard conducted a benchmark in Houston, TX to measure the online and batch performance of the Oracle Applications Standard Benchmark processes in an environment running Oracle E-Business Suite 11*i* (11.5.10) with Oracle10*g*™ (10.1.0.4) for Linux on a Hewlett-Packard® ProLiant™ DL580 G3 database server running two dual-core hyper-threaded processors and Red Hat® Enterprise Linux® Advanced Server release 4.0 Update 3. Three 2-way dual-core ProLiant BL25p's were used as application/web servers. Six HP StorageWorks MSA50 disk arrays were used for data storage.

The benchmark measured the online user response times and the Order Management and Payroll batch business process hourly throughputs for a small database model. Testing was conducted in a controlled environment with online users and the two batch processes running concurrently. **The goal of this Benchmark was to obtain reference response times and throughputs for Oracle E-Business Suite 11*i* Benchmark on 2-way* HP ProLiant servers.**

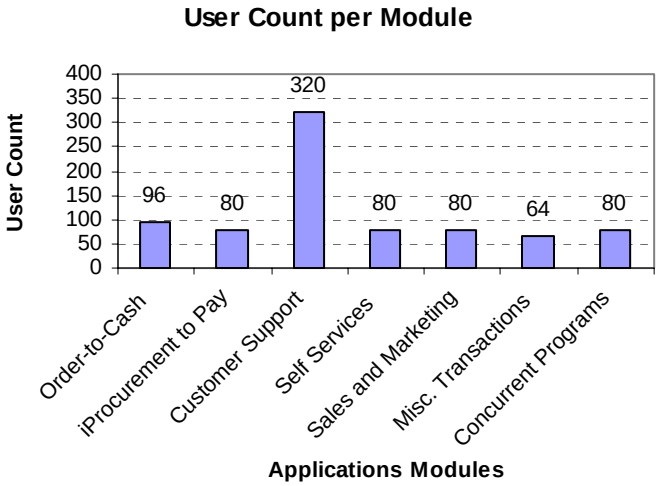


Figure 1: Oracle eBS Benchmark Concurrent User Distribution

* 2-way 'Dual-Core' CPUs performed as 4-ways.

BENCHMARK METHODOLOGY

E-Business Suite 11*i* Benchmark 11.5.10 online and batch processes can be initiated from a browser. For this benchmark, all runs used a browser to initiate the on-line user transactions and the batch processes were initiated as concurrent programs running simultaneously with the online users.

The batch workloads were run as standard concurrent processes via the concurrent manager.

Mercury Interactive's LoadRunner® was used as the load driver, simulating concurrent users. It submitted transactions at an average rate of one every 2.5 – 10 minutes for each concurrent user.

Measurements were recorded on all of the servers when the user load was attained and the environment reached a steady state.

Figure 2 shows the configuration used for this benchmark run.

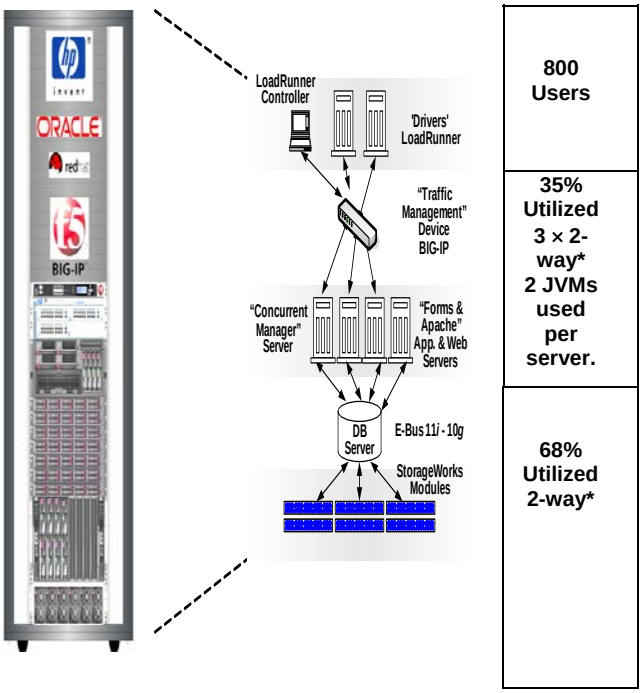


Figure 2: 3-Tier Configuration

This benchmark was run as a "Physical" 3-Tier configuration with discrete machines hosting all of the Database and Application server instances. The load across the multiple mid-tiers was balanced using an F5 Networks BIG-IP local traffic manager device.

BENCHMARK BUSINESS PROCESSES

The eBS benchmark consists of a mix of on-line transactions and batch processes running in parallel.

The following table describes the on-line transactions included in the benchmark run.

Oracle Application Product Flow	% within App.	% Overall	Pacing in Min
Order to Cash (10%)			
Create & Book Order	40	4	5
Pick Release	20	2	2.5
Ship Confirm / ITS	20	2	2.5
Receivables - Invoice	20	2	2.5
Procurement to Pay (10%)			
Create & Query Requisition	20	2	3
Auto-create & Approve PO	20	2	3
View Purchase Order	20	2	3
Create Invoice	20	2	3
Invoice Inquiry	20	2	3
Customer Service (40%)			
Create Service Request	40	16	4
Update Service Request	40	16	4
Close Service Request	20	8	4
Self Service (10%)			
Create & Query Cash Exp.	20	2	6
Create & Query Credit Card Expense	20	2	6
Create Project Timecard	30	3	6
View Employee Payslip	30	3	6
Sales & Marketing (10%)			
Sales Lead to Proposal	40	4	3
Opportunity to Quote	20	2	10
Sales Opportunity to Order	20	2	10
Opportunity to Sales Forecast	20	2	7.5
Miscellaneous Trans. (12%)			
AR View Customer Transact.	16.7	2	7.5
AR Customer Summary	16.7	2	7.5
FA Create & Query Asset	16.7	2	7.5
GL Create Journal Entry	16.7	2	7.5
INV View Item Attributes	16.7	2	7.5
INV Insert Misc. Transactions	16.7	2	7.5

Reports (8%)			
AR – Aging Report	25	2	15
INV – Min/Max Inventory Rep.	25	2	15
OM – Order Summary Report	25	2	15
PO – Printed PO Report	25	2	15
		100%	

Table 1: Online Transaction Mix

Batch Order-to-Cash Processes

Business Process	Number of Threads Used
High Vol. Order Proc.	2
Pick Release	2
Shipping Confirmation	2
ITS	2
Auto Invoice	1
Revenue Recognition	2
GL	1

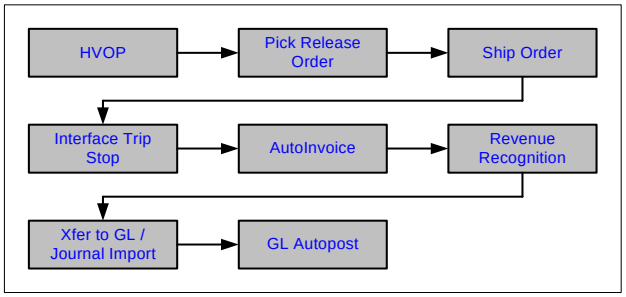


Figure 3: Order-to-Cash Process Flow

High Volume Order Processing (HVOP): The HVOP program processes orders by reading the rows from the Order Management Interface tables and converting the interface records into permanent order headers and their respective order lines. The orders are then booked and advanced to the shipping state.

Pick Release: Pick Release finds and release the eligible delivery lines that meet the release criteria, and creates move orders. The process of transacting move orders creates a reservation and determines the inventory source sub-inventory.

Ship Confirm: Ship Confirm is the process of confirming that items have shipped. When a delivery is ship-confirmed, Shipping Execution confirms that the delivery lines associated with the delivery have shipped.

Interface Trip Stop: The deliveries created in the previous step are then assigned to trips, which may involve multiple stops depending upon the shipping addresses of the deliveries. SRS has been modified to accept Organization code as a parameter and process the trip stops for the specified organization. Interface Trip Stop - SRS has also been enhanced to spawn multiple child processes to process trip stops in parallel. The parameter Stops per Batch is used to specify the number of stops to be processed by each thread of the Interface Trip Stop - SRS. Interface Trip Stop - SRS has also been enhanced to defer the Inventory Interface processes. In the eBS kit, this profile is set to Yes so that the Inventory Interface transactions are processed in the background by the Inventory transaction manager.

INV Material: The material transaction manager is configured to execute material transaction by periodic concurrent request submissions. The execution interval is set to 20 minutes.

Auto-Invoice: The Auto-Invoice process is used to import invoices, credit memos, debit memos, and on–account credits. 'Receivables' ensures that the data imported is accurate and valid.

Revenue Recognition: Revenue Recognition program generates the revenue distribution records for the invoices and credit memos that use Invoicing and Accounting Rules. Accounting rules were assigned to recognize revenue over a 12-months accounting period. The Revenue Recognition program will create distribution records for the invoices and credit memos that are created in Receivables and imported using Auto-Invoice.

Transfer to General Ledger & Journal Import: The General Ledger Interface program transfers Receivables transaction accounting distributions to the general ledger interface table (GL_INTERFACE) and creates either detailed or summarized journal batches. "Receivables" creates un-posted journal entries in general ledger and executes Journal Import from Oracle General Ledger. It posts journal batches in Oracle General Ledger to update account balances.

General Ledger Auto-post: This posts journal batches to update the account balances of the detail and summary accounts. It can post actual budget or encumbrance journal batches.

Batch Payroll Processes

Business Process	Number of Threads Used
Payroll Process	2
PrePayments	2
NACHA	2
Check Writer	2
Costing	2

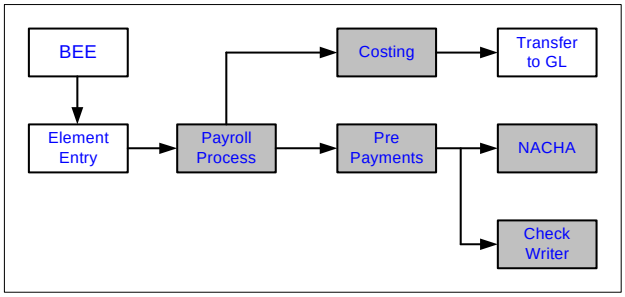


Figure 4: Payroll Process Flow

The Oracle E-Business Suite 11*i* Payroll processes tested are as follow:

Payroll Process: Identifies all employees to be processed and performs calculations required to complete the gross to net calculation including earnings, deductions, and taxes. The specific groups of employees processed can be controlled by multiple parameters to the payroll process including the ability for a user to define a rules based set of employees.

PrePayments: Distributes the net pay for each employee across the various payment methods (Direct Deposit, Check, or Cash). This can be run for a single payroll process or across multiple payroll processes.

NACHA: This is the US version of the Global Direct Deposit process which creates the bank interface file as per NACHA rules based on the rules in the Pre Payment process.

Check Writer: (Oracle Report Writer) This process allocates check numbers and creates/prints the payroll check and associated paper payslip.

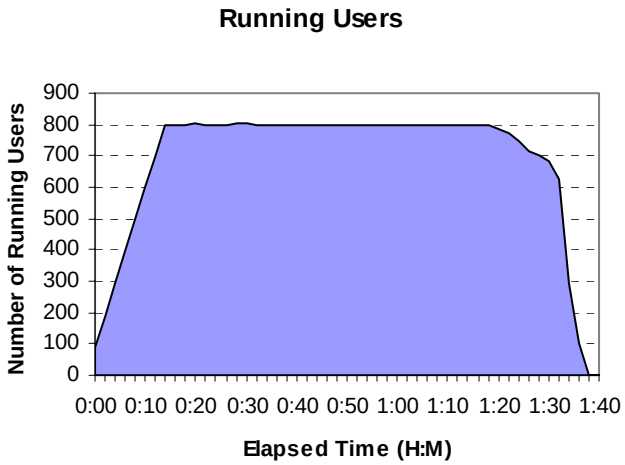
Costing: This process associates the payroll transaction data with the General Ledger (GL) accounts in preparation for transfer of the data to GL. This process uses a sophisticated hierarchical rules based engine to determine the mapping of the HRMS data and payroll results to the GL accounts.

BENCHMARK RESULTS

Online Workload	Avg. Resp. (Sec)	90th Percentile Response Time in Seconds
800 Concurrent Users	0.746	1.413
700 Concurrent Users	0.675	1.230
600 Concurrent Users	0.616	1.098

Table 1: Online Overall Response Times

Two checkpoints were completed during the measurement interval.



Business Metrics	Achieved Output
Order to Cash	
Number of Orders Created/Booked	1,938
Number of Orders Picked	1,920
Number of Orders Ship Confirmed	1,920
Number of Orders Interface Trip Stopped	1,920
Number of Invoice Headers Created	1,920
Number of Invoice Lines Created	3,840
Procurement to Pay	
Number of Requisitions Created	320
Number of Purchase Orders Created	1.599
Number of Purchase Orders Approved	1.599
Number of PO Invoices Created	320
Customer Support	
Number of Service Requests Created	1,921
Number of Service Requests Updated	1,921
Number of Service Requests Closed	906
Self-Service	
Number of Cash Expenses Created	320
Number of Credit Card Expenses Created	320

Number of Timecards Created		240
Sales & Marketing		
Number of Leads Converted to Proposal		640
Number of Leads Converted to Opportunities		638
Number of Opportunities Converted to Quotes		192
Number of Opportunities Converted to Orders		97
Miscellaneous Transactions		
Number of Fixed Assets Created		127
Number of GL Entries Created		1,170
Number of INV Miscellaneous Transactions Completed		640
Reports		
Number of GL Autoposts		57
Number of AR Reports		64
Number of INV Reports		64
Number of OM Reports		64
Number of PO Reports		64

Table 2a: Online Transactions Completed

	600 Users		700 Users		800 Users	
	Avg.	**90th%**	**Avg.**	**90th%**	**Avg.**	**90th%**
Order to Cash						
Cr./Book Order	1.89	2.41	2.12	2.71	2.41	3.28
Pick Release	0.94	1.25	1.02	1.33	1.10	1.50
Ship Confirm	0.38	0.53	0.40	0.54	0.42	0.62
AR Insert Inv.	0.84	1.03	0.93	1.15	1.03	1.33
Procurement to Pay						
Checkout req.	0.49	0.74	0.61	0.92	0.77	1.23
Submit Rq Data	0.42	0.58	0.41	0.66	0.51	0.78
Query Req.	0.25	0.41	0.28	0.46	0.31	0.57
Auto-create PO	0.25	0.38	0.23	0.42	0.28	0.44
Approve PO	0.46	0.66	0.56	0.88	0.62	0.98
View Purchase Order Find	0.38	0.62	0.39	0.59	0.42	0.68
Lines	0.55	0.78	0.57	0.78	0.58	0.86
Shipments	0.51	0.72	0.52	0.66	0.51	0.77
Distributions	0.76	1.0	0.79	1.05	0.79	1.09
Create AP Inv.	0.43	0.66	0.47	0.72	0.54	0.85
Inv. Distribution	0.33	0.54	0.45	0.62	0.52	0.80
View AP Invoice Find	0.37	0.53	0.41	0.57	0.38	0.56
Overview	2.58	3.39	2.84	3.72	2.96	3.97
Distributions	0.33	0.54	0.38	0.66	0.37	0.62
Customer Service						
Create Service Request	0.46	0.66	0.49	0.72	0.53	0.79
Update Service Request	0.49	0.72	0.52	0.79	0.56	0.86
Close Service Request	0.96	1.37	1.07	1.59	1.27	2.02
Self Service						
Create Cash Exp. Login	0.48	0.77	0.63	1.05	0.69	1.15
Submit Cash Exp.	0.95	1.26	1.03	1.38	1.17	1.73
Query Cash Exp.	0.45	0.64	0.52	0.73	0.65	0.99
Credit Card Expense Entry	0.33	0.48	0.37	0.52	0.38	0.53
Submit	1.03	1.28	1.03	1.38	1.24	1.81
Query Credit Card Expense	0.49	0.69	0.52	0.73	0.63	0.84
Create Project Timecard	0.37	0.61	0.43	0.66	0.44	0.68
View Employee Payslip	0.68	0.99	0.77	1.08	0.93	1.24

Table 2a: Detailed Online Transaction Response Times

	600 Users		700 Users		800 Users	
	Avg.	**90th%**	**Avg.**	**90th%**	**Avg.**	**90th%**
Sales & Marketing						
Create Proposal	0.5	0.73	0.56	0.88	0.66	1.11
Create Quote	0.75	0.96	0.81	1.10	0.94	1.38
Place Order	1.73	2.27	2.09	3.19	2.30	3.37
Query Forecast	0.32	0.52	0.38	0.65	0.40	0.64
Query Forecast Details	0.19	0.34	0.22	0.30	0.23	0.43
Submit Forecast	0.47	0.71	0.59	0.83	0.62	0.92
Update Forecast	0.21	0.32	0.27	0.47	0.34	0.64
Update Forecast Details	0.48	0.75	0.57	0.85	0.63	0.97
Update quote	0.42	0.72	0.45	0.66	0.51	0.89
Miscellaneous Trans.						
AR View Cust. Transact. Find	0.58	0.77	0.54	0.81	0.58	0.89
Aging	0.30	0.44	0.26	0.46	0.26	0.43
Acct. Summary	0.23	0.34	0.20	0.37	0.2	0.34
Acct. Details 1	0.25	0.42	0.22	0.35	0.22	0.41

Acct. Details 2	0.79	1.00	0.73	1.1	0.86	1.42
Line Items	0.61	0.83	0.59	0.96	0.65	1.07
Tax	0.25	0.34	0.25	0.41	0.26	0.47
AR Cust. Sum. Open Address	0.24	0.38	0.26	0.36	0.27	0.48
Open 'Ship To'	0.25	0.41	0.26	0.35	0.26	0.44
FA Create	0.36	0.57	0.35	0.55	0.36	0.60
FA Query Asset	0.28	0.45	0.27	0.44	0.28	0.47
GL Create Journal Entry	0.43	0.61	0.46	0.71	0.47	0.66
GL Query J. E.	0.21	0.33	0.23	0.38	0.20	0.34
INV View Item Attributes	0.31	0.47	0.33	0.50	0.36	0.58
INV View Quant	0.25	0.42	0.28	0.44	0.27	0.55

Table 2b: Detailed Online Transaction Results

10,000 order lines were processed in this test. Tables 3-5 show the processing time in minutes.

10,000 Order Lines		Time (Min)	Order Lines per Hour
HVOP		3.33	180,180
Pick Release		8.70	68,965
Ship Confirm		1.48	405,405
ITS		6.90	86,956
Auto Invoice		3.50	171,428
Revenue Recognition		4.95	121,212
General Ledger		12.07	49,710
Totals:		40.93	14,659

Table 3: Order-to-Cash Batch Performance (800 Users)

10,000 Order Lines		Time (Min)	Order Lines per Hour
HVOP		3.02	198,675
Pick Release		7.6	78,947
Ship Confirm		1.38	434,782
ITS		6.4	93,750
Auto Invoice		3.73	160,857
Revenue Recognition		4.36	137,614
General Ledger		10.13	59,230
Totals:		36.62	16,384

Table 4: Order-to-Cash Batch Performance (700 Users)

10,000 Order Lines		Time (Min)	Order Lines per Hour
HVOP		2.47	242,914
Pick Release		7.38	81,300
Ship Confirm		1.23	487,804
ITS		5.98	100,334
Auto Invoice		3.27	183,486
Revenue Recognition		3.92	153,061
General Ledger		9.6	62,500
Totals:		33.85	17,725

Table 5: Order-to-Cash Batch Performance (600 Users)

5,000 employees were processed for the semi-monthly payroll in this test. Tables 6-8 show the processing time in minutes.

5,000 Employees		Time (Min)	Employees per Hour
Payroll Process		17.80	16,853
PrePayments		1.28	234,375
NACHA		0.08	3,750,000
Check Writer		0.30	1,000,000
Costing		1.53	196,078
Totals:		20.99	14,292

Table 6: Payroll Batch Performance (800 Users)

5,000 Employees		Time (Min)	Employees per Hour
Payroll Process		14.57	20,590
PrePayments		1.32	227,272
NACHA		0.1	3,000,000
Check Writer		0.32	937,500
Costing		1.3	230,769
Totals:		17.61	17,035

Table 7: Payroll Batch Performance (700 Users)

5,000 Employees	Time (Min)	Employees per Hour
Payroll Process	13.98	21,459
PrePayments	1.22	245,901
NACHA	0.05	6,000,000
Check Writer	0.27	1,111,111
Costing	1.22	245,901
Totals:	16.74	17,921

Table 8: Payroll Batch Performance (600 Users)

SERVER PERFORMANCE

Figure 4 shows the average CPU utilization for each process. The value shown is the average across the 2 processors in the database server and the 2 processors in each application server.

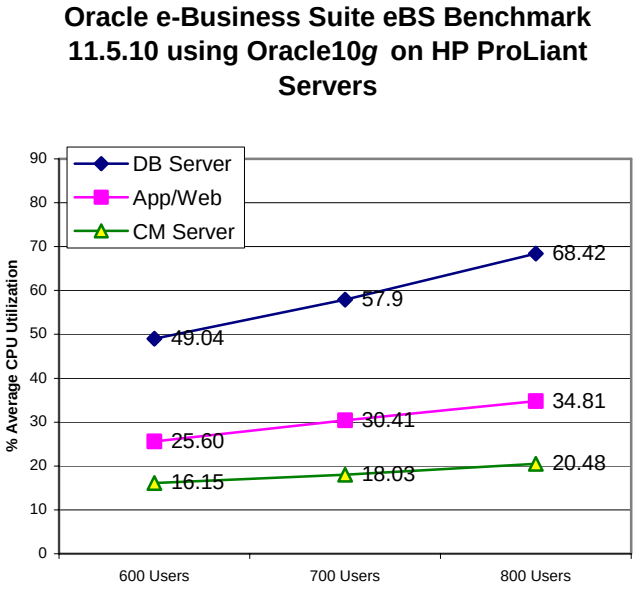


Figure 4: Average CPU Utilization

Each server scaled smoothly as users were added, keeping the batch load constant over the steady state period.

Online Workload	600 Users	700 Users	800 Users
DB Server CPU	49%	57.9%	68.4%
App/Web Server 1	26.1%	31.1%	35.4%
App/Web Server 2	24.0%	29.3%	34.6%
App/Web Server 3	26.7%	30.8%	34.4%
Concurrent Man. Server	16.1%	18.0%	20.5%

Table 9: Average CPU Utilization

Online Workload	600 Users	700 Users	800 Users
DB Server (32 GB)	12,661	13,872	15,125
App/Web Ser. 1 (16 GB)	6,303	7,266	8,635
App/Web Ser. 2 (16 GB)	6,331	7,282	8,051
App/Web Ser. 3 (16 GB)	6,692	7,568	7,835
CM Server (16 GB)	842	851	871

Table 10: Average Memory Utilization (Megabytes)

I/O PERFORMANCE

The Direct-Connected HP Storage Works MSA50 disk arrays were used for storage. I/O performance is crucial to batch performance and is summarized as follows:

8K Blocks		600 Users	700 Users	800 Users
Blocks Xfers/Sec Avg.		638	654	722
Peak		2,840	2,526	2,435
Blocks Written/Sec Avg.		512	515	561
Peak		2,646	2,343	2,224
Blocks Read/Sec Avg.		126	138	160
Peak		736	776	634

Table 11: I/O Subsystem Metrics

DATA COMPOSITION DESCRIPTION

Major data components for the model under test are summarized in the following table.

Application	Business Objects	Small Model
TCA	Organizations	100,000
	Contacts	200,000
	Contact Points	200,000
	Accounts	100,000
	Account Sites	100,000
	Account Site Uses	200,000
Contracts	Contracts	20,000
Install Base	Instances	100,000
	Trackable Items	5
Items	Reserve - Items	100,000
HR	Managers	200
	Employees	5,000
	Payroll Users	5,000
	Users	5,000

	Credit Card Entries	5,000
	Supplier(s)	1,000
Assets	Asset Categories	100
General Ledger	GL Code Combinations	1,000
Sales & Marketing	Resources	3,601
	Resource Groups	400
	Resource Hierarchy Level(s)	4
	Sales Leads	100,000
	Campaigns	1
	Sales Territories	3,201

Table 12: Data Composition

PATCHES

The following patches were applied to the benchmark environment on top of Oracle Applications 11.5.10.

1. 4529484: SUBMIT EXPENSE PERFORMANCE ISSUE
2. 4058603: OIE.I ROLLUP PATCH #2
3. 4282785: PERFORMANCE: SERVICE REQUEST CREATION IS SLOW FROM THE SRTAB FROM CC
4. 4455883: POOR PERFORMANCE SEARCHING SEVICE REQUESTS
5. 4564212: AR AGING 4 BUCKET REPORT IS DOING FULL TABLE SCAN
6. 4345584: UNABLE TO ENTER A LINE IN SALES ORDER FORM
7. 4605076: EXCESSIVE EXECUTIONS FOR SPECIFIC PACKAGE
8. 4612749: BUG FIXES FOR CS: OCT-05 PATCH
9. 4756197: TOO MANY EXECUTIONS OF SELECT A.PERZ_DATA_ID, A.PROFILE_NAME...IN UPDATE
10. 4733725: BUG FIXES FOR CS: DEC 05 PATCH
11. 5068932: INV: EXCESSIVE PROFILE AND LOGGING CALLS IN PICK RELEASE
12. 4384590: BACKPORT FOR BUG# 4287370
13. 4699535: HIGH BUFFER GET SQL IN WSHINTERFACE.
14. JAVA.LANG.ARRAYINDEXOUTOFBOUNDSEXCEPTION WHILE CREATING QUOTATION

APPLICATION SETTINGS

Database:

1. The database initialization parameters were set according to the MetaLink document 216205.1 "Database Initialization Parameters and Configuration for Oracle Applications 11i".

Order Management:

1. The profile option 'OM: Apply Automatic Attachments' was set to 'No'.
2. Price adjustment event at booking. "Book Order" was disabled.
3. The item identifier default type was changed to 'Internal Item Number'.
4. The setup parameters "Enable Freight Ratings" and "Enable Ship Method" were set to No.
5. Re-pricing was disabled at Book Order. 'Save Order Event' was disabled in the Pricing setup.
6. The profile option ONT_BYPASS_NOTIFY_OC was created and set to "Y".

Inventory:

1. The pick release rules was set to "Autocreate Deliveries".
2. Except 'serviceable items', all other items used in the benchmark were set as 'Non Trackable' through the Item Master form.

Expenses:

1. In jserv.properties file the following properties were changed:
   # XML Gateway Parameters
   wrapper.bin.parameters=-DOXTALogDebugMsg=false
   # OA Framework
   wrapper.bin.parameters=-Djbo.323.compatible=true
   # JMS & WF
   wrapper.bin.parameters=-DLONG_RUNNING_JVM=true
   # STO
   wrapper.bin.parameters=-DCACHEMODE=DISTRIBUTED

Sales & Marketing:

1. Update 'Launch On Date' to current date if 3 months passed after Campaign Schedule created.
2. The profile options ASO_CALCULATE_PRICE and ASO_CALCULATE_TAX were set to "Manual
3. The profile option ASO_USE_NETWORK_CONTAINER was set to 'No'.

Service:

1. Business event subscriptions were disabled.
2. For iSupport, the type of Alert bin was changed to Java.
   Content Source Type : Java Object
   Content Source Name: oracle.apps.ibu.homepage.AlertBinRenderer

Receivables:

1. The scheduled "General Ledger Transfer" concurrent program was cancelled.

Payroll:

1. CHUNCK_SIZE was set to 20 in PAY_ACTION_PARAMETERS table.

2. Moved PAY_RUN_RESULTS, PAY_RUN_RESULT_VALUES table and index to the tablespace, locally managed, uniform size 20M.

APPLICATION TUNING

1. Two additional indexes were created on table RA_CUSTOMER_TRX_LINES_ALL on columns interface_line_attribute1 and interface_line_attribute6

2. The index INV.MTL_ITEM_CATEGORIES_N3 was modified to have the columns in the following order.
   MTL_ITEM_CATEGORIES(CATEGORY_ID,CATEGORY_SET_ID,ORGANIZATION_ID)

3. The sequence cache size for the following indexes were set to 10000:

   INV.MTL_SALES_ORDERS_S,
   ONT.OE_MSG_ID_S,
   ONT.OE_SALES_CREDITS_S,
   MRP.MRP_AP_REFRESH_S,
   MRP.MRP_ATP_SCHEDULE_TEMP_S,
   WSH.WSH_DELIVERY_ASSIGNMENTS_S,
   WSH.WSH_DELIVERY_DETAILS_S

4. The snapshot logs were dropped on the following tables:
   INV.MTL_MATERIAL_TRANSACTIONS
   INV.MTL_RESERVATIONS
   INV.MTL_DEMAND
   OSM.AS_SALES_LEADS

5. The retention time of the following queues was set to 0:
   APPLSYS.WF_REPLAY_OUT
   APPLSYS.WF_REPLAY_IN
   APPLSYS.WF_IN
   APPLSYS.WF_OUT
   APPLSYS.WF_DEFERRED
   APPLSYS.WF_NOTIFICATION_IN
   APPLSYS.WF_NOTIFICATION_OUT
   APPLSYS.WF_JAVA_DEFERRED

6. Statistics were re-collected for index HZ_RELATIONSHIPS_N6

7. The index AR.RA_CUST_TRX_LINE_GL_DIST_N2 was dropped.

8. RA_CUST_TRX_LINE_GL_DIST_ALL table and index were moved to the tablespace, locally managed, uniform size 20M

9. The address and hash_value for the following SQL was determined at runtime and pined.

```
SELECT
ROW_ID,INVOICE_ID,VENDOR_ID,VENDOR_SITE_ID,SET_OF_BOOKS_ID,VENDOR_NAME,
VENDOR_SITE_CODE,VENDOR_NUMBER,NUM_1099,INVOICE_NUM,INVOICE_TYPE,
INVOICE_DATE,BATCH_NAME,INVOICE_TYPE_LOOKUP_CODE,INVOICE_CURRENCY_CODE,
PAYMENT_CURRENCY_CODE,ACTUAL_INVOICE_AMOUNT,INVOICE_AMOUNT,
ORIGINAL_PREPAYMENT_AMOUNT,VOUCHER_NUM,DOC_SEQUENCE_VALUE,DOC_SEQUENCE_ID,
AMOUNT_PAID,PO_NUMBER,RELEASE_NUMBER,EARLIEST_SETTLEMENT_DATE,
RECEIPT_NUMBER,DESCRIPTION,PAYMENT_STATUS,PAYMENT_STATUS_FLAG,
LAST_UPDATED_BY,LAST_UPDATE_DATE,LAST_UPDATE_LOGIN,CREATION_DATE,CREATED_BY,
  WFAPPROVAL_STATUS_DSP
FROM
 AP_INVOICES_V WHERE INVOICE_ID = :1  order by VENDOR_NAME, VENDOR_SITE_CODE,
  INVOICE_DATE DESC, INVOICE_NUM, INVOICE_AMOUNT DESC
```

BENCHMARK ENVIRONMENT

HARDWARE CONFIGURATION

A Hewlett-Packard® ProLiant® DL580 G3 server was used as the batch/database server. It was equipped with the following:

- 2 × 3.0 GHz Intel® Xeon™ Dual-Core 7040 processors with hyper-threading turned on, each with 1 Megabyte of Level 2 Cache and 8 Megabytes of Level-3 Cache.
- 32 Gigabytes of Memory
- 6 × Direct-Connected HP StorageWorks MSA50 disk arrays attached to 3 SmartArray P600 controllers for Data
- 1 × Direct-Connected HP StorageWorks MSA50 disk array attached to 1 SmartArray P600 controller for Logs
- ~25.6 Terabytes of (Data) total Disk Space available (6 × 60 × 72.8 GB + 4 × 72 GB internal disk drives), approximately 383 GB of RAID 0 storage used for this benchmark
- ~4.26 Terabytes of (Log) total Disk Space available (60 × 72.8 GB).

Application Server(s):

3 × HP ProLiant® BL25p blade servers were used as a application and web servers. They were equipped with the following:

- 2 × 2.4 GHz AMD® Opteron™ Dual-Core 280 processors, each with 1 Megabyte of Level 2 Cache write-back cache per core
- 16 Gigabytes of Memory
- ~144 GB of storage with an integrated SmartArray 6i Ultra320 Controller

CM/NFS Server:

1 × HP ProLiant® BL25p blade server was used as the CM/NFS server. It was equipped with the following:

- 2 × 2.4 GHz AMD® Opteron™ Dual-Core 280 processors, each with 1 Megabyte of Level 2 Cache write-back cache per core
- 16 Gigabytes of Memory
- ~144 GB of storage with an integrated SmartArray 6i Ultra320 Controller

APPLICATION TRAFFIC MANAGEMENT DEVICES

1 x BIG-IP model 1500 Local Traffic Manager was used to distribute the LoadRunner traffic across the Web and application servers.

SOFTWARE VERSIONS

Oracle's E-Business Suite (eBS Kit) 11.5.10

Oracle10*g*™ 10.1.0.4 (32-bit)

Red Hat Enterprise Linux Advanced Server release 4.0 Update 3 (on the database server)

Red Hat Enterprise Linux Advanced Server release 4.0 Update 2 (on the application/web servers and CM server)

Mercury Interactive's LoadRunner® 8.0

Apache WebServer 1.3.19 with JServ 1.1.2

Java(TM) 2 Runtime Environment, Standard Edition (build 1.4.2_04-b05). Java HotSpot(TM) Client VM (build 1.4.2_04-b05, mixed mode)

F5 Networks Big-IP LTM v9.2.2

Glossary and Acronyms:

ATP	Available to Promise
BEE	Batch Element Entries
HVOP	High Volume Order Processing
OASB	Oracle Applications Standard Benchmark
RAC	Real Applications Clusters

Oracle
Applications Performance & Benchmarks
500 Oracle Parkway
Redwood Shores, California 94065
Tel 650/506-7000
Fax 650/506-7000
Email eBSkit_us@oracle.com
World Wide Web http://www.oracle.com

The results published in this report have been independently reviewed and audited by:

INFOSIZING