

# E-BUSINESS SUITE APPLICATIONS 11i (11.5.10) BENCHMARK - USING ORACLE10g (RAC) ON HEWLETT- PACKARD PROLIANT BL680C AND BL480c SERVER BLADES

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)	90 <sup>th</sup> Percentile Response Time (Sec)
2,700 Concurrent Users	0.377	0.625
Batch Workload		
Order-to-Cash Batch	Time (Min)	Hourly Order Line Throughput
50,000 Order/Inv. Lines	26.86	111,690 Lines/Hour
Payroll Batch	Time (Min)	Hourly Employee Throughput
10,000 Employees	6.64	90,361 Empl./Hour

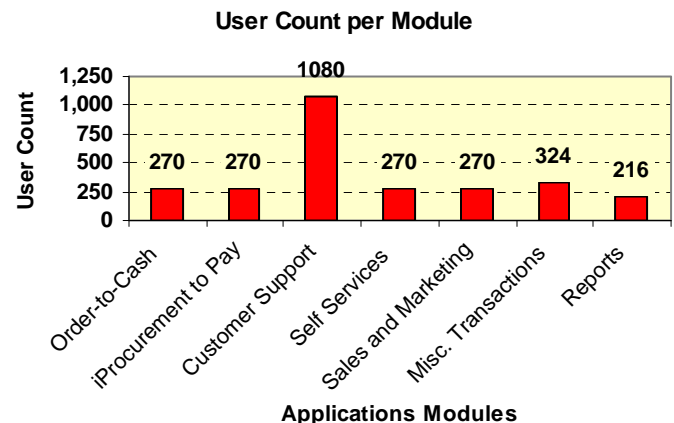
Note that the online users and the two batch workloads were running simultaneously and the hourly throughput numbers mentioned above are linear extrapolations. Many factors can influence performance and your results may differ.

## BENCHMARK PROFILE

In February and March 2008, Oracle and Hewlett-Packard conducted a benchmark in Corona, CA to measure the online and batch performance of the Oracle Applications Standard Benchmark processes in an environment running Oracle E-Business Suite 11i (11.5.10) with Oracle10g™ RAC (10.2.0.3) for the Linux operating system on a pair of Hewlett-Packard® ProLiant® BL680c G5 blade servers, running Red Hat® Enterprise Linux® Advanced Server release 4.0 Update 4. The first BL680C G5 blade in the RAC cluster used 4 sockets of quad-core processors for a total of 16 cores whilst the second BL680C G5 blade used 2 sockets of quad-cores for a total of 8 cores.

Three 2-socket quad-core HP ProLiant BL480c server blades (8 cores per blade total), running Red Hat® Enterprise Linux® Advanced Server release 4.0 Update 4 were used as application/web servers. One 2-socket quad-core HP ProLiant BL480c server blade was used as the Concurrent Manager server (also as the 4<sup>th</sup> App/Web server). A single HP Storage Works EVA6100 disk array was used for storage.

The benchmark measured the online user response times and the Order Management and Payroll batch business process hourly throughputs for a medium 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 11i Benchmark on HP servers running Linux.**



**Figure 1: Oracle E-Business Suite Benchmark Concurrent User Distribution**

## BENCHMARK METHODOLOGY

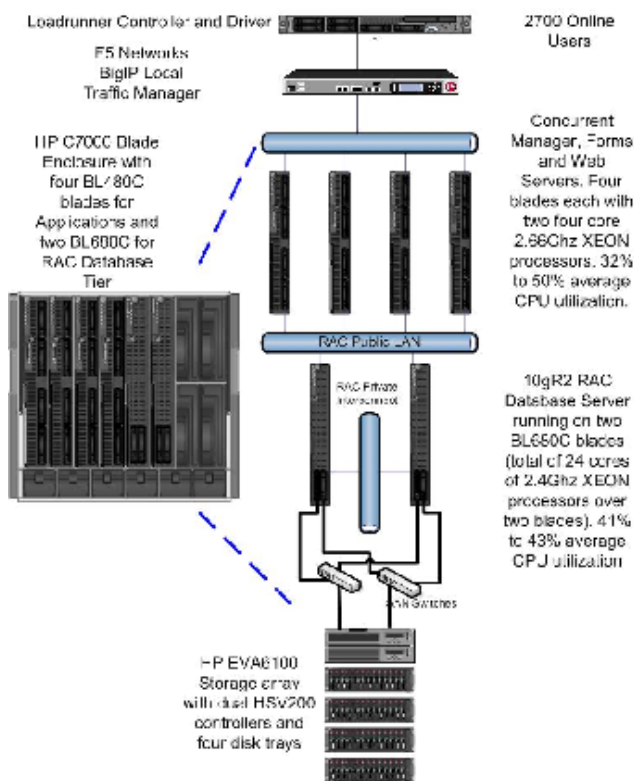
E-Business Suite 11i Benchmark 11.5.10 online and batch processes can be initiated from a browser. For this benchmark, all runs used a browser to initiate the on-line user transactions and the batch processes were initiated as concurrent programs running simultaneously with the online users.

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

Mercury® LoadRunner® was used as the load driver, simulating concurrent users. It submitted transactions at an average rate of one every 2.5 – 15 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

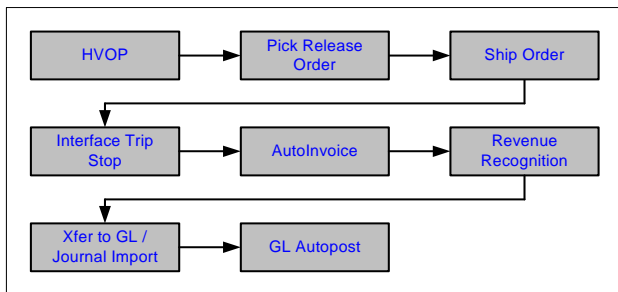
The E-Business Suite benchmark consists of a mix of on-line transactions and batch processes running in parallel. The following table describes the on-line transactions included in the benchmark run.

Oracle Application Product Flow	% within App.	% Overall	Pacing in Min
<b>Order to Cash (10%)</b>			
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
<b>Procurement to Pay (10%)</b>			
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
<b>Customer Service (40%)</b>			
Create Service Request	40	16	4
Update Service Request	40	16	4
Close Service Request	20	8	4
<b>Self Service (10%)</b>			
Create & Query Cash Exp.	20	2	6
Create & Query C. Card Exp.	20	2	6
Create Project Timecard	30	3	6
View Employee Payslip	30	3	6
<b>Sales &amp; Marketing (10%)</b>			
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
<b>Miscellaneous Trans. (12%)</b>			
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
<b>Reports (8%)</b>			
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.	12
Pick Release	8
Shipping Confirmation	8
ITS	8
Auto Invoice	8
Revenue Recognition	8
GL	8



**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 E-Business Suite 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 1 minute.

**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-month 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.

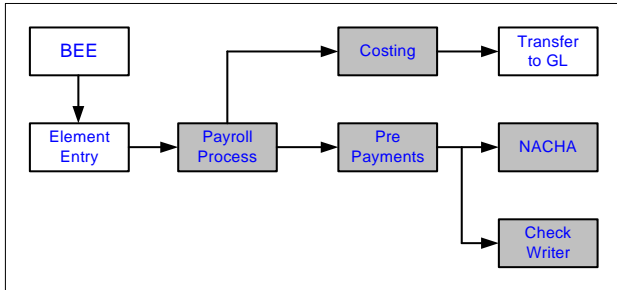
**Transfer to General Ledger & Journal Import:** The General Ledger Interface program transfers Receivables transaction accounting distributions to the general ledger interface table (GL\_INTERFACE) and creates either detailed or summarized journal batches. "Receivables" creates un-posted journal entries 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.

## BENCHMARK RESULTS

### Batch Payroll Processes

Business Process	Number of Threads Used
Payroll Process	8
PrePayments	8
NACHA	8
Check Writer	8
Costing	8



**Figure 4: Payroll Process Flow**

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

**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.

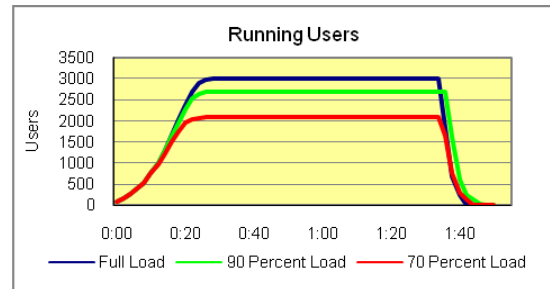
**Check Writer:** (Oracle Report Writer) This process allocates check numbers and creates/prints the payroll check and associated paper payslip.

**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.

Online Workload	Avg. Resp. (Sec)	90 <sup>th</sup> Percentile Response Time in Seconds
2,700 Concurrent Users	0.377	0.625

**Table 2: Online Overall Response Times**

At least two checkpoints were completed during the measurement interval.



**Figure 6: User Load Over Time: 70% Load = 2,100 Users, 90% Load = 2,700 Users and 100% Load = 3,000 Users**

## BENCHMARK RESULTS CONTINUED

Batch Business Metrics	Achieved Output
<b>Order to Cash</b>	
Number of Order Lines Created/Booked	50,000
Number of Order Lines Picked	50,000
Number of Order Lines Ship Confirmed	50,000
Number of Order lines Interface Trip Stopped	50,000
Number of Invoice Headers Created	50,000
Number of Invoice Lines Created	100,000

**Table 3a: Batch Transactions Completed (2,700 Users)**

Online Business Metrics	Achieved Output
<b>Order to Cash</b>	
Number of Orders Created/Booked	6,575
Number of Orders Picked	6,475
Number of Orders Ship Confirmed	6,475
Number of Orders Interface Trip Stopped	6,475
Number of Invoice Headers Created	6,475
Number of Invoice Lines Created	12,950
<b>Procurement to Pay</b>	
Number of Requisitions Created	1,079
Number of Purchase Orders Created	5,400
Number of Purchase Orders Approved	5,400
Number of PO Invoices Created	1,082
<b>Customer Support</b>	
Number of Service Requests Created	6,476
Number of Service Requests Updated	7,426
Number of Service Requests Closed	3,240
<b>Self-Service</b>	
Number of Cash Expenses Created	1,080
Number of Credit Card Expenses Created	1,080
Number of Timecards Created	810
<b>Sales &amp; Marketing</b>	
Number of Leads Converted to Proposal	2,159
Number of Leads Converted to Opportunities	2,162
Number of Opportunities Converted to Quotes	648
Number of Opportunities Converted to Orders	323
<b>Miscellaneous Transactions</b>	
Number of Fixed Assets Created	432
Number of GL Entries Created	4,320
Number of INV Miscellaneous Transactions Completed	2,155
<b>Reports</b>	
Number of AR Reports	216
Number of INV Reports	217
Number of OM Reports	218
Number of PO Reports	216

**Table 3b: Online Transactions Completed (2,700 Users)**

	2,700 Users	
	Avg.	90 <sup>th</sup> %
<b>Order to Cash</b>		
Cr./Book Order	0.87	1.00
Pick Release	0.44	0.48
Ship Confirm	0.24	0.32
AR Insert Inv.	0.53	0.61
<b>Procurement to Pay</b>		
Checkout req.	0.31	0.37
Submit Rq Data	0.32	0.37
Query Req.	0.13	0.16
Auto-create PO	0.21	0.21
Approve PO	0.33	0.43
View Purchase Order Find	0.28	0.32
Lines	0.44	0.54
Shipments	0.41	0.43
Distributions	0.63	0.72
Create AP Inv.	0.27	0.41
Inv. Distribution	0.30	0.35
View AP Invoice Find	0.21	0.21
Overview	1.06	1.20
Distributions	0.25	0.27
<b>Customer Service</b>		
Create Service Request	0.33	0.38
Update Service Request	0.35	0.41
Close Service Request	0.67	0.86
<b>Self Service</b>		
Create Cash Exp. Login	0.27	0.34
Submit Cash Exp.	0.48	0.58
Credit Card Expense Entry	0.20	0.23
Submit	0.51	0.58
Query Credit Card Expense	0.30	0.38
Create Project Timecard	0.14	0.17
View Employee Payslip	0.43	0.57

**Table 4a: Detailed Online Transaction Response Times**

	2,700 Users	
	Avg.	90 <sup>th</sup> %
<b>Sales &amp; Marketing</b>		
Create Proposal	0.30	0.38
Create Quote	0.56	0.78
Update quote	0.35	0.49
Place Order	1.52	1.95
Query Forecast	0.19	0.23
Query Forecast Details	0.12	0.15
Submit Forecast	0.28	0.35
Update Forecast	0.16	0.24
Update Forecast Details	0.28	0.35
<b>Miscellaneous Trans.</b>		
AR Bill to Open	0.21	0.21
AR View Cust. Transact. Find	0.42	0.54
Aging	0.19	0.29
Acct. Summary	0.16	0.21
Acct. Details 1	0.17	0.21
Acct. Details 2	0.53	0.76
Line Items	0.39	0.56
Tax	0.16	0.21
Tr. Accounting	0.17	0.21
AR Cust. Sum. Open Address	0.21	0.21
Open 'Ship To'	0.21	0.21
FA Create	0.23	0.21
FA Query Asset	0.19	0.24
GL Create Journal Entry	0.29	0.40
GL Query J. E.	0.17	0.21
INV Insert	1.18	2.04
INV View Item Attributes	0.27	0.32
INV View Quant	0.24	0.23
Overall Avg.	0.38	0.63

**Table 4b: Detailed Online Transaction Response Times**

50,000 order lines were processed in this test. Table 5 shows the processing time in minutes.

50,000 Lines	Order	Time (Min)	Order Lines per Hour
HVOP		1.53	1,960,784
Pick Release		5.40	555,556
Ship Confirm		0.75	4,000,000
ITS		4.38	684,932
Auto Invoice		5.95	504,202
Revenue Recognition		2.57	1,167,315
General Ledger		2.88	1,041,667
Journal Import		1.95	1,538,462
Posting		1.45	2,068,966
<b>Totals:</b>		<b>26.86</b>	<b>111,690</b>

**Table 5: Order-to-Cash Batch Performance (2,700 Users)**

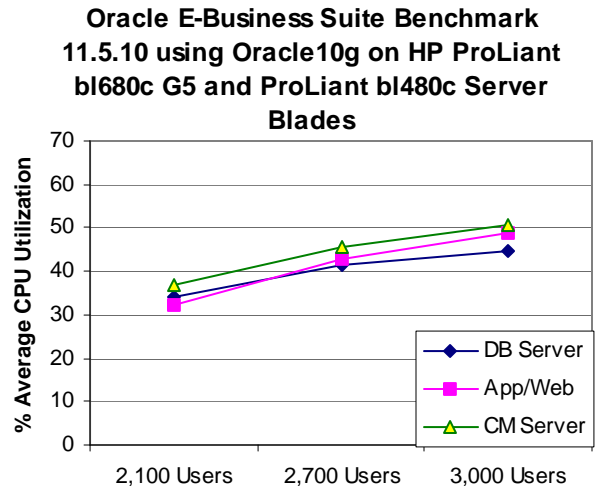
10,000 employees were processed for the semi-monthly payroll in this test. Table 6 shows the processing time in minutes.

10,000 Employees	Time (Min)	Employees per Hour
Payroll Process	5.50	109,091
PrePayments	0.29	2,068,966
NACHA	0.05	12,000,000
Check Writer	0.35	1,714,286
Costing	0.45	1,333,333
<b>Totals:</b>	<b>6.64</b>	<b>90,361</b>

**Table 6: Payroll Batch Performance (2,700 Users)**

## SERVER PERFORMANCE

Figure 7 shows the average CPU utilization on the Database, App/Web and CM servers. The value shown is the average across the processors in both database servers (a total of 24 cores) and the two processors (8 cores) in each of the three application servers and the Concurrent Manager server.



**Figure 7: Average CPU Utilization**

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

Online Workload	% User	% System	% I/O Wait	% Idle
<b>DB Server1 90%</b>	35.86	3.45	1.07	59.62
<b>DB Server2 90%</b>	33.2	6.63	2.5	57.68
<b>App/Web 1 90%</b>	25.37	6.47	0.13	68.02
<b>App/Web 2 90%</b>	39.08	10.7	0.13	50.09
<b>App/Web 3 90%</b>	35.95	10.65	0.4	53
<b>CM Server* 90%</b>	40.86	4.72	0.2	54.22

**Table 7: Average CPU Utilization Breakout**

\* The 'Concurrent Manager (CM) Server' also served as an App/Web server.

## DATA COMPOSITION DESCRIPTION

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

Average GB Used	2,700 Users
DB Server 1	42.62
DB Server 2	52.49
App/Web 1	15.54
App/Web 2	27.11
App/Web 3	23.92
CM Server	13.33

**Table 8: Average Memory Utilization Breakout**

## I/O PERFORMANCE

An EVA6100 storage system equipped with four disk trays was used for storage. The batch workload requires optimal I/O performance.

Average I/O Performance	2,700 Users
<b>DB Server 1</b>	
Avg. Reads/sec	53.13
Avg. Writes/sec	503.78
Avg. KB Read/sec	421.69
Avg. KB Written/sec	15,103.2
Avg. Service Time (ms)	0.440
<b>DB Server 2</b>	
Avg. Reads/sec	74.86
Avg. Writes/sec	170.13
Avg. KB Read/sec	597.20
Avg. KB Written/sec	1,293.29
Avg. Service Time (ms)	1.310

**Table 9: Average I/O Utilization Breakout**

Application	Business Objects	Medium Model
TCA	Organizations	500,000
	Contacts	1,000,000
	Contact Points	1,000,000
	Accounts	500,000
	Account Sites	500,000
	Account Site Uses	1,000,000
	Contracts	Contracts
Install Base	Instances	500,000
	Trackable Items	5
Items	Reserve - Items	500,000
HR	Managers	400
	Employees	50,000
	Payroll Users	50,000
	Users	10,000
	Credit Card Entries	500,000
	Supplier(s)	5,000
Assets	Asset Categories	100
General Ledger	GL Code Combinations	1,000
Sales & Marketing	Resources	9,021
	Resource Groups	820
	Resource Hierarchy Level(s)	4
	Sales Leads	500,000
	Campaigns	1
	Sales Territories	8,201

**Table 10: 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 SERVICE 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	4070860:	ORACLE QUOTING ROLLUP 2 ON 11i.QOT.D
14	4070199:	ORACLE ORDER CAPTURE ROLLUP 2 ON 11i.ASO.M
15	5742459:	BR11510: QOT: GETTING JAVA.LANG.VERIFYERROR WHILE ACCESSING QUOTES
16	4742368:	Create Inter-company AR Invoices Program - Poor Performance
17	4599286:	11510: ISUPPORT CONSOLIDATION PATCH AS OF SEPTEMBER, 2005
18	3641831:	DBI60:RUP4:WF_EVENT_OMB_QH IS INVALID AFTER APPLYING HR_PF.D.
19	4137620:	FND/AFCPROG.LCT 11.5 PREREQ PATCH E
20	5161676:	MINIPACK 11i.AD.I.5
21	5854189:	BUG:5582347:OE_ORDER_PUB.PROCESS_ORDER API FOR PRICING ATTRIBUTES
22	4665900:	This is the OM Prerequisite Patch (OMPRP) for 11.5.10 customers.
23	4042499:	Supply Chain Management Family Pack J Rollup Patch 1
24	4218015:	CUMULATIVE TAX PATCH #34 FOR RECEIVABLES TAXMODULE
25	3822219:	XDO/ORACLE XML PUBLISHER OA ROLLUP PATCH 5.0.0
26	4175764:	11i.ADXE.1 FEB 2005 CUMULATIVE UPDATE
27	4198954:	Linux Operating System Family: Patch COMPATIBILITY PACKAGES FOR ORACLE ON RHEL 4

**Table 11: Application Patches**

## 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 were 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.

### Tech. Stack Configuration:

1. Disable the nagle algorithm in protocol.ora by setting TCP\_NODELAY=YES in \$TNS\_ADMIN
2. Set the FORMS60\_REJECT\_GO\_DISABLED\_ITEM="0" environment variable
3. Set the FND\_JDBC\_PLSQL\_RESET parameter to "true" in the dbc file

## APPLICATION SETTINGS CONTINUED

### 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. CHUNK\_SIZE was set to 20 in PAY\_ACTION\_PARAMETERS table.

## APPLICATION TUNING

Two additional indexes were created on table RA\_CUSTOMER\_TRX\_LINES\_ALL on columns interface\_line\_attribute1 and interface\_line\_attribute6

1. 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)
2. The sequence cache size for the following sequences 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
3. The snapshot logs were dropped on the following tables:  
INV.MTL\_MATERIAL\_TRANSACTIONS  
INV.MTL\_RESERVATIONS  
INV.MTL\_DEMAND  
OSM.AS\_SALES\_LEADS
4. 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

## APPLICATION TUNING CONTINUED

5. The index AR.RA\_CUST\_TRX\_LINE\_GL\_DIST\_N2 was dropped.
6. RA\_CUST\_TRX\_LINE\_GL\_DIST\_ALL, GL\_INTERFACE, RA\_CUSTOMER\_TRX\_ALL, RA\_CUSTOMER\_TRX\_LINES\_ALL, GL\_IMPORT\_REFERENCES, GL\_JE\_HEADERS, GL\_JE\_LINES, MTL\_MATERIAL\_TRANSACTIONS, MTL\_RESERVATIONS, MTL\_ONHAND\_QUANTITIES\_DETAIL, tables and their index were moved to the tablespace, locally managed, uniform size 10M
7. PAY\_RUN\_RESULTS, PAY\_RUN\_RESULT\_VALUES tables and index were moved to the tablespace, locally managed, uniform size 20M.
8. Add index: oe\_price\_adjustments (list\_line\_id , list\_line\_type\_code , updated\_flag)
9. Add index: wfevents\_u3 as wf\_events (name,status,type,LICENSED\_FLAG)
10. Add index gl\_code\_combinations\_u2 (segment4,segment3,segment2,segment5,segment1, chart\_of\_acount\_ids)
11. Decreased the polling interval and worker wait time for the Revenue Recognition job step within the Orders To Cash batch
12. Add index: fnd\_random\_stats(lock\_id)

## OPERATING SYSTEM TUNING

### DATABASE OPERATING SYSTEM TUNING

1. The following Kernel parameters were automatically set during boot on both database RAC machines using the sysctl.conf file:

```
kernel.sem = 250 32000 100 128
kernel.shmmax = 64424509440
kernel.shmmni = 4096
kernel.shmall = 15728640
fs.file-max = 200000
net.ipv4.tcp_sack = 0
net.ipv4.ip_local_port_range = 1024 65000
net.core.rmem_default = 262144
net.core.rmem_max = 262144
net.core.wmem_default = 262144
net.ipv4.tcp_timestamps = 0
net.core.wmem_max = 262144
vm.nr_hugepages = 12803
```

2. The following limits were set in the limits.conf file:

```
soft    nproc    16380
hard    nproc    16384
soft    nfile    180000
hard    nfile    200000
```

3. Hugepages were enabled for the Oracle Database to use

## OPERATING SYSTEM TUNING CONT.

### APPLICATIONS OPERATING SYSTEM TUNING

1. The following parameters were set via sysctl:

```
net.ipv4.tcp_sack = 0
net.ipv4.ip_local_port_range = 1024 65000
net.core.rmem_default = 262144
net.core.rmem_max = 262144
net.core.wmem_default = 262144
net.ipv4.tcp_timestamps = 0
net.core.wmem_max = 262144
vm.nr_hugepages = 1700
kernel.shmmax = 2147483648
```

2. Large pages were enabled for Java

### OTHER TUNING

1. Application tier blade1 (CM, Web and Forms) and blade2 (Web and Forms) were directed to the 16 core RAC database node. Application tier blade3 and blade4 (both Web and Forms) were directed to the 8 core RAC database node
2. Both Orders to Cash and Payroll batch jobs were executed on the 16 core RAC database node
3. The following online workload was directed towards application tier blade3 and blade4:

```
lead2proposal
update_sr
inv_view_item_attributes
inv_insert_miscll_transactions
create_payables_invoice
create_sr
gl_journal_entry
view_payables_invoice
Opportunity2Quote
Opportunity2Order
Opportunity2Forecast
close_sr
view_purchase_order
fa_create_asset
view_employee_payslip
```

The remaining online workload was directed towards application tier blade1 and blade2.

## BENCHMARK ENVIRONMENT

### HARDWARE CONFIGURATION

A pair of Hewlett-Packard® ProLiant® BL680c G5 server blades were used for the RAC database servers. They were equipped with the following:

- For the first RAC node: 4 × 2.4 GHz Intel® Xeon™ Quad-Core E7340 processors (16 cores total), each with 8 MB of Level 2 cache
- For the second RAC node: 2 × 2.4 GHz Intel® Xeon™ Quad-Core E7340 processors (8 cores total), each with 8 MB of Level 2 cache
- 64 Gigabytes of Memory
- 2 × 146 GB internal disk drives attached to an embedded HP SmartArray P400i Controller
- 1 × HP Storage Works EVA6100 disk array shared between the two RAC nodes using a dual-port Qlogic Fibre Channel Adapter for data and logs
- 8 TB raw disk space available for allocation. (56 × 146 GB)
- Approximately 552 GB of mirrored storage configured for this benchmark (data and logs)

### Application Servers:

2 × HP® ProLiant® BL480c server blades were used as the application/web servers. They were equipped with the following:

- 2 × 2.66 GHz Intel® Xeon™ Quad-Core X5355 processors (8 cores total), each with 8 MB of Level 2 cache
- Total Memory: 32 GB.
- Network: Gigabit full duplex.
- 2 × 72 GB internal disk drives attached to an embedded HP SmartArray P400i Controller

1 × HP® ProLiant® BL480c server blade was used as an application/web server. It was equipped with the following:

- 2 × 2.66 GHz Intel® Xeon™ Quad-Core X5355 processors (8 cores total), each with 8 MB of Level 2 cache
- Total Memory: 24 GB.
- Network: Gigabit full duplex.
- 2 × 72 GB internal disk drives attached to an embedded HP SmartArray P400i Controller

### Concurrent Manager Server(s):

1 × HP® ProLiant® BL480c server blade was used as a Concurrent Manager server (and as the fourth app/web server). This system was equipped with the following:

- 2 × 2.66 GHz Intel® Xeon™ Quad-Core X5355 processors (8 cores total), each with 8 MB of Level 2 cache
- Total Memory: 24 GB.
- Network: Gigabit full duplex.
- 2 × 72 GB internal disk drives attached to an embedded HP SmartArray P400i Controller

### Application Traffic Management Device(s):



1 × F5 BIG-IP Model 1500 Local Traffic Manager was used to distribute the LoadRunner traffic across the web and application servers.

### Load Driver(s):

1 × HP® ProLiant® DL380 G4 server was used as the load driver. It was equipped with the following:

- 2 × 2.8 GHz Dual Core Intel® Xeon™ processors, each with 2 MB of Level 2 cache
- 6 GB memory

## SOFTWARE VERSIONS

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

Oracle10g™ 10.2.0.3 (64-bit)

Red Hat Enterprise Linux Advanced Server release 4.0  
Update 4 (on the database servers, application/web servers  
and CM server)

Mercury® LoadRunner® 8.0

For more details on Mercury's LoadRunner, please refer to  
<http://www.mercury.com/us/products/performance-center/loadrunner/>

Apache WebServer 1.3.19 with JServ 1.1.2

Java™ 2 Runtime Environment, Standard Edition (version  
1.5.0).

F5 Traffic Management Software BIG-IP 9.1.0 Build 6.2

### 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



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